SKSSWEDEN

Nidec

All for dreams

Installation & maintenance

Three-phase induction motors

LS / LSES, aluminium motors
FLSES, cast iron motors
PLSES, IP23 drip-proof motors

Part number: 4850 en - 2017.10 / e

LEROY-SOMER™

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 experienced, qualified and authorized personnel.

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

Particular attention should 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.

⚠ **The following preliminary precautions must be taken before working on any stationary device:**
• mains voltage disconnected and no residual voltage present
• careful examination of the causes of the stoppage (blocked transmission - loss of phase - cut-out due to thermal protection - lack of lubrication, etc)

Dear Customer,

You have just acquired a LEROY-SOMER 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.

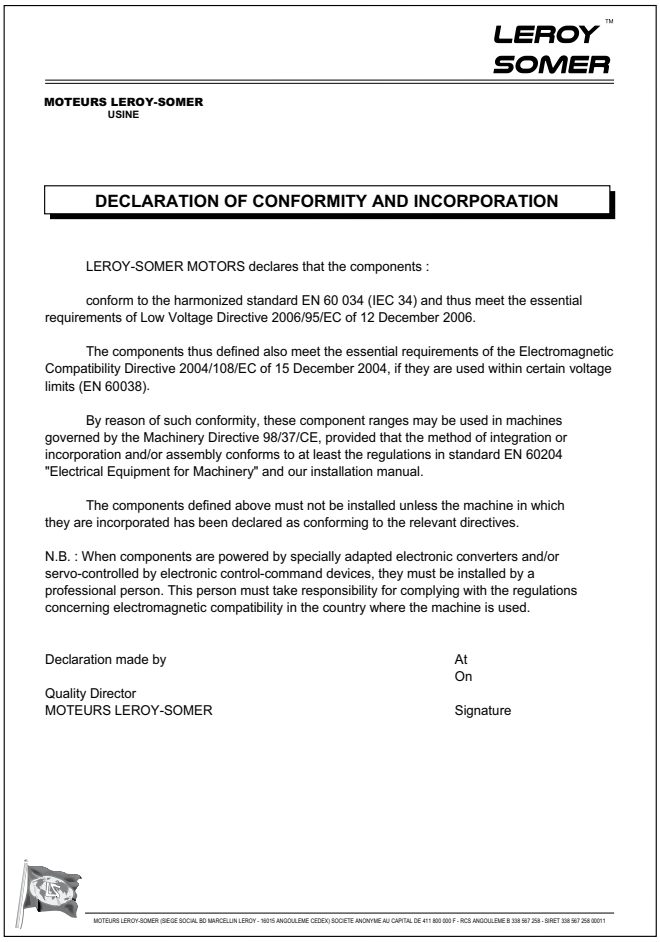
We thank you for making this choice, and would ask you to read the contents of this manual.

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

MOTEURS LEROY-SOMER

CE conformity

Our motors conform to standard EN 60034 (IEC 34), and to the directives 2006/95/EC (low voltage) modified by Directive 2006/42/EC (machine), which is demonstrated by their marking with the symbol CE



LEROY SOMER

MOTEURS LEROY-SOMER
USINE

DECLARATION OF CONFORMITY AND INCORPORATION

LEROY-SOMER MOTORS declares that the components :

conform to the harmonized standard EN 60 034 (IEC 34) and thus meet the essential requirements of Low Voltage Directive 2006/95/EC of 12 December 2006.

The components thus defined also meet the essential requirements of the Electromagnetic Compatibility Directive 2004/108/EC of 15 December 2004, if they are used within certain voltage limits (EN 60038).

By reason of such conformity, these component ranges may be used in machines governed by the Machinery Directive 98/37/CE, provided that the method of integration or incorporation and/or assembly conforms to at least the regulations in standard EN 60204 "Electrical Equipment for Machinery" and our installation manual.

The components defined above must not be installed unless the machine in which they are incorporated has been declared as conforming to the relevant directives.

N.B. : When components are powered by specially adapted electronic converters and/or servo-controlled by electronic control-command devices, they must be installed by a professional person. This person must take responsibility for complying with the regulations concerning electromagnetic compatibility in the country where the machine is used.

Declaration made by

Quality Director
MOTEURS LEROY-SOMER

At
On

Signature

MOTEURS LEROY-SOMER (SIEGE SOCIAL BD MARCELLIN LEROY - 16015 ANGOULEME CEDEX) SOCIETE ANONYME AU CAPITAL DE 411 800 000 F - RCS ANGOULEME B 338 567 258 - SIRET 338 567 258 00011

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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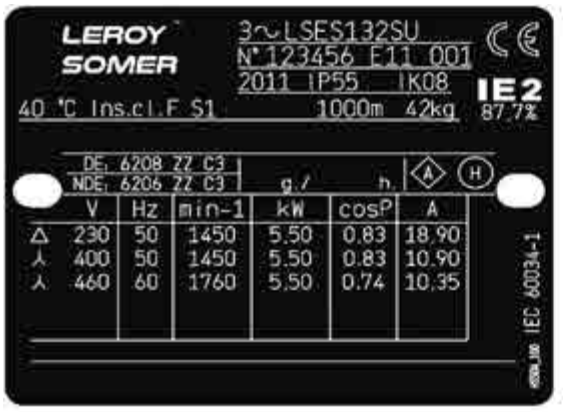
1 - RECEIPT

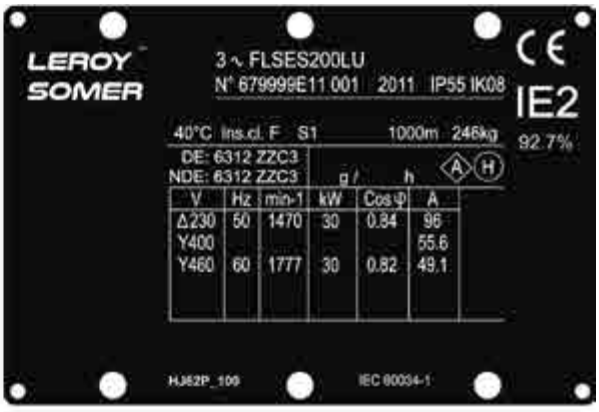
On receipt of your motor, check that it has not suffered any damage in transit.

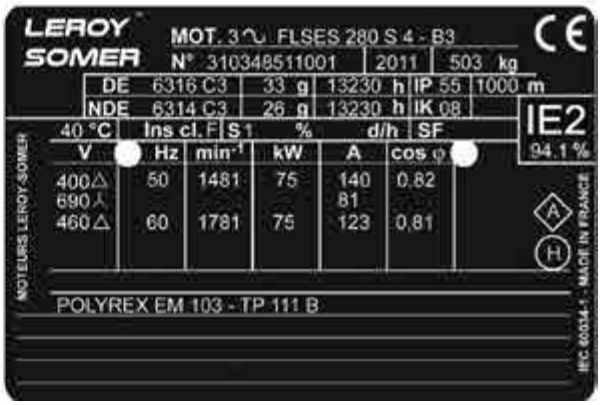
If there are obvious signs of knocks, contact the carrier (you may able to claim on their insurance) and after a visual check, turn the motor by hand to detect any malfunction.

1.1 - Identification

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







** Other logos may be used as an optional extra:*
This must be agreed prior to ordering.

Definition of symbols used on nameplates:

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

MOT 3 ~	: 3-phase A.C. motor
LSES	: Series
132	: Frame size
S	: Housing symbol

Motor no.

123456	: Motor batch number
E	: Month of production
11	: Year of production
001	: Serial number
IE2	: Efficiency class
83.8%	: Efficiency at 4/4 load

IP55 IK08	: Index of protection
I cl. F	: Insulation class F
40°C	: Ambient operating temperature
S1	: Duty - Duty (operating) factor
kg	: Weight
V	: Supply voltage
Hz	: Supply frequency
min^{-1}	: Revolutions per minute (rpm)
kW	: Rated output power
cos φ	: Power factor
A	: Rated current
Δ	: Delta connection
Y	: Star connection

Bearings

DE	: Drive end bearing
NDE	: Non drive end bearing
g	: Amount of grease at each regreasing (in g)
h	: Regreasing interval (in hours)

POLYREX EM103 : Type of grease

A : Vibration level

H : Balancing mode

Please quote when ordering spare parts

1.2 - Storage

Prior to commissioning, machines should be stored in a horizontal position:
- Away from humidity: at relative humidity levels greater than 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 package (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 plate or similar) and turn the rotor a fraction of a turn once a fortnight to prevent the bearing rings from becoming marked.
- Do not discard 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
Bearings which cannot be regreased
Maximum storage: 3 years. After this time, replace the bearings (see section 6.3).

Bearings which can be regreased

Storage period	Grease grade 2	Grease grade 3	
	less than 6 months	less than 1 year	The motor can be commissioned without regreasing.
	more than 6 months less than 1 year	more than 1 year less than 2 years	Regrease before commissioning, as described in section 3.1
	more than 1 year less than 5 years	more than 2 years and less than 5 years	Dismantle the bearing - Clean it - Replace the grease completely
	more than 5 years	more than 5 years	Change the bearing - Regrease it completely

Greases used by LEROY-SOMER
(see nameplate): - grade 3: ESSO UNIREX N 3
- POLYREX EM103

2 - ASSEMBLY

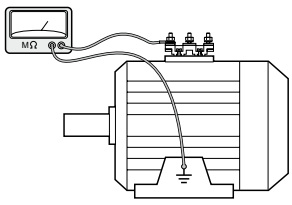
In all cases, compatibility of the motor and its environment must be guaranteed before its installation and also throughout its life.

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

2.1 - Checking the insulation

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 500V 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). For slip-ring motors, this test should be performed with the rotor short-circuited.
- 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° difference.
While it is drying, all the motor orifices must be open (terminal box, drain holes).



For all insulation or dielectric tests, it is advisable to earth the thermal probes and/or accessories.

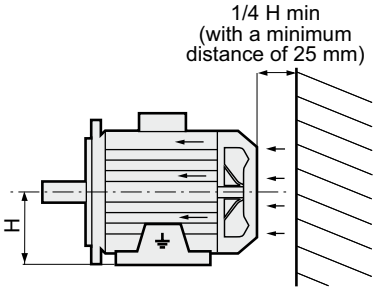
Warning: If the high voltage test, carried out at the factory before dispatch, needs to be repeated, it should be performed at half the standard voltage, ie.: 1/2 (2U+1000V). Check that the capacitive effect resulting from the high voltage test is eliminated before connecting the terminals to earth.

⚠ Prior to commissioning for all motors: Rotate the motor at 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 5.

2.2 - Location - ventilation

2.2.1 - TEFV motors

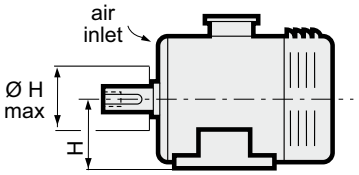
Our motors are cooled in accordance with method IC 411 (standard IEC 34-6), i.e. «machine cooled by its surface, using the ambient fluid (air) flowing along the machine».
The fan at the non drive end cools the motor. Air is sucked in through the grille of a fan cover (which provides protection against the risk of direct contact with the fan in accordance with standard IEC 34-5) and blown along the housing fins to ensure thermal equilibrium of the motor whatever the direction of rotation.



2.2.2 - Drip-proof motors

Location ventilation

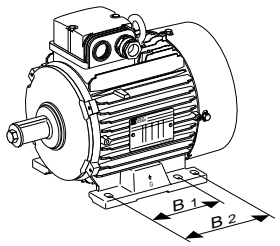
Our motors are cooled in accordance with method IC 01 (standard IEC 34-6), ie. «machine cooled by means of the ambient fluid (air) circulating inside the machine».
A fan at the non-drive end cools the motor. Air is sucked in at the front of the motor and blown along the fan cover to ensure thermal equilibrium 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 onequarter of the frame size.
Obstruction (clogging) - even accidental - of the fan cover grille has an adverse effect on motor operation.
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 penetration by any foreign bodies.
It is also 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 the discharge of hot air, in order prevent abnormal motor temperature rise.
In this case, if the air is not circulated by an auxiliary fan, the dimensions of the pipes must be such that the pressure 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.



Ensure there is 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.

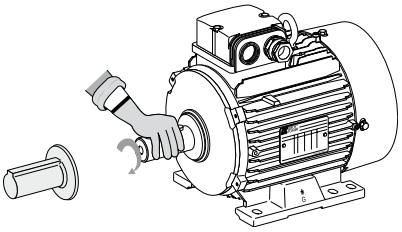
Note 1: When installing a suspended motor, it is essential to provide protection in case the fixing breaks.

Note 2: Never stand on the motor.

2.3 - Coupling

Preparation

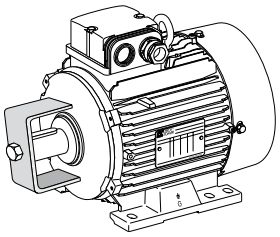
Turn the motor by hand before coupling to detect any possible fault due to handling.
Remove any protection from the shaft extension.



Drain off any condensation water which may have formed inside the motor by removing the plugs from the drain holes.

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 in accordance with standard ISO 8821:
- Half-key when the shaft extension is marked H
- No key when the shaft extension is marked N.
- Full key when the shaft extension is marked F.

and 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 key or half-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.

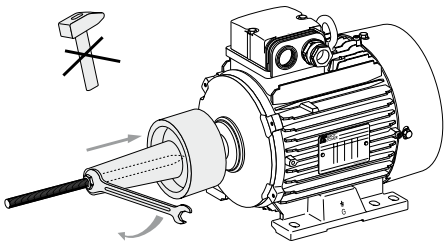
Precautions
All measures must be taken to ensure protection against the risks which arise when there are rotating parts (coupling sleeve, pulley, belt etc).

> ⚠ **If a motor is started up without a coupling device having been fitted, carefully immobilize the key in its location.**

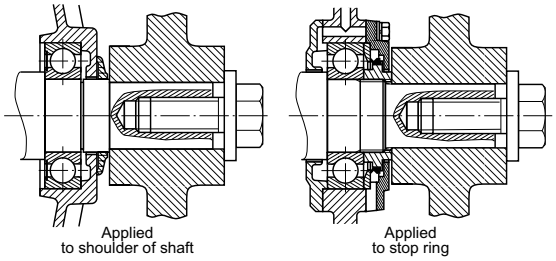
Beware of backdriving when the motor is switched off. The appropriate precautions must be taken:
- For pumps, a non-return valve must be installed.
- For mechanical devices, install a backstop or a holding brake.
- etc..

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 72-1.
- 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 end 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.**

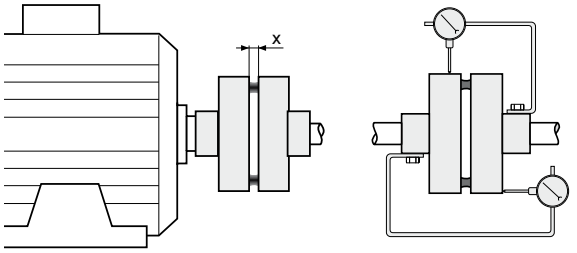
The inertia flywheels device must not be mounted directly onto the shaft extension, but installed between end shield and device using a coupling.

Mounting a face mounted motor
Mounting face mounted motors IM B14 (IM 3601) and IM B34 (IM 2101).
Max. screw insertion length when mounting face mounted motors IM B34 and IM B14.

	Max. insertion (mm)
LSES 71 F75 M5 / F85 M6	13
LSES 80 F100 M6	11
LSES 90 F115 M8	11
LSES 100 F130 M8	11
LSES 112 F130 M8	11
LSES 132 F215 M12	11
LSES 160 F215 M12	15

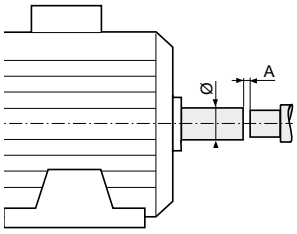
Direct connection onto the machine
When the mobile device (pump or fan turbine) is mounted directly on the motor shaft extension, check that this device is perfectly balanced and that the radial force and the axial thrust are within the limits indicated in the catalogue for the bearing withstand.

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 coupling halves is compatible with the recommendations of the coupling sleeve manufacturer.
Both parts of the coupling should be provisionally assembled to make it easier to alter their relative position.
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 extremes of the value «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 deviations registered by either shaft will indicate the need for either an axial or radial adjustment if the deviation exceeds 0.05mm.

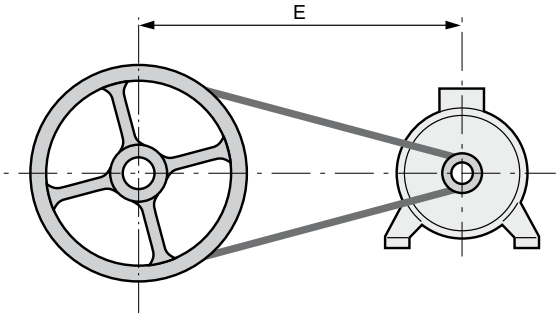
Direct connection using a rigid coupling
Both shafts must be aligned so as to adhere to the tolerances of the coupling sleeve manufacturer.
Maintain the minimum distance between the two shaft extensions to allow for expansion of the motor shaft and the load shaft.



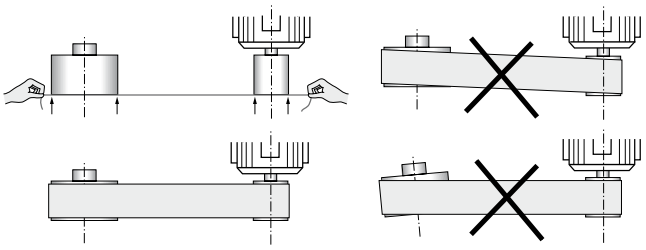
Ø (mm)	A (mm) min.
9 to 55	1
60	1.5
65	1.5
75	2
80	2

Transmission via belt pulleys
The user can choose the diameter of the pulleys.
Cast iron pulleys with a diameter greater than 315 are not recommended for rotation speeds of 3000 min^{-1}.
Flat belts cannot be used for rotation speeds of 3000 min^{-1} or more.

Positioning the belts
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 completely parallel with that of the receiving pulley.

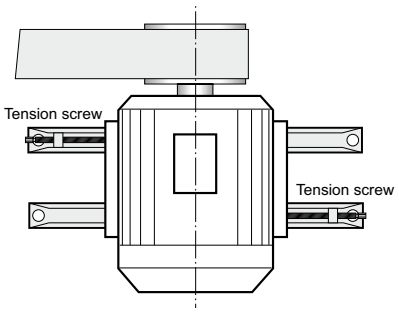


Protect all rotating devices before power-up.

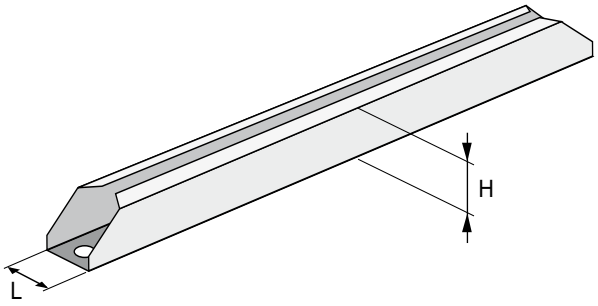
Adjusting the tension of the belts
The tension of the belts must be adjusted very carefully in accordance with the recommendations of the belt supplier and the calculations made when the product was specified.
Reminder:
- Tension too great = unnecessary force on the end shields which could lead to premature wear of the bearing unit (end shield-bearings) and eventually break the shaft.
- Too little tension = vibration (wearing of the bearing unit).

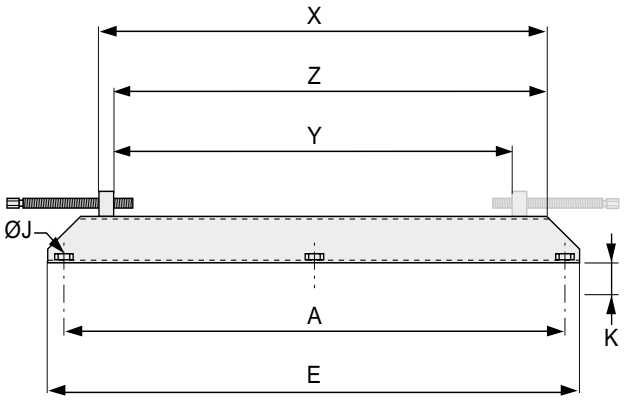
Fixed distance between centers:
Place a belt tensioning pulley on the slack side of the belts:
- Smooth pulley on the outside of the belt
- Grooved pulley on the inside of the belts when using V-belts.

Adjustable distance between centers:
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 perfectly 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 (the 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.



Optional: Standard slide rails (conforming to standard NFC 51-105)
These steel slide rails are supplied with tension screws and the 4 nuts and bolts for fixing the motor on the slide rails, but the fixing bolts for the slide rails are not supplied.





Motor frame size	Type of slide rail	Dimensions									Weight per pair of slide rails (kg)
		A	E	H	K	L	X	Y	Z	Ø J	
90	G 90/8 PM	355	395	40	2.5	50	324	264	294	13	3
100, 112 and 132	G 132/10 PM	420	530	49.5	7	60	442	368	405	15	6
160 and 180	G 180/12 PM	630	686	60.5	7	75	575	475	525	19	11
200 and 225	G 225/16 PF	800	864	75	28.5	90	-	623	698	24	16
250 and 280	G 280/20 PF	1000	1072	100	35	112	-	764	864	30	36
315 and 355	G 355/24 PF	1250	1330	125	36	130	-	946	1064	30	60

2.4 - Electrical guidelines

2.4.1 - Limiting problems caused by motor starting

In order to protect the installation, all significant temperature rises in the cabling conduits must be prevented, while ensuring that the protection devices are not triggered during starting. Operating problems in other equipment connected to the same supply are due to the voltage drop caused by the current demand on starting - many times greater than the current absorbed by the motor at full load (approximately 7).
See the LEROY-SOMER induction motors technical catalogue).
Even though the 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.

2.4.2 - LEROY-SOMER «Digistart» electronic starter

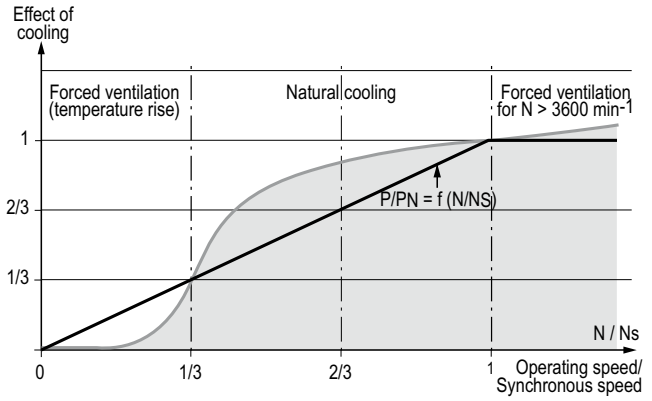
This is a multi-function electronic system with a microcontroller, which is used with all 3-phase cage induction motors.
It provides soft starting of the motor with:
- Reduction of the starting current
- Gradual, jolt-free acceleration, achieved by controlling the current absorbed by the motor.
After 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.

2.4.3 - Other control systems

Frequency inverters, flux vector control, etc. Special precautions need to be taken when standard induction motors are being used for variable speed control, powered by a frequency inverter or voltage controller:

The reference voltage (drive output or motor input) is 400V at 50 Hz: The drive must deliver a constant voltage/frequency signal to the motor in the 50 Hz operating range. Beyond the 25/50 Hz range, ensure that the fan and bearing unit are suitable.

During prolonged operation at low speed, cooling efficiency is greatly diminished. It is therefore advisable to install a forced ventilation unit that will produce a constant flow of air independently of the motor speed.
In prolonged operation at high speed, the fan may make excessive noise. It is again advisable to install a forced ventilation system.



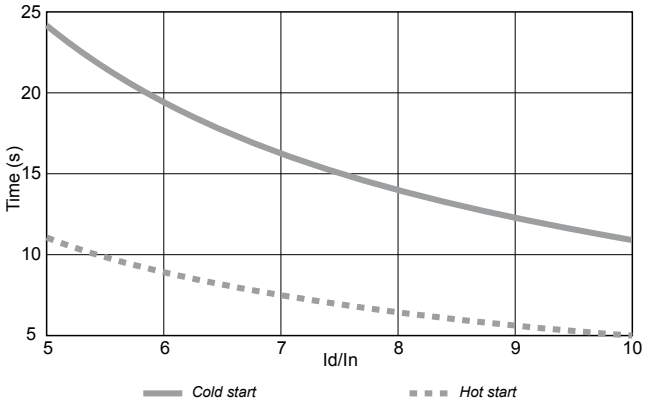
If the frequency exceeds 50 Hz:
a - Carefully check that all the components on a particular transmission are properly aligned.
b - The voltage remains constant above 50 Hz.
c - The power supplied by the motor up to 60 Hz remains constant (make sure that the power absorbed by the load does not vary differently in this frequency range).
d - Check that the application speed does not exceed the synchronous speed values:
- 2P --> 3600 min^{-1} motors
- 4P --> 1800 min^{-1} motors
- 6P --> 1200 min^{-1} motors

e - For all other frequency and/or voltage limits, additional precautions must be taken for derating, bearings, ventilation, noise, etc: please consult Leroy-Somer.
Check that the vibration level of the assembled machine complies with standard ISO 10816-3.

The user is responsible for protecting the motor and drive equipment from hazardous currents and overvoltages in the winding. These instructions cannot guarantee efficiency in all cases.

2.4.4 - Permissible starting times and locked rotor times

The starting times must remain within the limits stated 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 in relation to the ratio I_D / I_N.

2.4.5 - Earthing (see section 2.5.5)

2.4.6 - Power factor compensation capacitors

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

2.4.7 - Motor protection devices

2.4.7.1 - On-line protection

Adjusting the thermal protection
It should be adjusted to the value of the current read on the motor nameplate for the connected mains voltage and frequency.

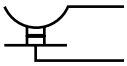
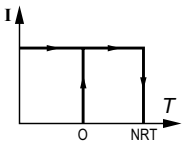
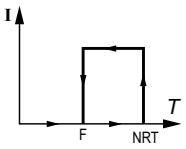
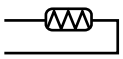
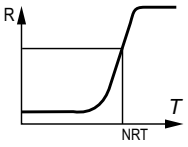
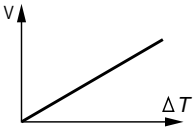
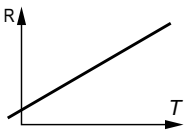
Thermal magnetic protection
The motors must be protected by a thermal magnetic device located between the isolating switch and the motor. These protection devices provide total protection of the motor against non-transient overloads.
This device can be accompanied by fused circuit-breakers.

Built-in direct thermal protection
For low rated currents, bimetallic strip-type protection may be used. The line current passes through the strip, which shuts down or restores the supply circuit as necessary. The design of this type of protection allows for manual or automatic reset.

2.4.7.2 - 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

It must be emphasized that these sensors cannot be used to carry out direct adjustments to the motor operating cycles.

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number required*
Normally closed thermostat **PTO**	bimetallic strip, indirectly heated operates on opening (0) 		1.6 at 250 V with cos φ 0.6	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in series
Normally open thermostat **PTF**	bimetallic strip, indirectly heated, contact on closing (F)		1.6 at 250 V with cos φ 0.6	general surveillance for non-transient overloads	Mounted on control circuit 2 or 3 in parallel
Positive temperature coefficient thermistor **PTC**	Variable non-linear resistor, indirectly heated 		0	general surveillance for transient overloads	Mounted with associated relay on control circuit 3 in series
Thermocouples **T** (T<150°C) Constantan copper **K** (T<1000°C) Copper Copper-Nickel	Peltier effect		0	continuous surveillance at hot spots at regular intervals	Mounted on control panels with associated reading device (or recording device) 1 per hot spot
Platinum resistance thermometer **PT 100**	Variable linear resistance, indirectly heated		0	high accuracy continuous surveillance at key hot spots	Mounted on control panels with associated reading device (or recording device) 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 affects the protection of the windings.

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).

Warning: Depending on the type of 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.

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.

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

If the drain plugs at the bottom of the motor have not been removed at the time of installation, they must be opened approximately every 6 months.

Warning: Check that the space heaters are powered down before any work is carried out in the terminal box or in the cabinet.

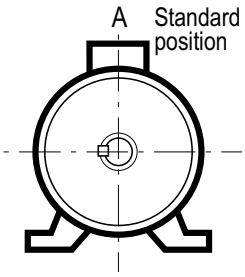
2.5 - Mains connection

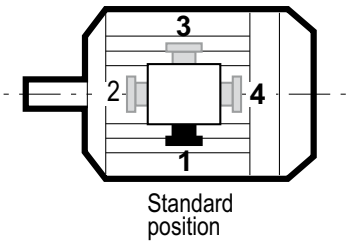
2.5.1 - Terminal box

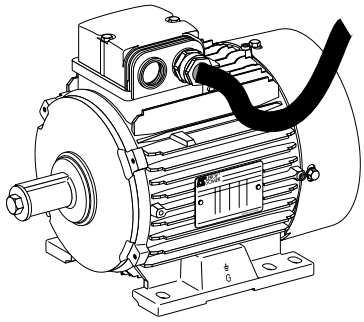
Placed as standard on the top of the motor near the drive end, for forms IM B3, B5, B14, the terminal box has IP 55 protection.
Warning: The position of the terminal box cannot be easily modified, even with flanged motors, as the condensation drain holes must be at the bottom.

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

If the non-standard position of the cable gland has not been correctly specified on the order, or is no longer suitable, the symmetrical construction of the terminal box enables it to be turned in any of the 4 directions except for position (2) on flange-mounted motors (B5).
A cable gland must never open upwards.
Check that the incoming cables have bends of such a radius as to prevent water from running into the cable gland.



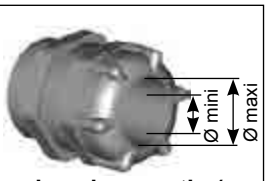




NB: motors are fitted with plugs or a support plate as standard.

Tightening capacity of cable glands

Adapt the cable gland and its reducer if present to the diameter of the cable being used. In order to preserve the motor's original IP55 protection, it is essential to tighten the cable gland seal correctly (so that it cannot be unscrewed by hand).



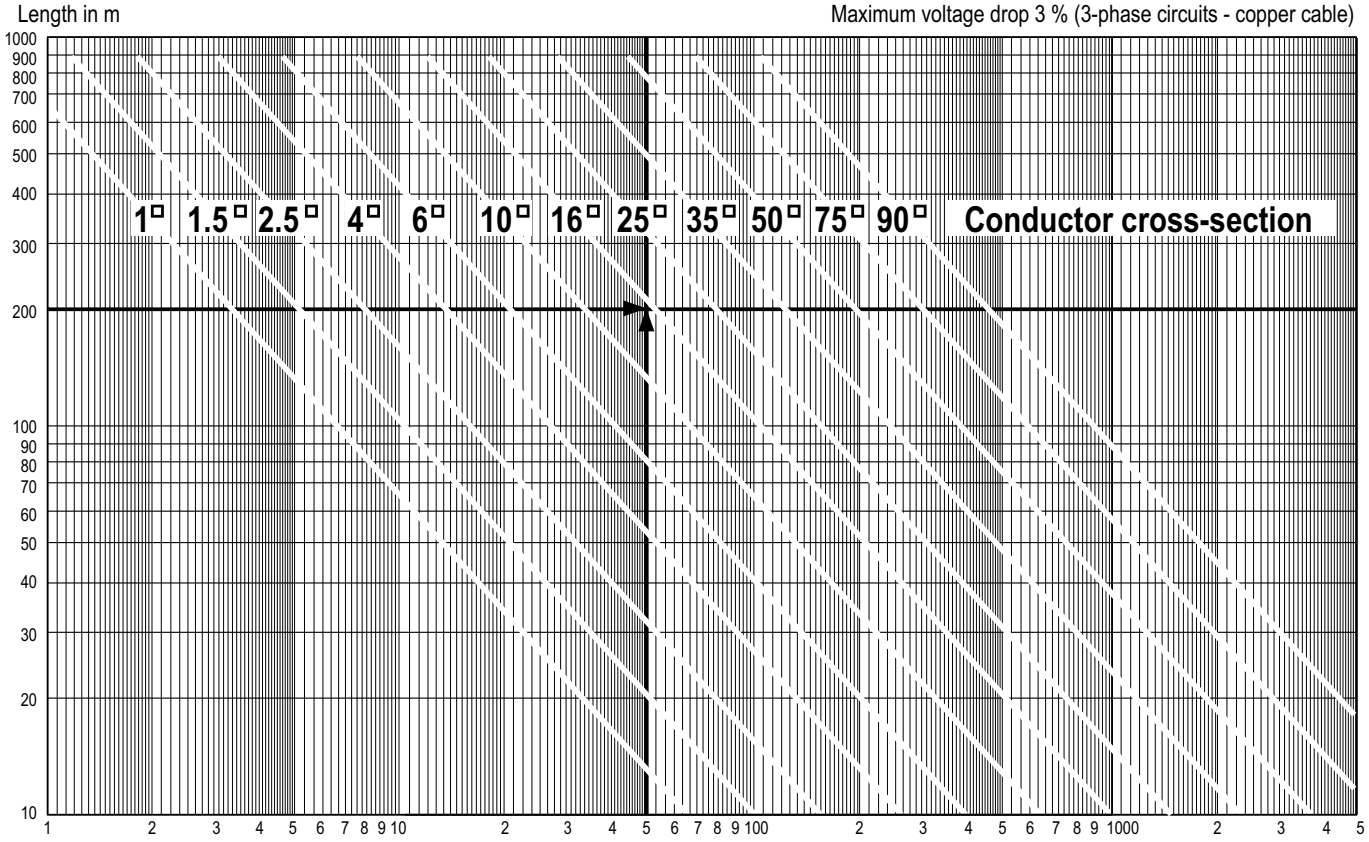
When there are several cable glands and some are not being used, ensure that they are always covered and tighten them so that they also cannot be unscrewed by hand.

Type of cable gland	Ø min. - Ø max. (mm) cable	
	Polyamide cable gland	Brass cable gland
ISO M16	5 - 10	5.5 - 9.5
ISO M20	9.5 - 15	8.5 - 13
ISO M25	13 - 19	12 - 17
ISO M32	15 - 25	15 - 22
ISO M40	21 - 32	19.5 - 28
ISO M50	26 - 38	25.5 - 36
ISO M63	31 - 34	33 - 46

2.5.2 - Cross-section of the power supply cables

The higher the current, the greater the voltage drop in the cables (standard NFC 15.100 or end user's national standard). The voltage drop should therefore be calculated **for the starting current** to see if this is suitable for the application.

If the most important criterion is the starting torque (or starting time), the voltage drop should be limited to 3% maximum (the equivalent of a loss of torque of around 6 to 8%).
The chart below can be used to select the conductors according to the length of the supply cables and the starting current, in order to limit the voltage drop to 3% maximum.



This table does not allow the installer to dispense with checking the protective systems.

For motors with flying leads, the power supply cable must not be used for handling.

2.5.3 - Connection of the motor-drive unit

It is the responsibility of the user and/or the installer to connect the motor-drive system in accordance with the current legislation and regulations in the country of use. This is particularly important as concerns cable size and connection of earths and grounds.
The following information is given for guidance only, and should never be used as a substitute for the current standards, nor does it relieve the installer of his responsibility.
A motor-drive system which has been earthed in accordance with good practice will contribute significantly to reducing the voltage on the shaft and the motor casing, resulting in fewer high-frequency leakage currents. Premature breakage of bearings and auxiliary equipment such as encoders, should also be avoided wherever possible.
To ensure the safety of personnel, the size of the earthing cables should be determined individually in accordance with local regulations.

To ensure the safety of motors with frame size 315 mm or above, we recommend installing grounding strips between the terminal box and the feet and/or the motor and the driven machine.
For motors with a power rating of 30 kW or higher, the use of shielded single-core cables is strongly recommended. The motor-drive wiring must be symmetrical (U,V,W at the motor end must correspond to U,V,W at the drive end) with the cable shielding earthed both at the motor end and at the drive end.
For high-powered motors, unshielded single-core cables can be used as long as they are installed together in a metal cable duct earthed on both sides with a grounding strip.
Cables must be kept as short as possible.
Typically, shielded cables up to 20 m long can be used without additional precautions. Beyond this length, special measures such as adding filters at the drive output should be considered.

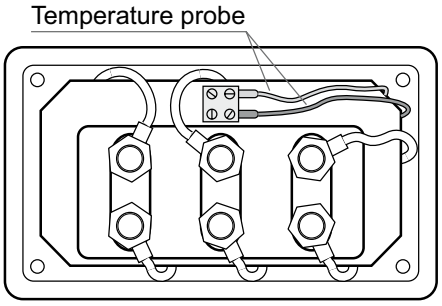
2.5.4 - Terminal block wiring diagram

All motors are supplied with a wiring diagram in the terminal box*.
The connector links required for coupling can be found inside the terminal box.
Single-speed motors are fitted with a block of 6 terminals complying with standard NFC 51 120, with the terminal markings complying with IEC 34 - 8 (or NFC 51 118).

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

2.5.5 - 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 end.
If 2 phases of the power supply are changed over, the motor will run in an anti-clockwise direction (make sure the motor has been designed to run in both directions of rotation).
Warning: motor with backstop: starting in the wrong direction destroys the backstop (see arrow on motor housing).
If the motor is fitted with accessories (thermal protection or space heater), these should be connected on screw dominos or terminal blocks with labelled wires (see section 2.4).



2.5.6 - Earth terminal

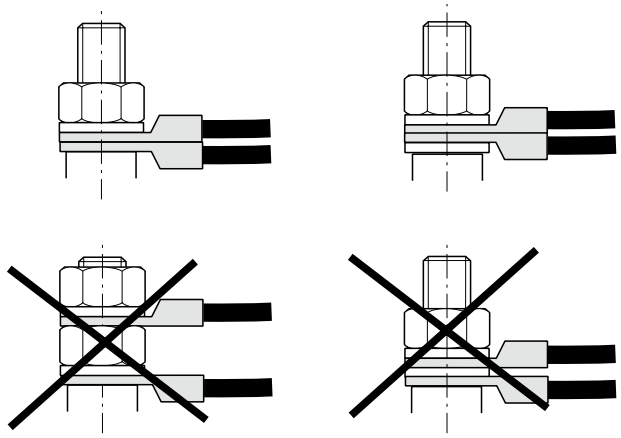
This is situated inside the terminal box; in some cases, the earth terminal may be situated on one of the feet or on one of the cooling fins (round motors).
It is indicated by the symbol: ⏚

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

* If required, this diagram should be obtained from the supplier, specifying the motor type and number (shown on the motor nameplate).

2.5.7 - 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):



Tightening torque (N.m) on the terminal block nuts

Terminal	M4	M5	M6	M8	M10	M12	M14	M16
Steel	1	2.5	4	10	20	35	50	65
Brass	1	2	3	6	12	20	-	50

If using cables without connectors, attach some calipers.
If any nuts on the brass terminal block are lost, they must be replaced by brass nuts, not steel ones.
When closing the box, ensure that the seal is correctly positioned.

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

3 - ROUTINE MAINTENANCE

Checks after start-up
After approximately 50 hours' operation, check that the screws fixing the motor and the coupling device are still tight.
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 might clog the cover grille and the housing fins.
Precaution: before carrying out any cleaning operation check that the motor is completely sealed (terminal box, drain holes, etc).
Dry cleaning (vacuuming or compressed air) is always preferable to wet cleaning.

⚠ Always clean at reduced pressure from the center of the motor towards the extremities to avoid introducing dust and particles under the seals.

Draining off condensation water
Temperature variations cause condensation to form inside the motor, which must be removed before it adversely affects motor operation.

Condensation drain holes, located at the bottom of the motors (bearing in mind their operating position) are sealed with plugs which must be removed and then replaced every six months (if they were not replaced, the motor degree of protection would no longer be maintained). Clean the orifices and plugs before reassembling them.
Note: In conditions of high humidity and significant temperature variations, a shorter period is recommended.
As long as it poses no risk to the motor protection, the condensation drain plugs can be removed.

3.1 - Greasing

3.1.1 - Type of grease

When the bearings are not greased for life, the type of grease is indicated on the nameplate.
As standard this grease is Polyrex EM103 and we recommend that it is used for subsequent lubrication.
Avoid mixing greases.

3.1.2 - Permanently greased bearings

For **LS/LSES and FLS/FLSES ≤ 225 motors**, the bearings defined offer long grease life and therefore lubrication for the lifetime of the machines. The grease life according to speed of rotation and ambient temperature is shown on the chart below.

PERMANENTLY GREASED BEARINGS

Under normal operating conditions, the service life (L_{10h}) in hours of the lubricant is indicated in the table below for ambient temperatures less than 55°C.

Series	Type	No. of poles	Types of permanently greased bearing		Grease life according to speed of rotation								
					3000 rpm			1500 rpm			1000 rpm		
			N.D.E.	D.E.	25°C	40°C	55°C	25°C	40°C	55°C	25°C	40°C	55°C
LS/LSES	80 L	2	6203 CN	6204 C3	≥40000	≥40000	25000	-	-	-	-	-	-
	80LG	2;4	6204 C3	6205 C3	≥40000	≥40000	24000	≥40000	≥40000	31000	-	-	-
	90 SL/L	2;4;6									≥40000	≥40000	34000
	90 LU	4	6205 C3	6205 C3	-	-	-	≥40000	≥40000	30000	-	-	-
	100 L	2;4;6	6205 C3	6206 C3	≥40000	≥40000	22000	≥40000	≥40000	30000	≥40000	≥40000	33000
	100 LR	4			-	-	-				-	-	-
	112 M	2	6205 C3	6206 C3	≥40000	≥40000	22000	-	-	-	-	-	-
	112 MG	2;6									≥40000	≥40000	33000
	112 MU	4	6206 C3	6206 C3	-	-	-	≥40000	≥40000	30000	-	-	-
	132 S	2;6	6206 C3	6208 C3	≥40000	≥40000	19000	-	-	-	≥40000	≥40000	30000
	132 SU	2;4						≥40000	≥40000	25000	-	-	-
	132 SM/M	2;4;6	6207 C3	6308 C3	≥40000	≥40000	19000	≥40000	≥40000	25000	≥40000	≥40000	30000
	132 MU	4;6	6307 C3	6308 C3	-	-	-	≥40000	≥40000	25000	≥40000	≥40000	30000
	160 MR	2;4	6308 C3	6309 C3	≥40000	35000	15000	≥40000	≥40000	24000	-	-	-
	160 MP	2;4	6208 C3	6309 C3	≥40000	35000	18000	≥40000	≥40000	24000	-	-	-
	160 M/MU	6	6210 C3	6309 C3	-	-	-	-	-	-	≥40000	≥40000	27000
	160 L	2;4;6			≥40000	30000	15000	≥40000	≥40000	23000			
	160 LUR	4;6	6210 C3	6310 C3	-	-	-	≥40000	≥40000	23000	≥40000	≥40000	27000
	180 MT	2;4			≥40000	30000	15000				-	-	-
	180 M	4	6212 C3	6310 C3	-	-	-	≥40000	≥40000	24900	-	-	-
	180 L	6						-	-	-	≥40000	≥40000	28000
	180 LR	4	6210 C3	6310 C3	-	-	-	≥40000	≥40000	23000	-	-	-
	180 LUR	4;6	6312 C3	6310 C3	-	-	-	≥40000	≥40000	22000	≥40000	≥40000	27000
	200 L	2;6	6214 C3	6312 C3	≥40000	25000	12500	-	-	-	≥40000	≥40000	27000
	200 LR	2;4;6	6312 C3	6312 C3	≥40000	25000	12500	≥40000	≥40000	22000	≥40000	≥40000	27000
	200 LU	4;6			-	-	-						
	225 ST	4	6214 C3	6313 C3	-	-	-	≥40000	≥40000	21000	-	-	-
	225 MT	2			≥40000	22000	11000	-	-	-			
	225 SR	4	6312 C3	6313 C3	-	-	-	≥40000	≥40000	21000	-	-	-
	225 MR	2;4;6			≥40000	22000	11000				≥40000	≥40000	26000
	225 SG	4	6216 C3	6314 C3	-	-	-	≥40000	≥40000	20000	-	-	-
	225 MG	4;6									≥40000	≥40000	25000

Note: on request, all motors can be fitted with grease nipples except the 132 S/SU.

Series	Type	No. of poles	Types of permanently greased bearing		Grease life according to speed of rotation								
					3000 rpm			1500 rpm			1000 rpm		
			N.D.E.	D.E.	25°C	40°C	55°C	25°C	40°C	55°C	25°C	40°C	55°C
FLS/FLSES	**80 L**	2	6203 CN	6204 C3	≥40000	≥40000	25000	-	-	-	-	-	-
	80 LG	4	6204 C3	6205 C3	-	-	-	≥40000	≥40000	31000	-	-	-
	90 SL/L	2 ; 4 ; 6			≥40000	≥40000	24000				≥40000	≥40000	34000
	90 LU	2 ; 6	6205 C3	6205 C3	≥40000	≥40000	24000	-	-	-	≥40000	≥40000	34000
	100 L	2 ; 4	6205 C3	6206 C3	≥40000	≥40000	22000	≥40000	≥40000	30000	-	-	-
	100 LG	4 ; 6			-	-	-				≥40000	≥40000	33000
	112 MG	2 ; 6			≥40000	≥40000	22000	-	-	-			
	112 MU	4	6206 C3	6206 C3	-	-	-	≥40000	≥40000	30000	-	-	-
	132 SM/M	2 ; 4 ; 6	6207 C3	6308 C3	≥40000	≥40000	19000	≥40000	≥40000	25000	≥40000	≥40000	30000
	132 MU	2 ; 4	6307 C3	6308 C3	≥40000	≥40000	19000	≥40000	≥40000	25000	-	-	-
	132 MR	4 ; 6	6308 C3	6308 C3	-	-	-	≥40000	≥40000	25000	≥40000	≥40000	30000
	160 M	2 ; 4 ; 6	6210 C3	6309 C3	≥ 40000	37800	18900	≥ 40000	≥ 40000	36900	≥ 40000	≥ 40000	20050
	160 MU	6			-	-	-	-	-	-			
	160 LUR	2 ; 4 ; 6	6210 C3	6310 C3	≥ 40000	24500	12250	≥ 40000	36400	18200	≥ 40000	≥ 40000	22450
	180 M	2	6212 C3	6310 C3	34000	17000	8500	-	-	-	-	-	-
	180 MT	4	6210 C3	6310 C3	-	-	-	≥ 40000	35500	17750	-	-	-
	180 MUR	2	6312 C3	6310 C3	≥ 40000	22800	11400	-	-	-	-	-	-
	180 L	4 ; 6	6212 C3	6310 C3	-	-	-	≥ 40000	39500	19750	≥ 40000	≥ 40000	29050
	180 LUR	4 ; 6	6312 C3	6310 C3	-	-	-	≥ 40000	≥ 40000	22900	≥ 40000	≥ 40000	29900
	200 LU	2 ; 4 ; 6	6312 C3	6312 C3	28600	14300	7150	≥ 40000	25400	12700	≥ 40000	33200	16600
	225 S	4	6314 C3	6314 C3	-	-	-	≥ 40000	23700	11850	-	-	-
	225 SR	4	6312 C3	6313 C3	-	-	-	≥ 40000	≥ 40000	21500	-	-	-
	225 M	4 ; 6	6314 C3	6314 C3	-	-	-	≥ 40000	23700	11850	≥ 40000	25600	12800
	225 MR	2	6312 C3	6313 C3	≥ 40000	22800	11400	-	-	-	-	-	-

Note: on request, all motors can be fitted with grease nipples.

3.1.3 - Bearings with grease nipples

The bearings are lubricated in the factory
The end shields are fitted with bearings lubricated by grease nipples such as Tecalemit-Hydraulic M8 x 125.

The frequency of lubrication and the quantity and quality of grease are given on the nameplates and these should be referred to in order to ensure correct bearing lubrication.

Even in the event of prolonged storage or downtime, the interval between 2 greasing operations should never exceed 2 years.

Series	Type	No. of poles	Type of bearing for bearings with grease nipples		Quantity of grease	Greasing intervals in hours								
						3000 rpm			1500 rpm			1000 rpm		
			N.D.E.	D.E.	g	25°C	40°C	55°C	25°C	40°C	55°C	25°C	40°C	55°C
LS/LSES	160 M/MU*	2 ; 4 ; 6	6210 C3	6309 C3	13	22200	11100	5550	32400	16200	8100	39800	19900	9950
	160 L*													
	180 MR*	2	6210 C3	6310 C3	15	19600	9800	4900	-	-	-	-	-	-
	180 MT*	2 ; 4							30400	15200	7600			
	180 LR*	4				-	-	-						
	180 LUR*	4 ; 6	6312 C3	6310 C3	20	-	-	-	26800	13400	6700	35000	17500	8750
	180 M*	4	6212 C3	6310 C3	15	-	-	-	29200	14600	7300	-	-	-
	180 L*	6							-	-	-	37200	18600	9300
	200 LR*	2 ; 4 ; 6	6312 C3	6312 C3	20	15200	7600	3800	26800	13400	6700	35000	17500	8750
	200 LU*	4 ; 6				-	-	-						
	200 L*	2 ; 6	6214 C3	6312 C3	20	14600	7300	3650	-	-	-	34600	17300	8650
	225 ST*	4	6214 C3	6313 C3	25	-	-	-	25200	12600	6300	-	-	-
	225 MT*	2				10600	5300	2650	-	-	-			
	225 SR/MR*	2 ; 4 ; 6	6312 C3	6313 C3	25	13400	6700	3350	25200	12600	6300	33600	16800	8400
	225 SG*	4	6216 C3	6314 C3	25	-	-	-	23600	11800	5900	-	-	-
	225 MG*	4 ; 6										32200	16100	8050
	250 MZ	2	6312 C3	6313 C3	25	13400	6700	3350	-	-	-	-	-	-
	250 ME	4 ; 6	6216 C3	6314 C3	25	-	-	-	16800	8400	16800	22800	11400	5700
	280 SC/MC	2				11800	5900	2950	-	-	-	-	-	-
	280 SC	6	6216 C3	6316 C3	35	-	-	-	-	-	-	32200	16100	8050
	280 SD/MD	4 ; 6	6218 C3	6316 C3	35	-	-	-	1900	3800	7600	29600	14800	7400
	315 SN	2	6216 C3	6316 C3	35	5600	2800	1400	-	-	-	-	-	-
	315 MP	2	6317 C3	6317 C3	40	5200	2600	1300	-	-	-	-	-	-
	315 SP	4	6317 C3	6320 C3	50	-	-	-	14000	7000	14000	-	-	-
	315 MP/MR	4 ; 6										21200	10600	5300

** bearing with grease nipple available to order*

Series	Type	No. of poles	Type of bearing for bearings with grease nipples		Quantity of grease	Greasing intervals in hours								
						3000 rpm			1500 rpm			1000 rpm		
			N.D.E.	D.E.	g	25°C	40°C	55°C	25°C	40°C	55°C	25°C	40°C	55°C
FLS/FLSES	160 M*	2 ; 4 ; 6	6210 C3	6309 C3	13	22200	11100	5550	32400	16200	8100	39800	19900	9950
	160 MU	6				-	-	-	-	-	-	23400	11700	5850
	160 LUR*	2 ; 4 ; 6	6210 C3	6310 C3	15	19600	9800	4900	30400	15200	7600	38200	19100	6600
	180 M*	2	6212 C3	6310 C3	15	18000	9000	4500	-	-	-	-	-	-
	180 MT*	4	6210 C3	6310 C3	15	-	-	-	30400	15200	7600	-	-	-
	180 MUR*	2	6312 C3	6310 C3	15	10600	5300	2650	-	-	-	-	-	-
	180 L*	4 ; 6	6212 C3	6310 C3	20	-	-	-	29200	14600	7300	37200	18600	9300
	180 LUR*	4 ; 6	6312 C3	6310 C3	20	-	-	-	26800	13400	6700	35000	17500	8750
	200 LU*	2 ; 4 ; 6	6312 C3	6312 C3	20	15200	7600	3800	26800	13400	6700	35000	17500	8750
	225 S*	4	6314 C3	6314 C3	25	-	-	-	23600	11800	5900	-	-	-
	225 SR*	4	6312 C3	6313 C3	25	-	-	-	25200	12600	6300	-	-	-
	225 M*	4 ; 6	6314 C3	6314 C3	25	-	-	-	23600	11800	5900	32200	16100	8050
	225 MR*	2	6312 C3	6313 C3	25	13400	6700	3350	-	-	-	-	-	-
	250 M	2 ; 6	6314 C3	6314 C3	25	10400	5200	2600	-	-	-	32200	16100	8050
	250 MR	4				-	-	-	17800	8900	4450	-	-	-
	280 S/M	2 ; 4 ; 6	6314 C3	6316 C3	35	7200	3600	1800	21000	13230	6615	29000	29000	18270
	315 S/M/L	2	6316 C3	6218 C3	35	7400	5880	2920	-	-	-	-	-	-
	315 S/M/L	4 ; 6	6316 C3	6320 C3	50	-	-	-	15600	12400	6160	25000	25000	12500
	355 L	2	6316 C3	6218 C3	35	7400	3700	1850	-	-	-	-	-	-
	355 L	4 ; 6	6316 C3	6322 C3	60	-	-	-	13200	8316	4160	22000	13860	6930
	355 LK	4 ; 6	6324 C3	6324 C3	72	-	-	-	7500	3700	2800	20000	20000	10000
	400 L/LV	4 ; 6	6324 C3	6324 C3	72	-	-	-	7500	3700	2800	20000	20000	10000
	400 LK/ 450 L	4 ; 6	6328 C3	6328 C3	93	-	-	-	4600	2300	1100	10000	6000	3000

** bearing with grease nipple available to order*

Series	Type	No. of poles	Type of bearing for bearings with grease nipples		Quantity of grease	Greasing intervals in hours					
						3000 rpm			1500 rpm		
			N.D.E.	D.E.	g	25°C	40°C	55°C	25°C	40°C	55°C
PLS/PLSES	225 MG	2 ; 4	6314 C3	6317 C3	40	8000	4000	2000	19600	9800	4900
	250 SF										
	250 MF										
	280 MD	2									
	280 SGU	4	6316 C3	6320 C3	50	-	-	-	15800	7900	3950
	280 MGU	4									
	315 SUR	4									
	315 LUS	4									
	315 SU	2				9000	4500	2250	-	-	-
	315 MU	2									
	315 L	2	6316 C3	6316 C3	35	9000	4500	2250	-	-	-
	315 LD	2	6316 C3	6219 C3	35	8000	4000	2000	-	-	-
	315 LG/MGU	2	6317 C3	6317 C3	35	6500	6500	4095	-	-	-
		4	6317 C3	6322 C3	55	-	-	-	13200	13200	8316
	315 VLG/VLGU	2	6317 C3	6317 C3	35	6500	6500	4095	-	-	-
		4	6317 C3	6322 C3	55	-	-	-	13200	13200	8316
	355 L	2	6317 C3	6317 C3	35	6500	6500	4095	-	-	-
		4	6324 C3	6324 C3	72	-	-	-	7500	3700	2800
	400 L	4	6328 C3	6328 C3	93	-	-	-	4600	2300	1100

** bearing with grease nipple available to order*

3.2 - Bearing maintenance

3.2.1 - Checking the bearings

As soon as you detect any of the following on the motor:
- Abnormal noise or vibration
- Abnormal temperature rise in the bearing even though it has been lubricated correctly,

the condition of the bearings must be checked.
Damaged bearings must be replaced as soon as possible to prevent worse damage to the motor and the equipment being driven.
If one bearing needs to be replaced, **the other bearing must also be replaced**.
The seals should be changed routinely when the bearings are changed.
The free bearing must allow the rotor shaft to expand (check its identification during dismantling).

3.2.2 - Reconditioning the bearings

Bearings without grease nipples
Dismantle the motor (see section 6.1); 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.

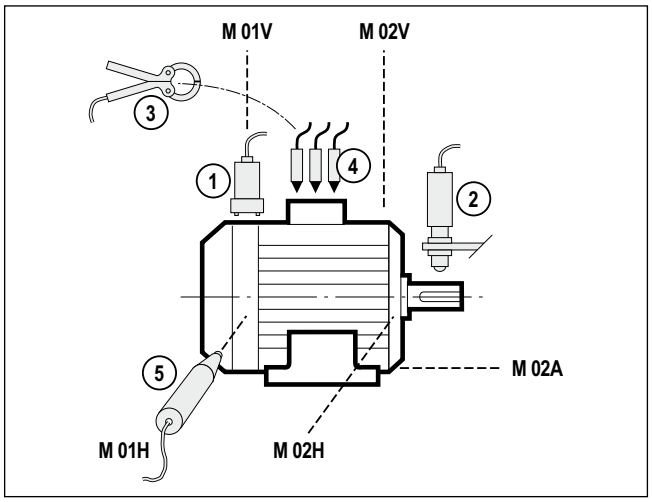
Bearings with grease nipples
Always begin by cleaning the waste grease channel
If using the type of grease stated on the nameplate, remove the covers and clean the grease nipple heads.
If a different grease from that on the nameplate is being used, the motor must be dismantled and the bearings and accessories cleaned with degreasing agent (carefully clean the grease inlet and outlet pipes) 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 should be recently manufactured, of equivalent performance and should not contain any impurities (dust, water, etc).

4 - 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 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)							●	●	●
④ Voltage probe	For measuring voltage							●	●	●
⑤ Infra-red probe	For measuring temperature	●		●						

5 - TROUBLESHOOTING GUIDE

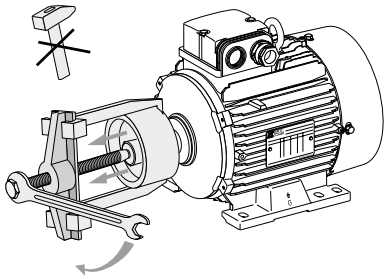
Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	**The cause is mechanical** if the noise persists after switching off the power supply, with the drive set to «freewheel» mode	
	- vibration	- check that the key conforms to the type of balancing (see section 2.3)
	- damaged bearings	- change the bearings
	- mechanical friction: ventilation, coupling	- check and replace the defective part
	The cause is electrical if the noise stops after switching off the power supply	- check the power supply at the motor terminals - check the drive settings
	- normal voltage and 3 phases balanced	- check the connection of the terminal block and the tightening of the terminals
	- abnormal voltage	- check the power supply line
	- phase imbalance	- check the winding resistance
	Other possible causes: - incorrect settings - drive malfunction	- refer to the drive manual
Motor heats abnormally	- 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
	- partial short-circuit	- check the electrical continuity of the windings and/or the installation
	- phase imbalance	- check the winding resistance
	Other possible causes: - incorrect settings - drive malfunction	- refer to the drive manual
Motor does not start	**at no load** - mechanical locking	When switched off: - check that rotation of the shaft is locked
	- broken power supply line	- check the fuses, electrical protection, starting device
	- position feedback (drive message)	- check the drive wiring and settings, operation of the position sensor
	- thermal protection	- check
	on load - phase imbalance	When switched off: - check the direction of rotation (phase order) - check the resistance and continuity of the windings - check the electrical protection
	- drive	- check the settings and sizing (max. current that can be delivered by the drive)
	- position feedback (drive message)	- check the drive wiring and settings, operation of the position sensor
	- thermal protection	- check

6 - CORRECTIVE MAINTENANCE: GENERAL

First switch off and lock the power supply

- 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 shaft end of the motor.



6.1 - Dismantling the motor

Refer to the detailed instructions for the relevant motor range (see following pages).

It is advisable to mark the shields in relation to the stator and the direction in which the rotor fan is mounted.

6.2 - 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 2.1) and if necessary, dry it in an oven.
- Clean the spigots thoroughly, and remove all traces of knocks on the mating surfaces if necessary.

Rotor:

- 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, keys and their housings.

End shields:

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

6.3 - 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: in a dryer, 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.

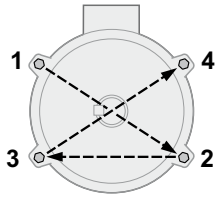
See detailed instructions for the relevant motor ranges in the following pages.

6.4 - Reassembling the motor

Be careful to replace the stator in its original position, that the stack of laminations is centered 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/screws

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



Tie rods/screws 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/LUR	M8	18
180 L	M10	25
200	M10	25
225 ST/MR/SR	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

6.5 - Reassembling the terminal box

Reconnect all the power supply wires in accordance with the diagram or markings made before dismantling.

To ensure the box is properly sealed: check that the cable glands on the box and the cable(s) have been retightened, and ensure that the seal has been correctly positioned before closing. For terminal boxes equipped with a horn (part no. 89 on the exploded views) or/and a cable gland support plate, ensure that the seal has been 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.

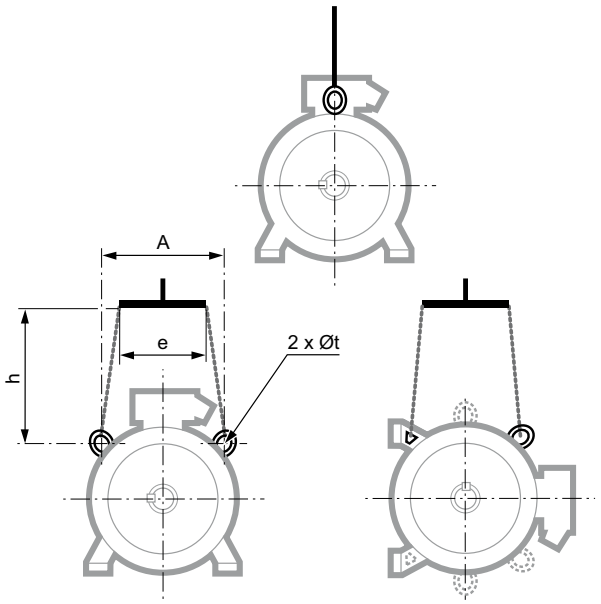
7 - POSITION OF LIFTING RINGS

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, protective cover or drip cover.

Motors intended for use in the vertical position may be delivered on a pallet in the horizontal position. 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

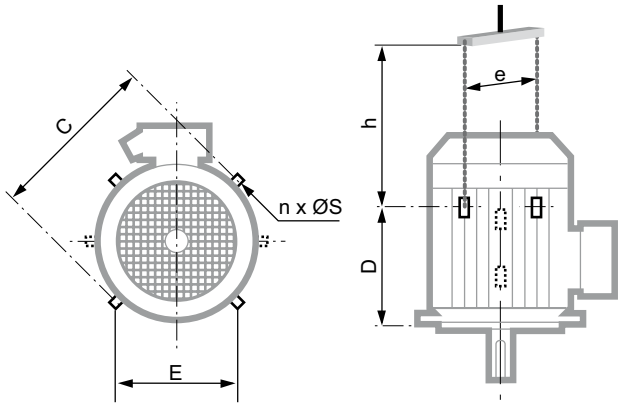


Type	Horizontal position			
	A	e min	h min	Øt
LSES 100 L/LR/LG	165	165	150	9
LSES 112 M/MR	165	165	150	9
LSES 112 MG/MU	-	-	-	9
LSES 132 S/SU	180	180	150	9
LSES 132 M/MU	200	180	150	14
LSES 160 MP/MR/LR	200	180	110	14
LSES 160 M/MU/L/LUR	200	260	150	14
LSES 180 M/MUR/L/LUR	200	260	150	14
LSES 200 L/LR	270	260	150	14
LSES 200 LU	270	260	150	14
LSES 225 SR/MR	270	260	150	14
LSES 225 S/SG/M/MG	360	380	200	30
LSES 250 MZ	360	380	200	30
LSES 250 ME	400	400	500	30
LSES 280 SC/SD/MC/MD	400	400	500	30
LSES 315 SN	400	400	500	30
LSES 315 SP/MP/MR	360	380	500	17

Type	Horizontal position			
	A	e min	h min	Øt
FLSES 100	152	200	150	22
FLSES 100 LG	145	200	150	22
FLSES 112	145	200	150	22
FLSES 132	180	200	150	25
FLSES 160 M/MU	200	260	150	14
FLSES 180 M/MUR/L/LUR	200	260	150	14
FLSES 200 LU	270	260	150	14
FLSES 225 SR/MR	270	260	150	14
FLSES 225 S/M	360	380	200	30
FLSES 250 M/MR	360	380	200	30
FLSES 280	360	380	500	30
FLSES 315 S/M/LA/LB	440	400	500	60
FLSES 355	545	500	500	60
FLSES/FLS 355LK	*685*	*710*	*500*	*30*
FLS 400	*735*	*710*	*500*	*30*
FLS 450	*730*	*710*	*500*	*30*

Type	Horizontal position			
	A	e min	h min	Øt
PLSES 225 MG	310	300	300	30
PLSES 250 MF/SF	310	300	300	30
PLSES 280 MD/MGU/SGU	310	300	300	30
PLSES 315 SUR/MUR/L/LD/LUS	385	380	500	30
PLSES/PLS 315 LG/MGU/VLG/VLGU	*450*	*750*	*550*	*48*

• Vertical position



View from above — Side view

Type	Vertical position						
	C	E	D	n**	ØS	e min*	h min
LSES 160 M/MU/L/LUR	320	200	230	2	14	320	350
LSES 180 MR	320	200	230	2	14	320	270
LSES 180 M/L/LUR	390	265	290	2	14	390	320
LSES 200 L/LR	410	300	295	2	14	410	450
LSES 200 LU	410	300	295	2	14	410	450
LSES 225 SR/MR	480	360	405	4	30	540	350
LSES 225 S/SG/M/MG	480	360	405	4	30	500	500
LSES 250 MZ	480	360	405	4	30	590	550
LSES 250 ME	480	360	405	4	30	500	500
LSES 280 SC/SD/MC/MD	480	360	405	4	30	500	500
LSES 315 SN	480	360	405	4	30	500	500
LSES 315 SP/MP/MR	630	-	570	2	30	630	550

Type	Vertical position						
	C	E	D	n**	ØS	e min*	h min
FLSES 160 M/MU	320	200	230	2	14	320	350
FLSES 180 M/MUR/L/LUR*	320	200	230	2	14	320	270
FLSES 200 LU	410	300	295	2	14	410	450
FLSES 225 SR/MR	410	300	295	2	14	410	450
FLSES 225 S/M	480	360	405	4	30	540	350
FLSES 250 M/MR	480	360	405	4	30	590	550
FLSES 280 S	480	360	585	4	30	590	550
FLSES 280 M	480	360	585	4	30	590	550
FLSES 315S/ M/LA/LB	620	-	715	2	35	650	550
FLSES 355	760	-	750	2	35	800	550
FLSES/FLS 355 LK	*810*	*350*	*1135*	*4*	*30*	*810*	*600*
FLS 400	*810*	*350*	*1135*	*4*	*30*	*810*	*600*
FLS 450	*960*	*400*	*1170*	*4*	*30*	*960*	*750*

Type	Vertical position					
	C	E	n**	ØS	e min*	h min
PLSES 180 LG/LGU	430	270	2	14	430	450
PLSES 200 M/LU/LR	400	280	2	14	400	450
PLSES 225 MG	450	310	2	14	450	490
PLSES 250 SP/MP/MF	450	310	4	30	450	490
PLSES 280 SD	450	310	4	30	450	490
PLSES 280 MD/MG	450	310	4	30	450	490
PLSES 315 S/SUR	500	385	4	30	500	500
PLSES 315 M/MUR/L/LD/LDS/LU	500	385	4	30	500	500
PLSES 315 MG/MGU/LG	750	450	4	48	750	450

** 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.*

*** if n = 2, the lifting rings form an angle of 90° with respect to the terminal box axis. if n = 4, this angle becomes 45°.*

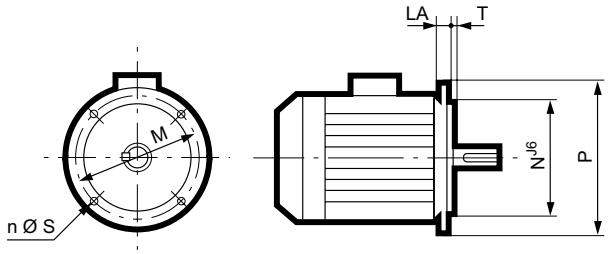
8 - SPARE PARTS

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

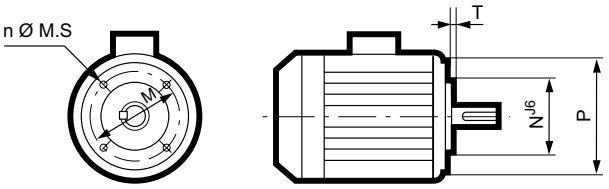
Part numbers can be found on the exploded views and their descriptions in the parts list (section 6).

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

IM 3001 (IM B5)



IM 3601 (IM B14)



Our extensive network of service centers can dispatch the necessary parts without delay.

To ensure that our motors operate correctly and safely, we recommend the 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.

9 - RECYCLING

At the end of life, we advise that you contact a salvage company to recycle the various motor components.

DISMANTLING AND REASSEMBLY PROCEDURES

10 - LS/LSES motors ..... 26 to 35

11 - FLS/FLSES motors ..... 36 to 45

12 - PLS/PLSES motors ..... 46 to 51

10 - LS/LSES MOTORS

10.1 - LS/LSES 71 to 160 MP/LR motors

10.1.1 - 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 LS/LSES 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.

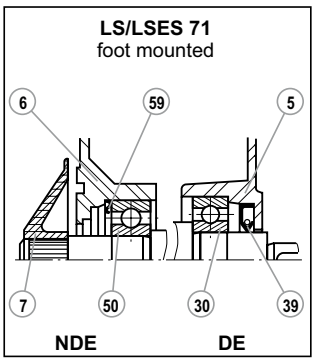
Use a bearing remover to take out the bearings, taking care not to knock the running surfaces of the shaft.

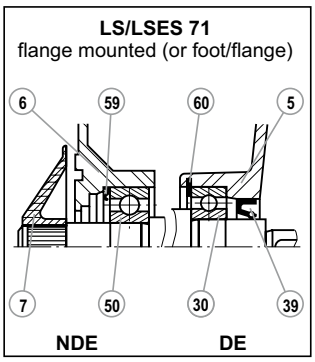
10.1.2 - Reassembling motors without circlip

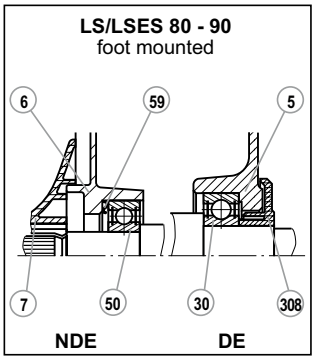
- Mount the bearings on the rotor shaft.
- Insert the rotor into the stator taking all possible precautions not to knock the winding.
- Mount the DE shield (5).
- For LS/LSES 71 motors, mount the seal (39) with grease beforehand.
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.4).
- 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).

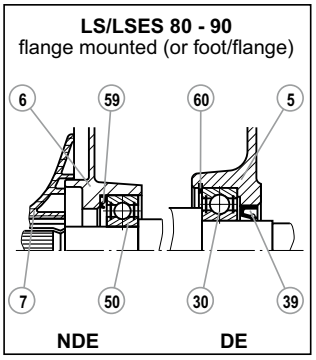
10.1.3 - Reassembling motors with flange and circlip

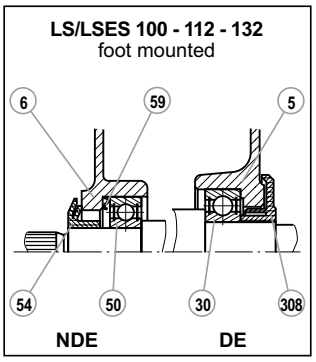
- Mount the DE bearing (30) in the flange (5) using the outer slip-ring for support.
- Fit the circlip (60).
- Mount this assembly on the rotor (3) using the inner slip-ring for support.
- Mount the NDE bearing on the rotor.
- Insert the rotor (3) and shield (5) assembly in the stator taking care not 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 up to the recommended torque (see section 6.4).
- 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).

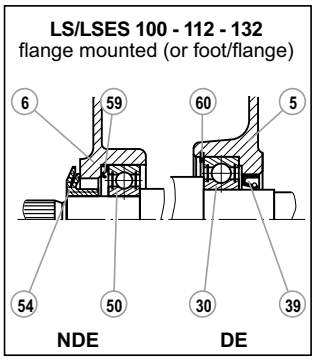


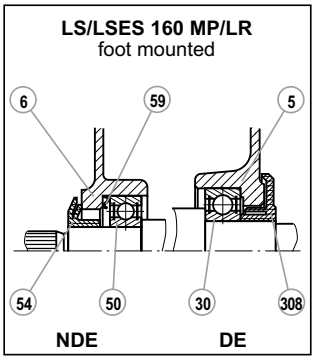


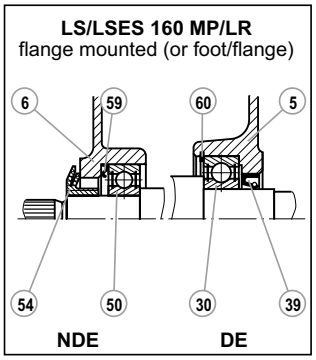




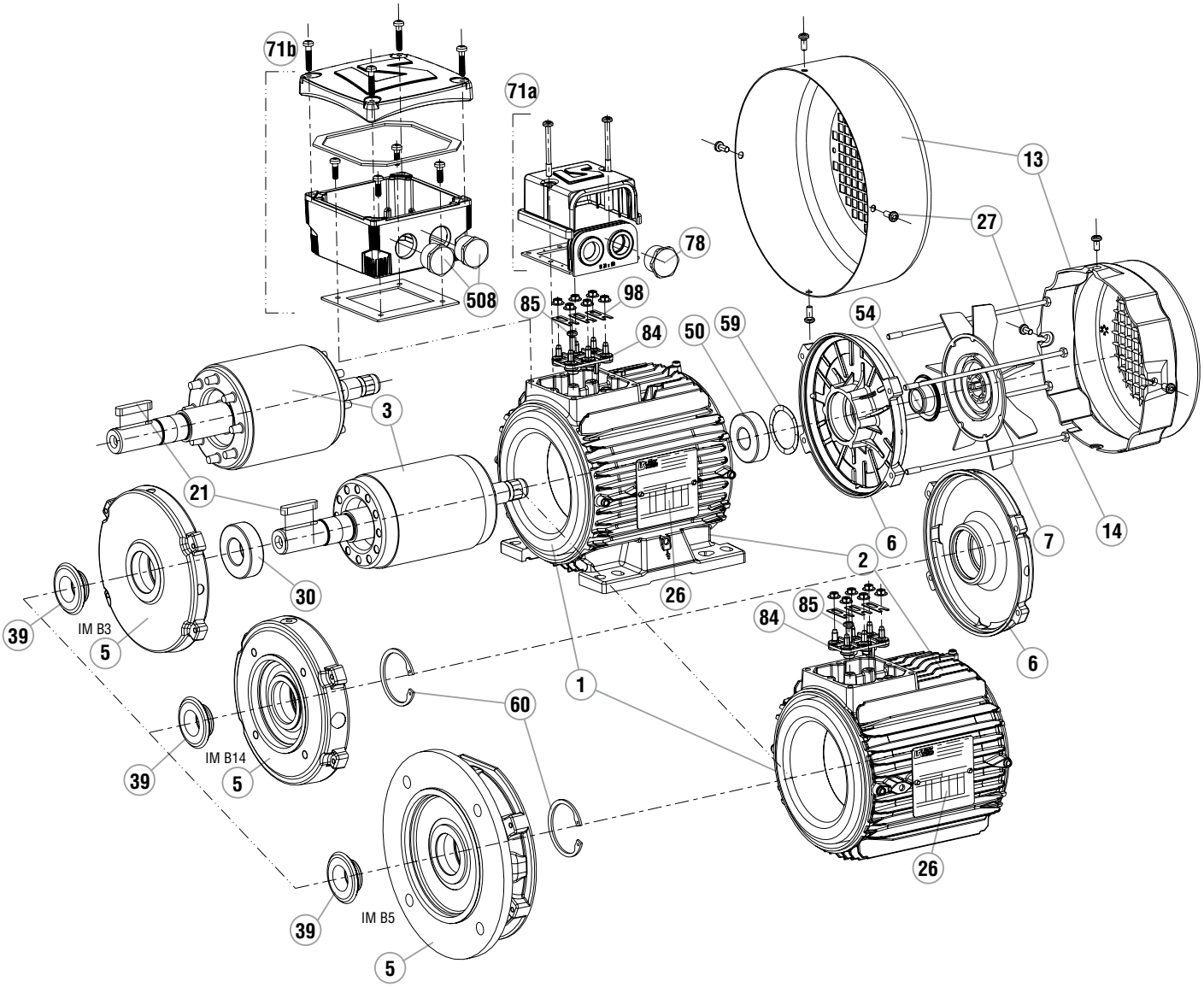








LS/LSES 71 to 160 MP/LR

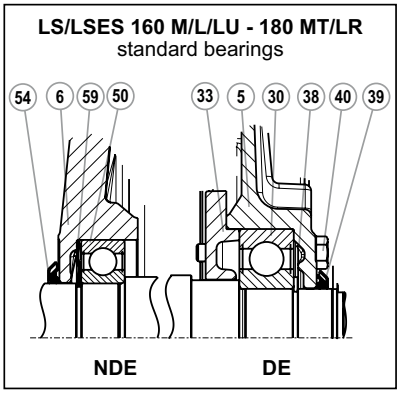


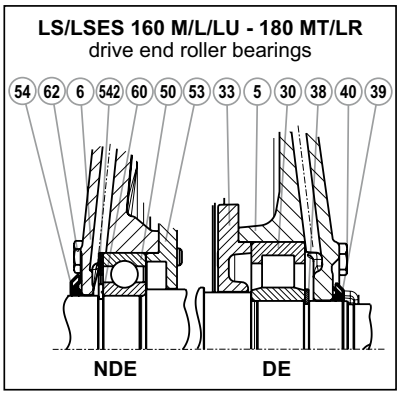
LS/LSES 71 to 160 MP/LR					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**21**	Drive end shield shaft extension key	**60**	Circlip
2	Frame	**26**	Nameplate	**71 a**	Plastic terminal box (< or = frame size 112)
3	Rotor	**27**	Fan cover screw	**71 b**	Metal terminal box
5	Drive end shield	**30**	Drive end bearing	**84**	Terminal block
6	Non drive end shield	**39**	Drive end seal	**85**	Set screw
7	Fan	**50**	Non drive end bearing	**98**	Connectors
13	Fan cover	**54**	NDE weatherproof seal	**508**	Terminal box plug
14	Tie rods	**59**	Preloading (wavy) washer		

10.2 - LS/LSES 160 M/L/LU, 180 MT/LR motors

10.2.1 - 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 opposed to 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).
- Remove the mounting screws (14).
- Unscrew the inner bearing retainer (33) fixing screws (40) when using a flange mounted motor or if the drive end bearing is locked.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover 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.

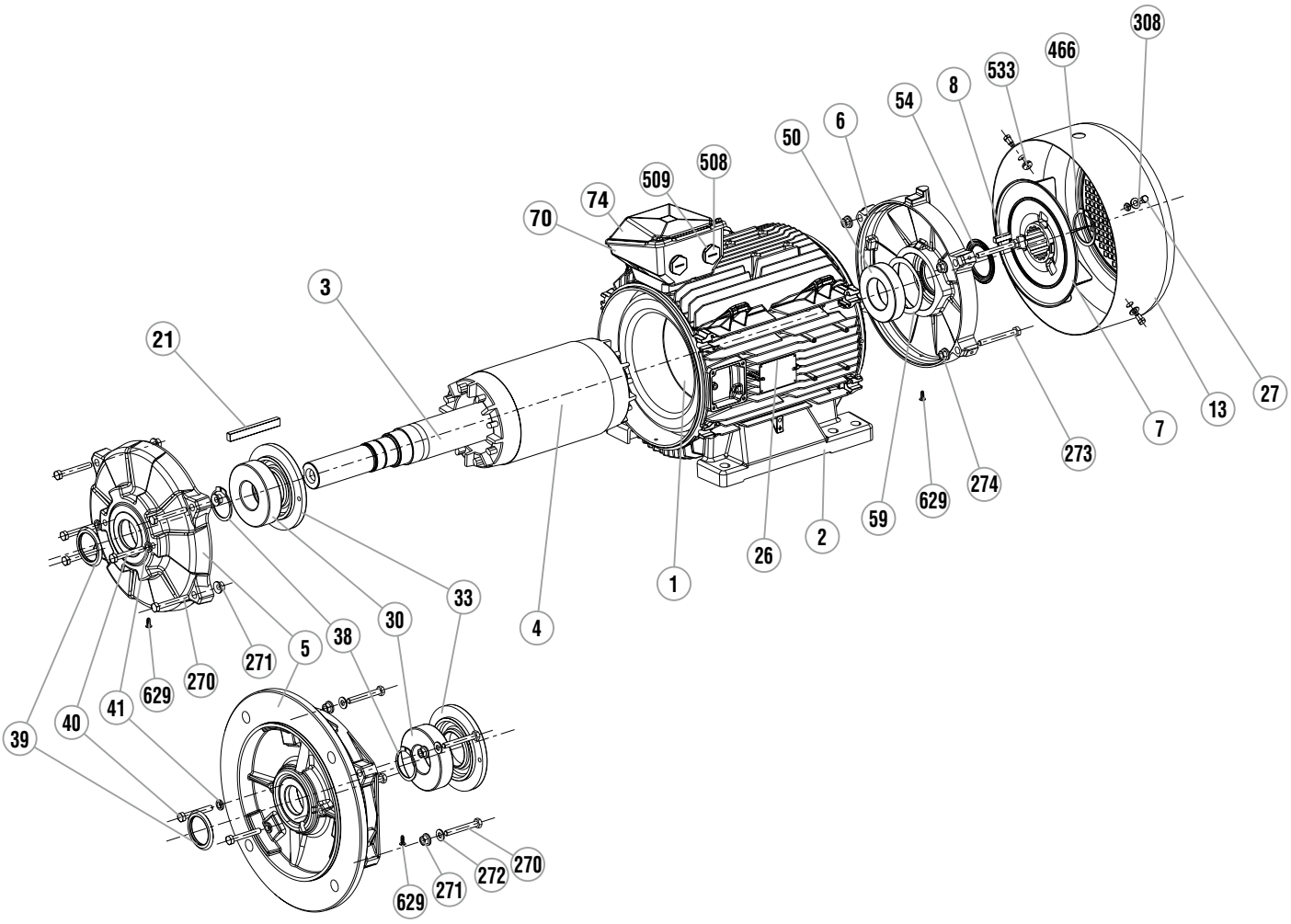




10.2.2 - Reassembly

- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- 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.
- If there is a bearing retainer (33), screw a rod with the same thread diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when remounting the DE shield (5).
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the mounting screws (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, fix the bearing retainer (33) with its own screws.
- 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).

LS/LSES 160 M/L/LU, 180 MT/LR



LS/LSES 160 M/L/LU, 180 MT/LR

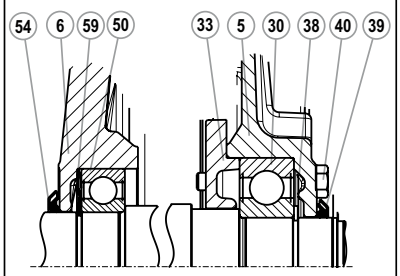
Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	30	Drive end bearing	271	Drive end shield fixing nut
2	Frame	33	Inner drive end bearing retainer	272	DE shield washer
3	Shaft	38	Snap ring for drive end shaft	273	Non drive end shield fixing screw
4	Rotor	39	Drive end seal	274	NDE shield fixing nut
5	Drive end shield	40	Drive end cover fixing screw	308	Cover fixing washer
6	Non drive end shield	41	Leaktight toothed lock washer for DE bearing retainer	466	Snap ring for fan
7	Fan	50	Non drive end bearing	508	Terminal box plug
8	Fan key	54	NDE weatherproof seal	509	Cable gland seal
13	Fan cover	59	Preloading (wavy) washer	533	Cover shock mount
21	Drive end shield shaft extension key	70	Terminal box	629	Draining plug
26	Nameplate	74	Terminal box lid		
27	Fan cover screw	270	Drive end shield fixing screw		

10.3 - LS/LSES 180 L/LUR, 200 L/LR/LU, 225 ST/MT/MR, 250 MZ motors

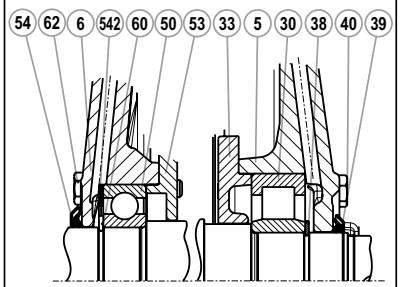
10.3.1 - Dismantling

- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposed to 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).
- Remove the mounting screws (14).
- Unscrew the inner bearing retainer (33) fixing screws (40) when using a flange mounted motor or if the drive end bearing is locked.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently 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.

LS/LSES 180 L/LUR - 200 L/LR/LU
225 ST/MT/MR - 250 MZ
standard bearings



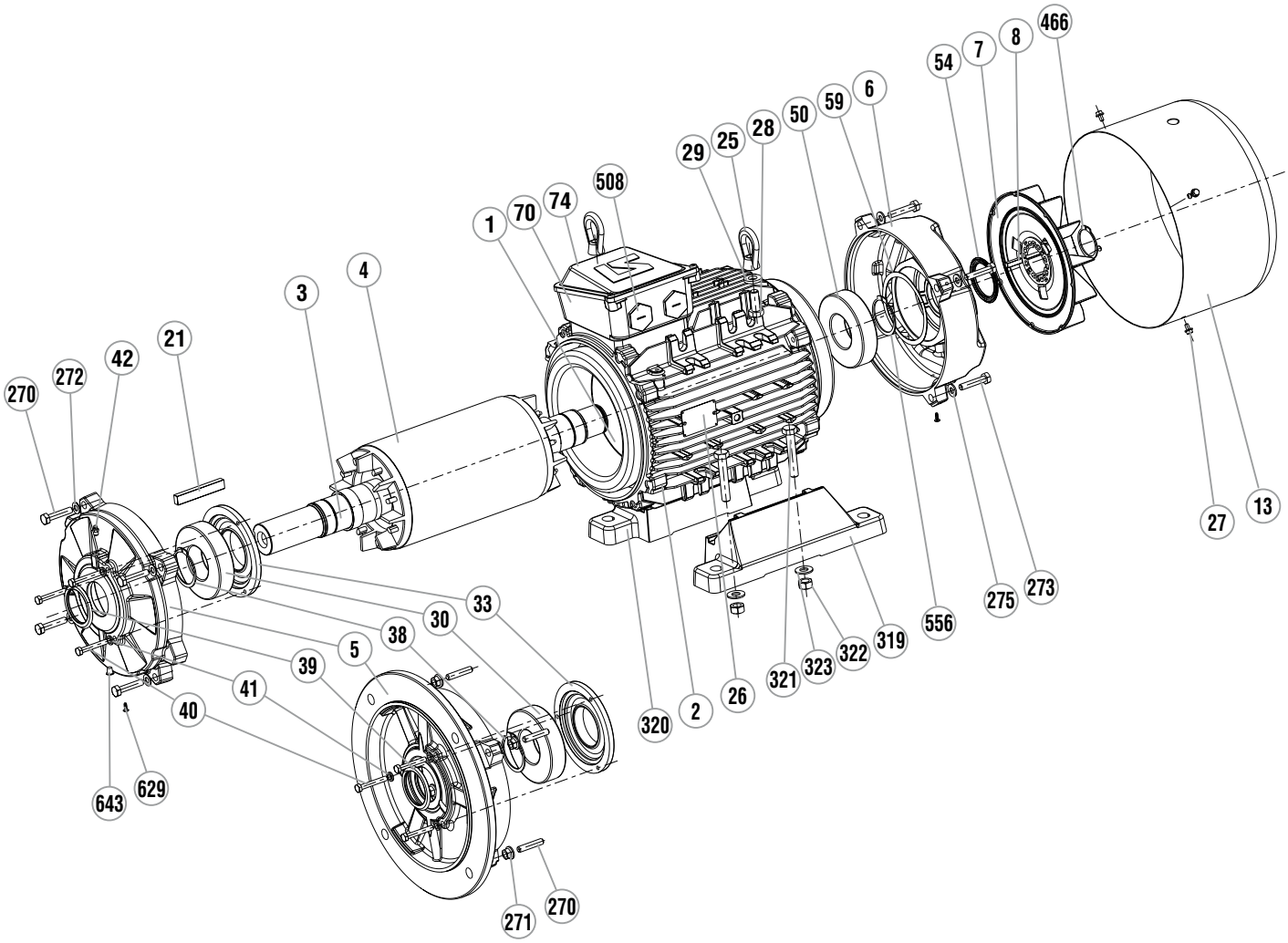
LS/LSES 180 L/LUR - 200 L/LR/LU
225 ST/MT/MR - 250 MZ
drive end roller bearings



10.3.2 - Reassembly

- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- Fill with new grease: the correct amount of new grease for the bearing is 50% of the free space.
- Mount 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.
- If there is a bearing retainer (33), screw a rod with the same thread diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when remounting the DE shield (5).
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the mounting screws (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, 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).

LS/LSES 180 L/LUR, 200 L/LR/LU, 225 ST/MT/MR, 250 MZ



Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	29	Lifting ring fixing washer	271	Drive end shield fixing nut
2	Frame	30	Drive end bearing	272	DE shield washer
3	Shaft	33	Inner drive end bearing retainer	273	Non drive end shield fixing screw
4	Rotor	38	Snap ring for drive end shaft	275	Fixing washer for NDE shield
5	Drive end shield	39	Drive end seal	319	Right foot
6	Non drive end shield	40	Drive end cover fixing screw	320	Left foot
7	Fan	41	Leaktight toothed lock washer for DE bearing retainer	321	Screws for feet
8	Fan key	42	Drive end grease nipples	322	Nut for feet
13	Fan cover	50	Non drive end bearing	323	Washer for feet
21	Drive end shield shaft extension key	54	NDE weatherproof seal	466	Snap ring for fan
25	Lifting ring	59	Preloading (wavy) washer	508	Terminal box plug
26	Nameplate	70	Terminal box	556	NDE bearing circlip
27	Fan cover screw	74	Terminal box lid	629	Draining plug
28	Lifting ring fixing screw	270	Drive end shield fixing screw	643	DE grease draining plug

10.4 - LS/LSES 225 MG, 250 ME/MF, 280 SC/MC, 315 SN motors

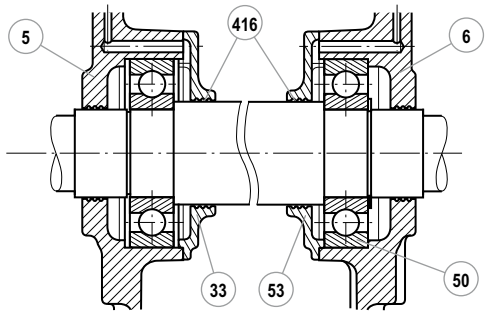
10.4.1 - Dismantling

- 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 levers diametrically opposed to one another, using the shield (6) for support.
- Take out the key (21).
- Remove the mounting screws (14).
- Unscrew the DE bearing retainer (33) fixing screws (40) and NDE bearing retainer (52) and (53) fixing screws (62), and remove them.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover the preloading washer (59).
- Remove circlips (38) and (60).
- Remove the rotor (3) from the stator (1), taking care not to touch the winding with the inner bearing retainer.
- 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; to avoid damaging the bearing retainers, heat the outer bearing retainer to make it easier to dismantle (the bearing should be discarded).

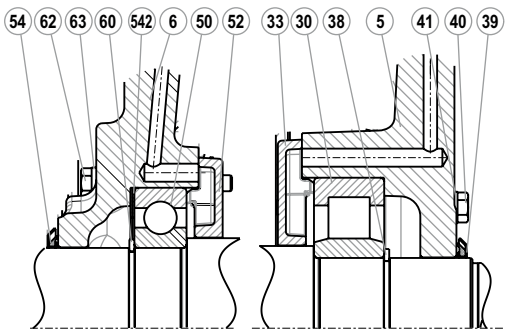
10.4.2 - Reassembly

- See section 6.1 before reassembly.
- Insert the inner bearing retainer (33) at the rotor drive end and the inner bearing retainer (53) at the non drive end.
- Add new grease: the correct amount of new grease for the bearing is 50% of the free space.
- Mount the new bearings on the shaft, see section 6.3 on mounting bearings.
- Mount the circlips (38) and (60).
- 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 their position and that of the grease nipple when remounting the shields (5 and 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.
- Fit the seal (54), the outer bearing retainer (52) and the locking screws (62) for the bearing retainers (52, 53).
- Mount the shield (5) taking care to allow for the positioning of the bearing retainer.
- Place the mounting screws (14), tighten the nuts diagonally without locking them so that the feet of the protective cover can be positioned when it is mounted.
- At the drive end fit the seal (39), insert the bearing retainer (32) and the locking screws (40) for the bearing retainer.
- 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 cover (13), fixing it with the screws (27).
- Replace the grease nipple (42) and extension.
- Tighten the rod nuts (14) diagonally up to the torque recommended in section 6.1.
- Replace the key (21).

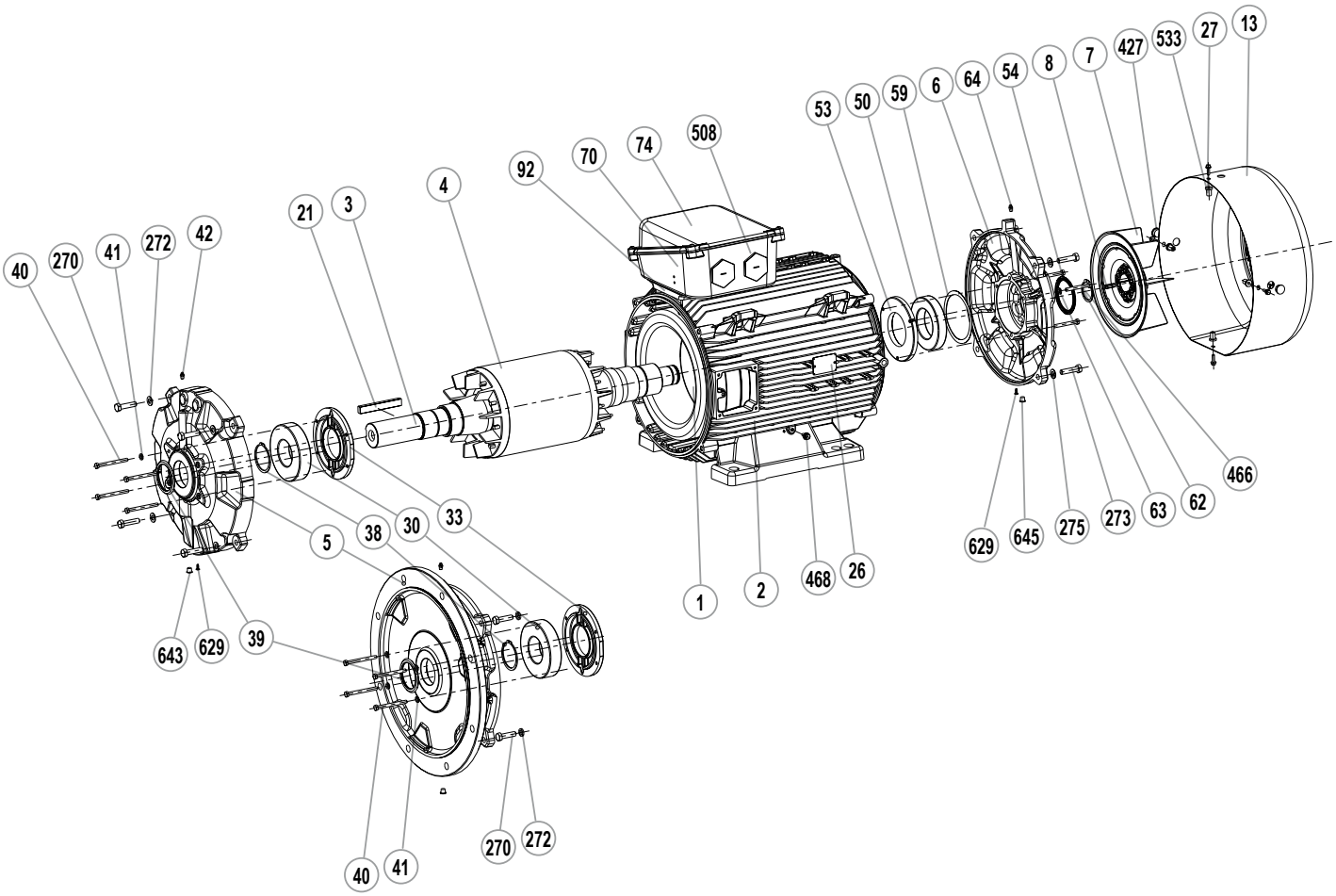
LS/LSES 225 MG - 250 ME/MF
280 SC/MC - 315 SN
standard bearings



LS/LSES 225 MG - 250 ME/MF
280 SC/MC - 315 SN
drive end roller bearings



LS/LSES 225 MG, 250 ME/MF, 280 SC/MC, 315 SN



Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	38	Snap ring for drive end shaft	92	Terminal box baseplate
2	Frame	39	Drive end seal	270	Drive end shield fixing screw
3	Shaft	40	Drive end cover fixing screw	272	DE shield washer
4	Rotor	41	Leaktight toothed lock washer for DE bearing retainer	273	Non drive end shield fixing screw
5	Drive end shield	42	Drive end grease nipples	275	Fixing washer for NDE shield
6	Non drive end shield	50	Non drive end bearing	427	Cover plug
7	Fan	53	Inner non drive end bearing retainer	466	Snap ring for fan
8	Fan key	54	NDE weatherproof seal	468	Earth terminal plug
13	Fan cover	59	Preloading (wavy) washer	508	Terminal box plug
21	Drive end shield shaft extension key	62	Cover fixing screw	533	Cover shock mount
26	Nameplate	63	Fixing washer for NDE bearing retainer	629	Draining plug
27	Fan cover screw	64	Non drive end grease nipple	643	DE grease draining plug
30	Drive end bearing	70	Terminal box	645	NDE grease draining plug
33	Inner drive end bearing retainer	74	Terminal box lid		

10.5 - LS/LSES 280 SU/SK/MK, 315 (except SN) motors

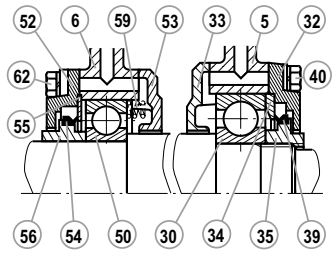
10.5.1 - Dismantling

- 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 seal (39 and 54).
- 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).

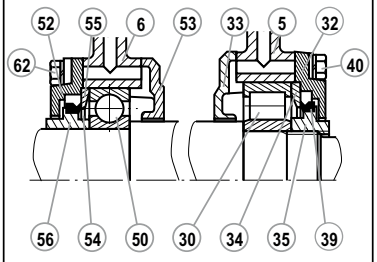
10.5.2 - Reassembly

- See section 6.1 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).
- Add 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 6.3 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.
- Fit the NDE shield (6), 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.
- Put the tie rods (14) in place, not forgetting the feet of the protective cover (380), tighten the nuts diagonally without locking them so that the feet of the protective 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 6.1.
- Replace the key (21).

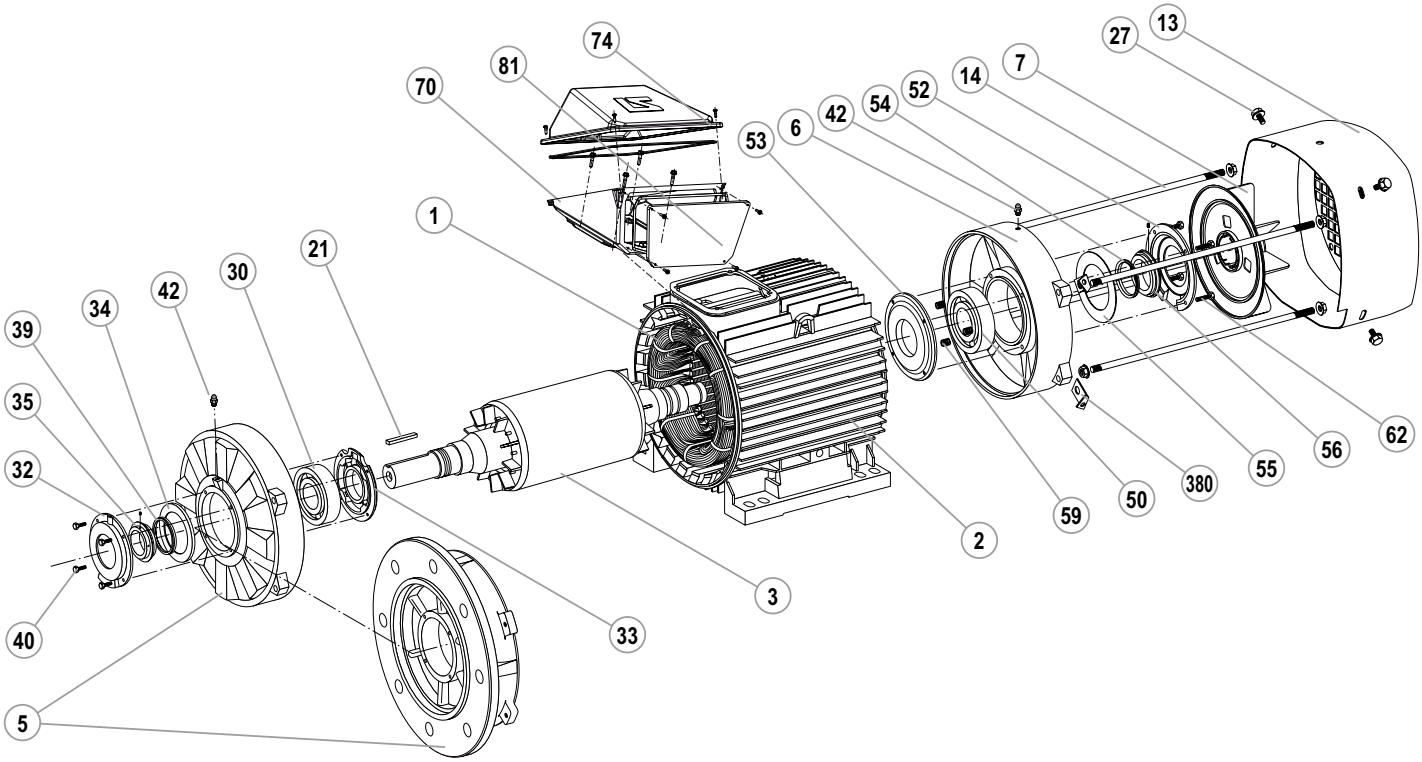
LS/LSES 280 SU/SK/MK - 315
standard bearings



LS/LSES 280 SU/SK/MK - 315
drive end roller bearings



LS/LSES 280 SU/SK/MK, 315 (except SN)



LS/LSES 280 SU/SK/MK, 315 (except SN)					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**30**	Drive end bearing	**53**	Inner non drive end bearing retainer
2	Frame	**32**	Outer drive end bearing retainer	**54**	NDE weatherproof seal
3	Rotor	**33**	Inner drive end bearing retainer	**55**	Non drive end fixed grease valve
5	Drive end shield	**34**	Drive end fixed grease valve	**56**	Non drive end mobile grease valve
6	Non drive end shield	**35**	Drive end mobile grease valve	**59**	Preloading washer or spring
7	Fan	**39**	Drive end seal	**62**	Cover fixing screw
13	Fan cover	**40**	Drive end cover fixing screw	**70**	Terminal box
14	Tie rods	**42**	Grease nipples	**74**	Terminal box lid
21	Shaft extension key	**50**	Non drive end bearing	**81**	Cable gland support plate
27	Fan cover screw	**52**	Outer non drive end bearing retainer	**380**	Protective cover feet

11 - FLS/FLSES MOTORS

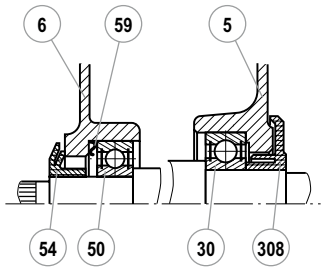
11.1 - FLS/FLSES 80 to 132 motors

11.1.1 - Dismantling

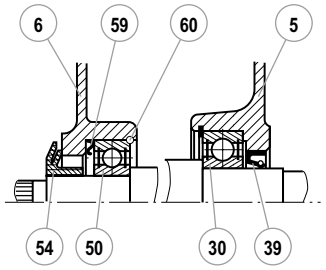
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers (for example, 2 screwdrivers) diametrically opposed to one another, using the shield (6) for support.
- Remove the tie rods (14).
- Remove the key (21).
- Using a wooden mallet, tap the shaft 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).
- Recover the preloading (wavy) washer (59) and the NDE shield seal (54).
- 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.

FLS/FLSES 80 to 132
foot mounted



FLS/FLSES 80 to 132
flange mounted (or foot/flange)



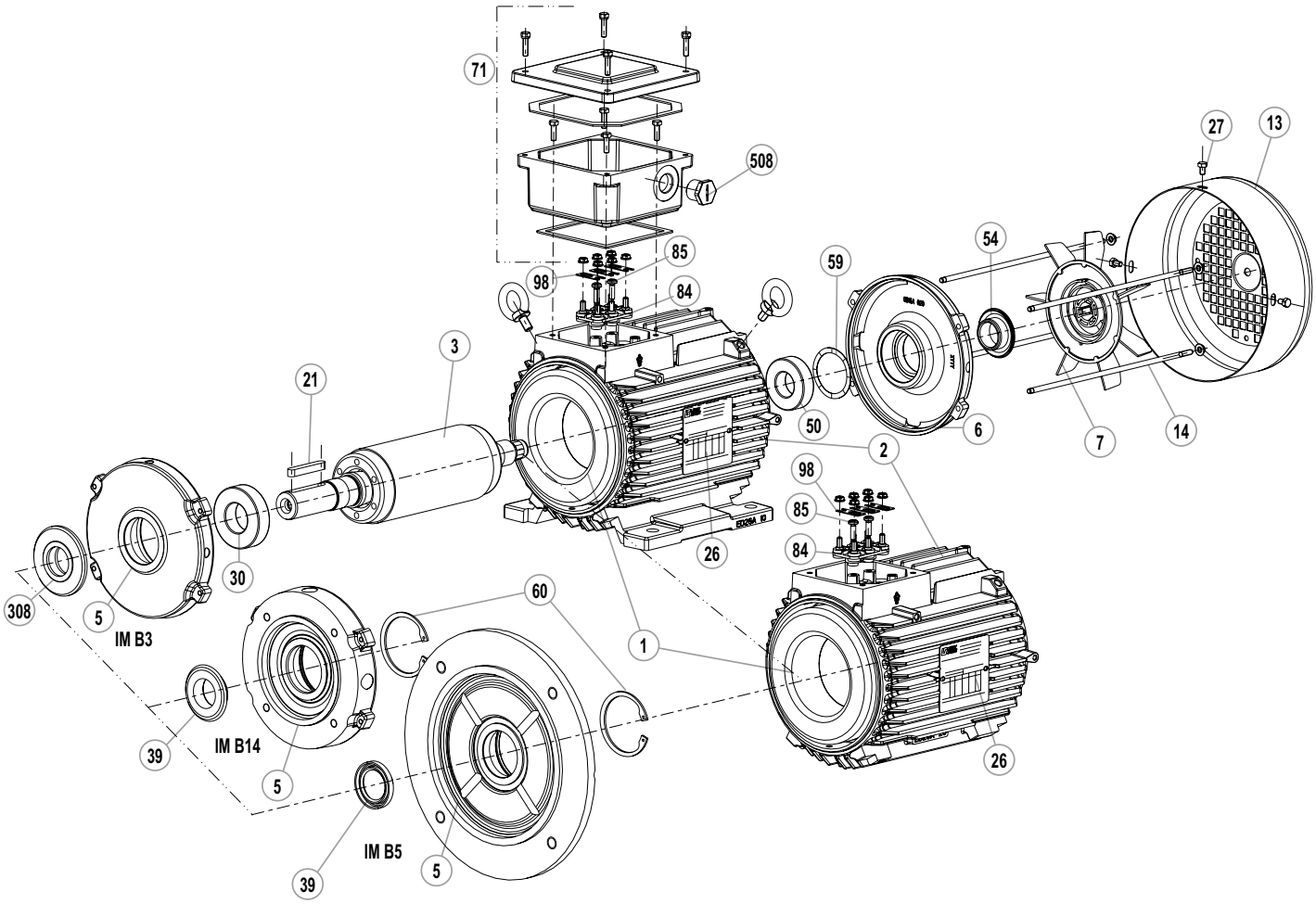
11.1.2 - Reassembling motors without circlip

- 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 up to the recommended torque (see section 6.4).
- 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 external 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 up to the recommended torque (see section 6.4).
- 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).

FLS/FLSES 80 to 132

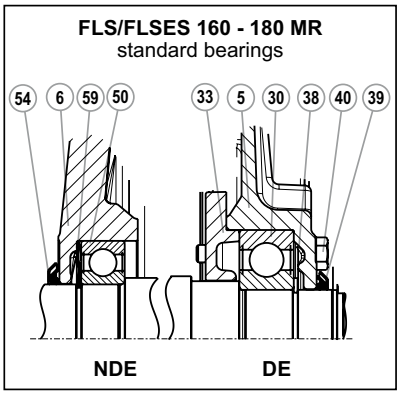


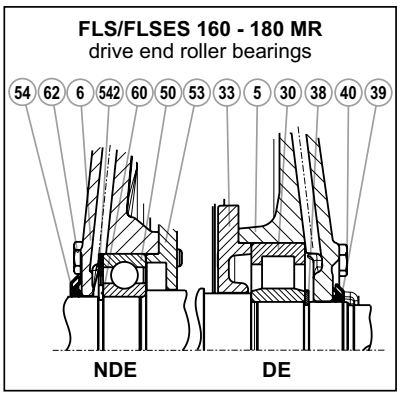
FLS/FLSES 80 to 132					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**21**	Shaft extension key	**60**	Circlip
2	Frame	**26**	Nameplate	**71**	FLSES terminal box
3	Rotor	**27**	Fan cover screw	**84**	Terminal block
5	Drive end shield	**30**	Drive end bearing	**85**	Set screw
6	Non drive end shield	**39**	Drive end seal	**98**	Connectors
7	Fan	**50**	Non drive end bearing	**308**	Labyrinth seal
13	Fan cover	**54**	NDE weatherproof seal	**508**	Terminal box plug
14	Tie rods	**59**	Preloading (wavy) washer		

11.2 - FLS/FLSES 160, 180 MR 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 opposed to 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).
- Remove the mounting screws (14).
- Unscrew the inner bearing retainer (33) fixing screws (40) when using a flange mounted motor or if the drive end bearing is locked.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover 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.

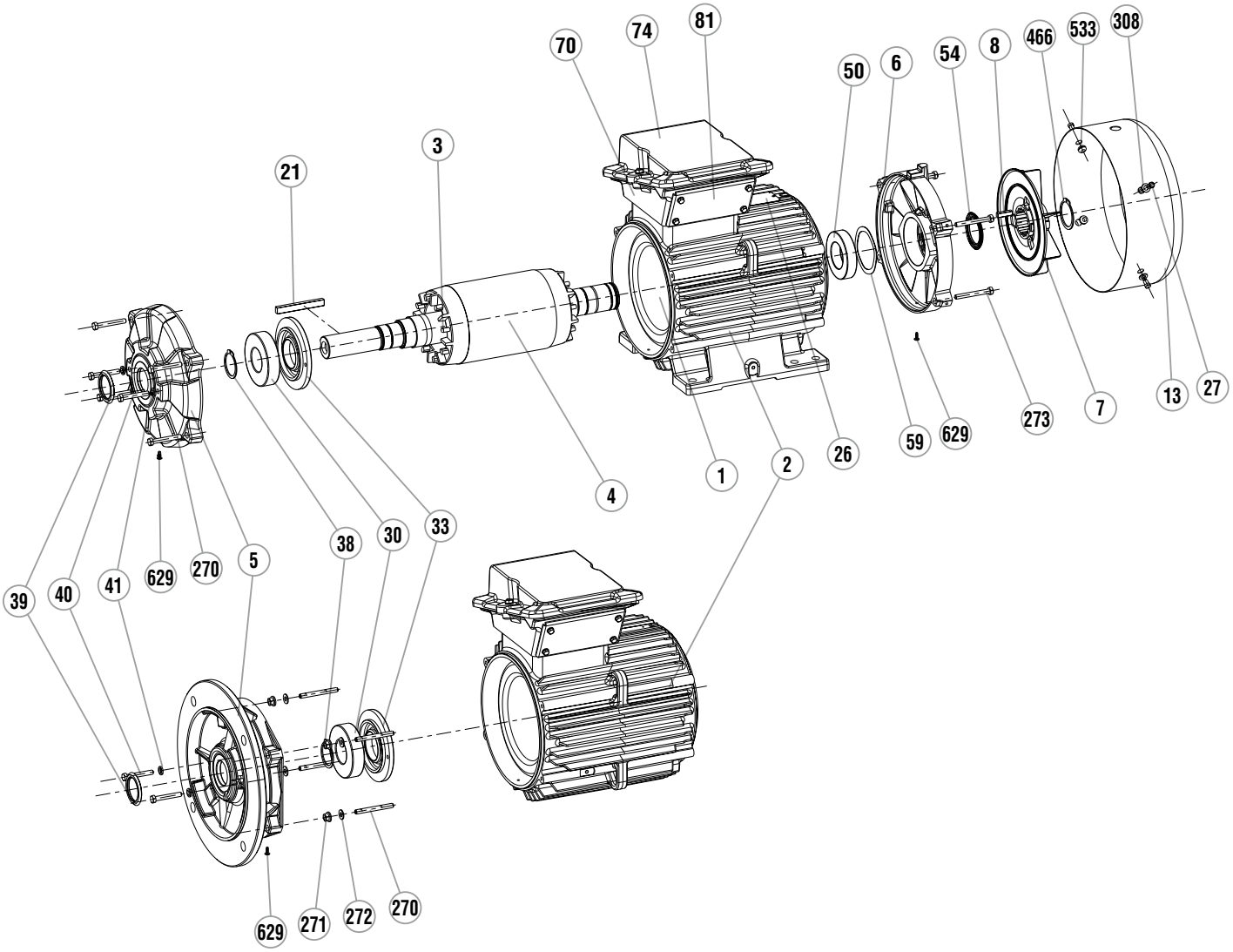




11.2.2 - Reassembly

- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- 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.
- If there is a bearing retainer (33), screw a rod with the same thread diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when remounting the DE shield (5).
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the mounting screws (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, fix the bearing retainer (33) with its own screws.
- 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).

FLS/FLSES 160, 180 MR

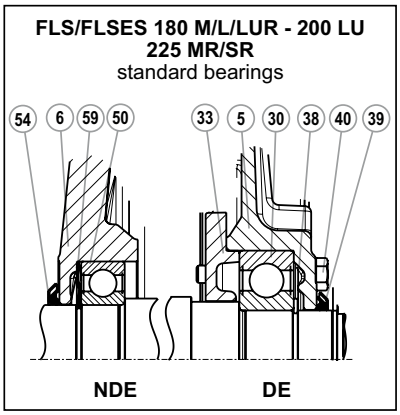


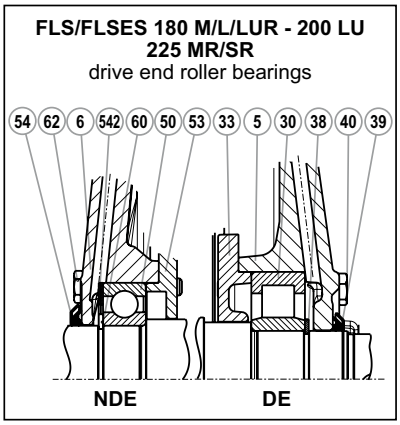
FLS/FLSES 160, 180 MR					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**27**	Fan cover screw	**74**	Terminal box lid
2	Frame	**30**	Drive end bearing	**81**	Cable gland support plate
3	Shaft	**33**	Inner drive end bearing retainer	**270**	Drive end shield fixing screw
4	Rotor	**38**	Snap ring for drive end shaft	**271**	Drive end shield fixing nut
5	Drive end shield	**39**	Drive end seal	**272**	DE shield washer
6	Non drive end shield	**40**	Drive end cover fixing screw	**273**	Non drive end shield fixing screw
7	Fan	**41**	Leaktight toothed lock washer for DE bearing retainer	**308**	Cover fixing washer
8	Fan key	**50**	Non drive end bearing	**466**	Snap ring for fan
13	Fan cover	**54**	NDE weatherproof seal	**533**	Cover shock mount
21	Drive end shield shaft extension key	**59**	Preloading (wavy) washer	**629**	Draining plug
26	Nameplate	**70**	Terminal box		

11.3 - FLS/FLSES 180 M/L/LUR, 200 LU, 225 MR/SR 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 opposed to 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).
- Remove the mounting screws (14).
- Unscrew the inner bearing retainer (33) fixing screws (40) when using a flange mounted motor or if the drive end bearing is locked.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover 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.

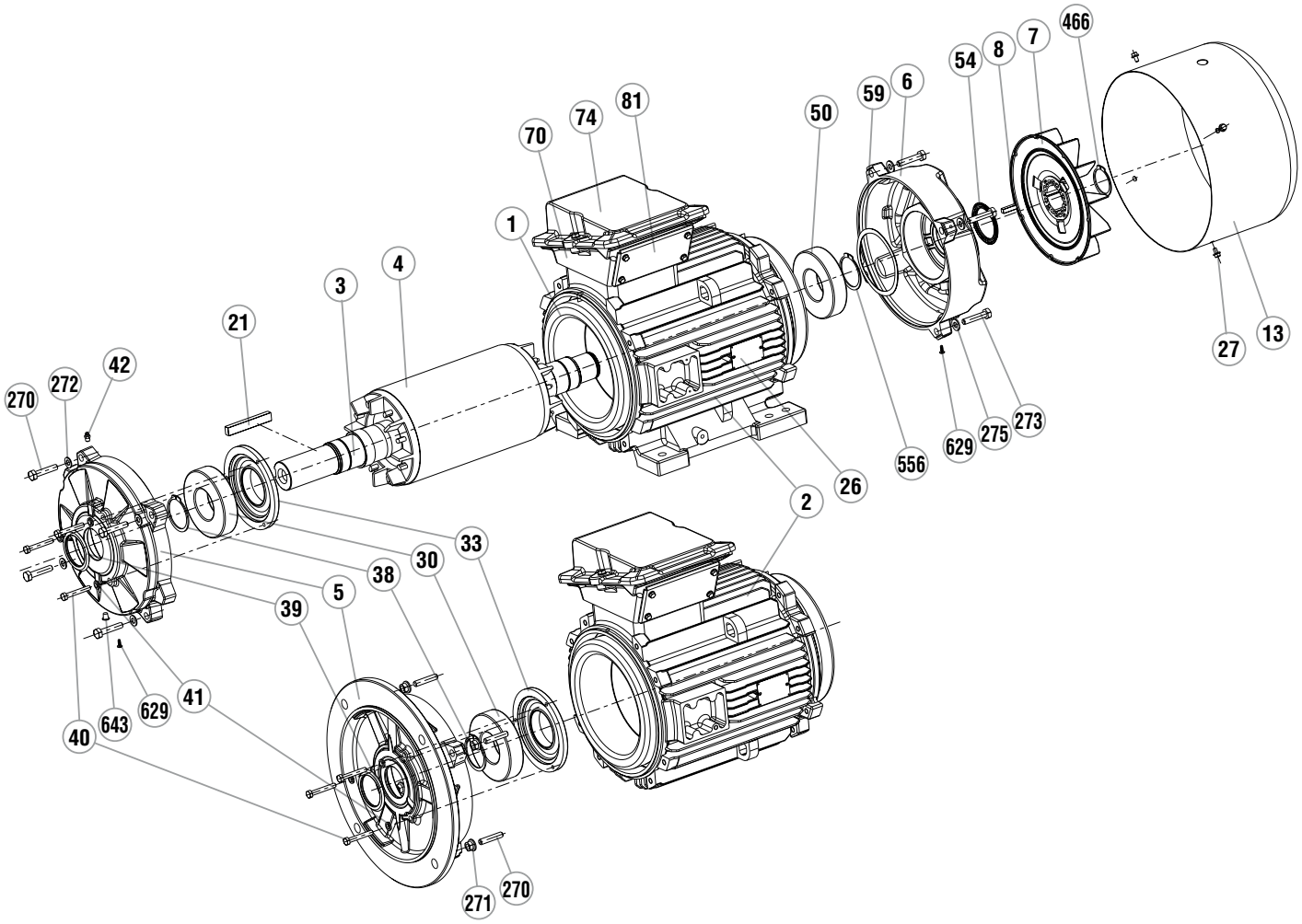




11.3.2 - Reassembly

- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- 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.
- If there is a bearing retainer (33), screw a rod with the same thread diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when remounting the DE shield (5).
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the mounting screws (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, fix the bearing retainer (33) with its own screws.
- 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).

FLS/FLSES 180 M/L/LUR, 200 LU, 225 MR/SR



FLS/FLSES 180 M/L/LUR, 200 LU, 225 MR/SR					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**30**	Drive end bearing	**81**	Cable gland support plate
2	Frame	**33**	Inner drive end bearing retainer	**270**	Drive end shield fixing screw
3	Shaft	**38**	Snap ring for drive end shaft	**271**	Drive end shield fixing nut
4	Rotor	**39**	Drive end seal	**272**	DE shield washer
5	Drive end shield	**40**	Drive end cover fixing screw	**273**	Non drive end shield fixing screw
6	Non drive end shield	**41**	Leaktight toothed lock washer for DE bearing retainer	**275**	Fixing washer for NDE shield
7	Fan	**42**	Drive end grease nipples	**466**	Snap ring for fan
8	Fan key	**50**	Non drive end bearing	**556**	NDE bearing circlip
13	Fan cover	**54**	NDE weatherproof seal	**629**	Draining plug
21	Drive end shield shaft extension key	**59**	Preloading (wavy) washer	**643**	DE grease draining plug
26	Nameplate	**70**	Terminal box		
27	Fan cover screw	**74**	Terminal box lid		

11.4 - FLS/FLSES 225 M to 280 motors

11.4.1 - 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.

11.4.2 - 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 DE internal cover (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.

11.4.3 - 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 in accordance with the instructions described in the General information in section 6 (shrinkfitting only).

IMPORTANT : Before undertaking any of these procedures, read the **«CHECKS BEFORE REASSEMBLY» section**.

11.4.4 - Reassembly

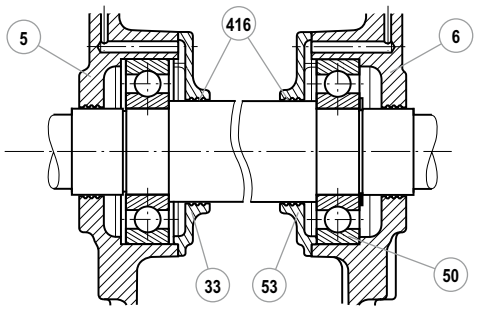
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33) and the circlip (38)!), and also the NDE bearing (50) if and only if the stator inner Ø allows the inner NDE bearing retainer (53) to pass through.
- Insert the rotor into the stator taking care not 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.

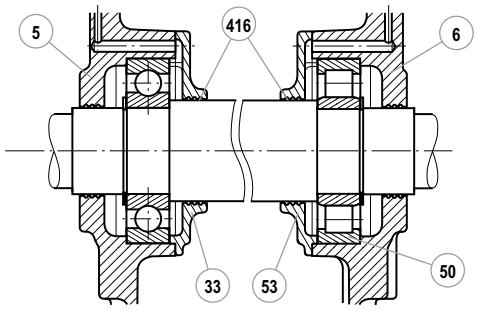
- Replace the shield fixing screws (270) and (273).
- Insert the fixing screws on the inner bearing retainers (33) and (53). Replace the AZ washers to ensure a perfect seal.
- Replace the fan key if appropriate.
- Replace the fan (7).
- Replace the shaft extension screw if necessary.
- Replace the cover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

Amount of grease for ball bearings:
- Frame size 225 - 250: DE and NDE = 120 cm^3
- Frame size 280: DE = 170 cm^3 / NDE = 120 cm^3

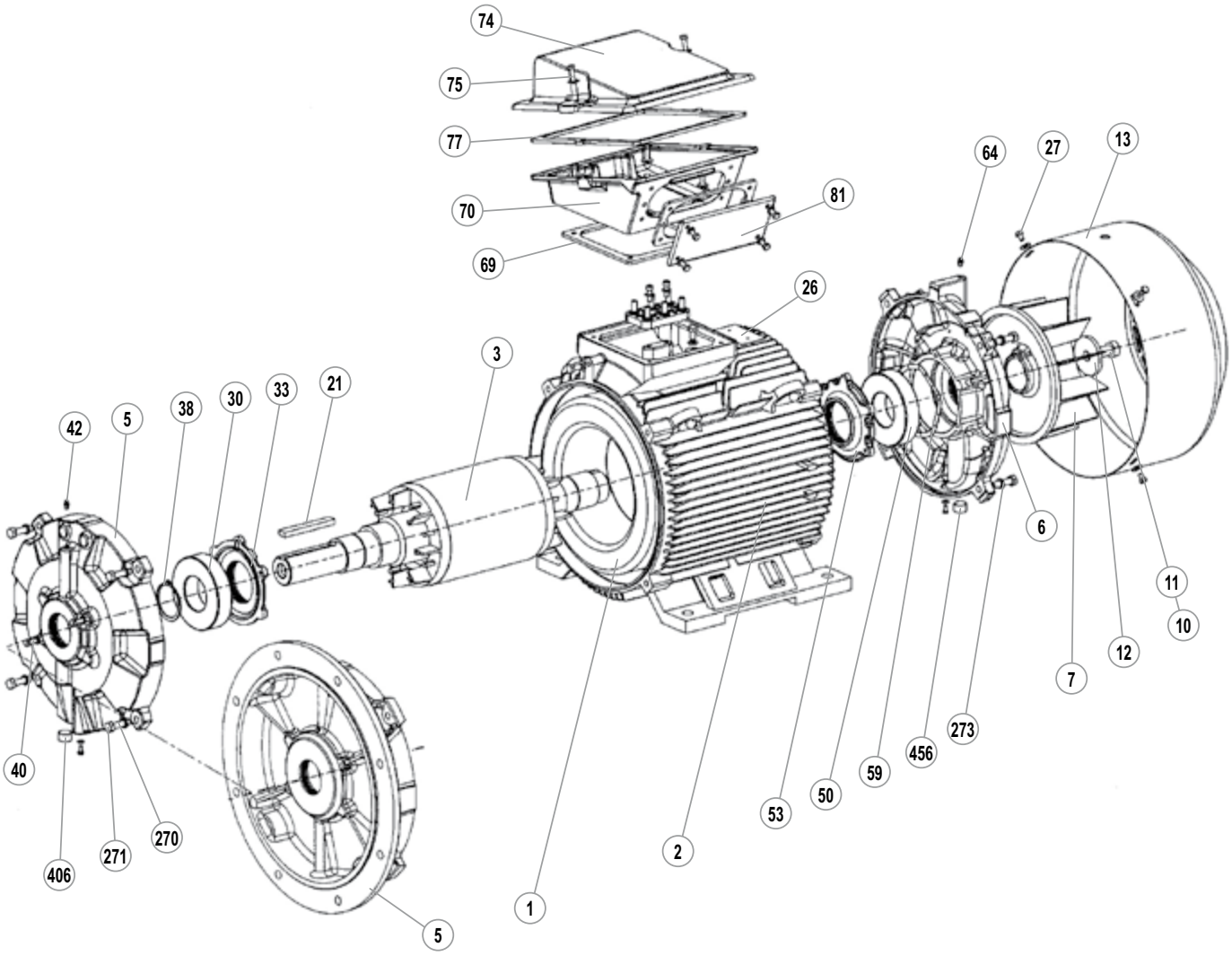
FLS/FLSES 225 M to 280
standard bearings



FLS/FLSES 225 M to 280
drive end roller bearings



FLS/FLSES 225 M to 280



FLS/FLSES 225 M to 280

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	26	Nameplate	69	Terminal box base seal
2	Frame	27	Fan cover screw	70	Terminal box
3	Rotor	30	Drive end bearing	74	Terminal box lid
5	Drive end shield	33	Inner drive end bearing retainer	75	Terminal box lid fixing screw
6	Non drive end shield	38	Snap ring for drive end shaft	77	Terminal box lid seal
7	Fan	40	Drive end cover fixing screw	81	Cable gland support plate
10	Turbine or fan screw	42	Drive end grease nipples	270	Drive end shield fixing screw
11	Lockwasher	50	Non drive end bearing	271	Drive end shield fixing nut
12	Lock washer	53	Inner non drive end bearing retainer	273	Non drive end shield fixing screw
13	Fan cover	59	Preloading (wavy) washer	406	Drive end grease valve cover plate (plug)
21	Drive end shield shaft extension key	64	Non drive end grease nipple	456	Non drive end grease valve cover plate (plug)

11.5 - FLS/FLSES 315 to 355 LD motors

11.5.1 - 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 retrieve the preloading springs (256), which should be replaced in their housing.

11.5.2 - 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 DE internal cover (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.

11.5.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the DE (38) and NDE (60) circlips.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Do not knock the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrinkfitting only).

IMPORTANT : Before undertaking any of these procedures, read the **«CHECKS BEFORE REASSEMBLY» section**.

11.5.4 - 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 Ø allows the inner NDE bearing retainer (53) to pass through, refit the circlip (60), refit the preloading springs in their housing in the inner NDE bearing retainer (53).
- Insert the rotor into 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 and the grease inlet pipes 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.

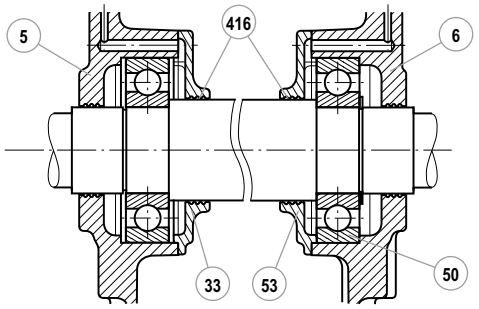
From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

- 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.

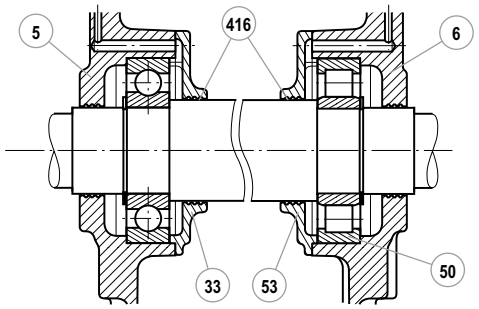
Amount of grease for ball bearings:

- Frame size 315 : DE and NDE = 50 g for 4P and + / 35 g for 2P
- Frame size 355 : DE and NDE = 60 g for 4P and + / 35 g for 2P

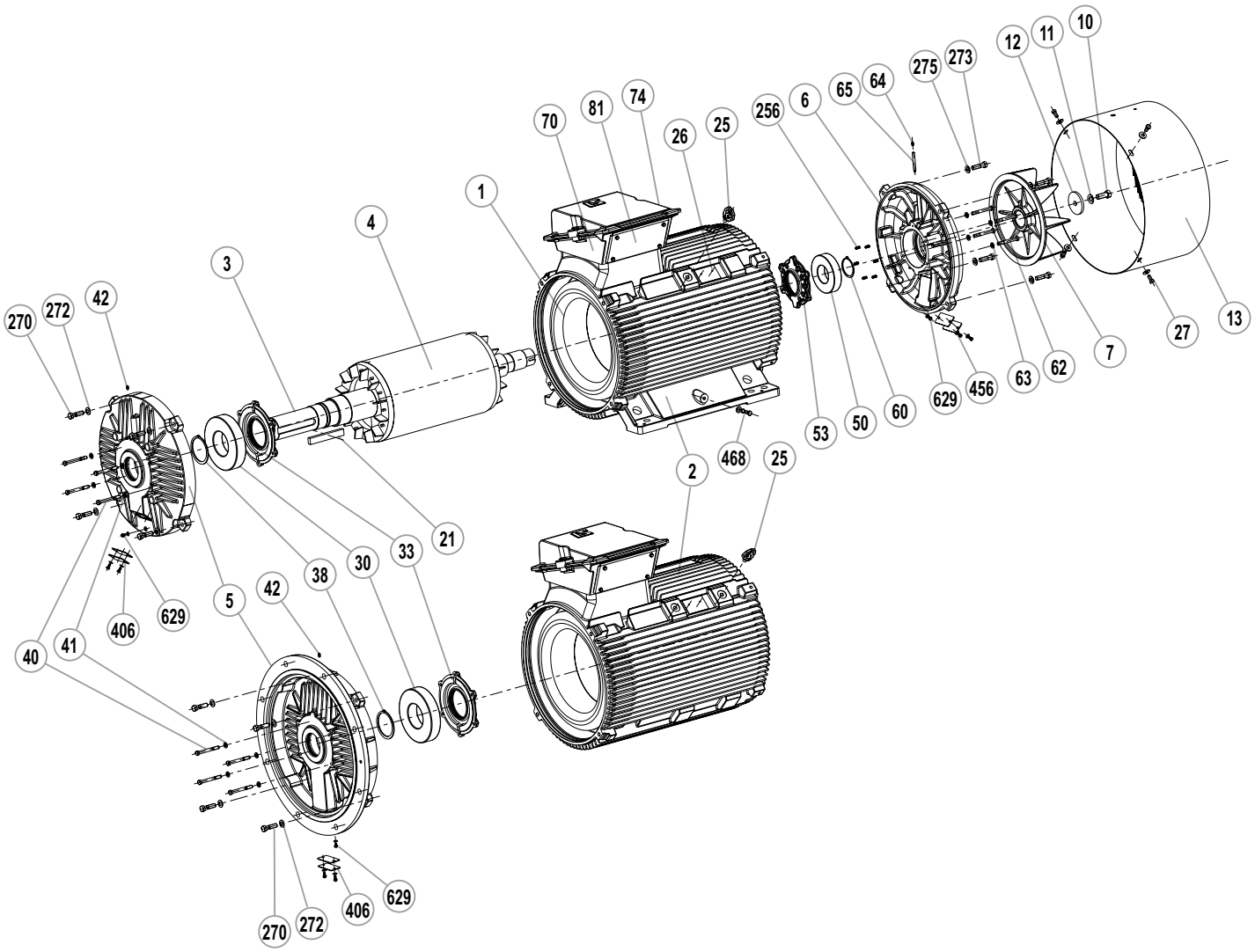
FLS/FLSES 315 to 355 LD
standard bearings



FLS/FLSES 315 to 355 LD
drive end roller bearings



FLS/FLSES 315 to 355 LD



FLS/FLSES 315 to 355 LD

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	27	Fan cover screw	70	Stator terminal box
2	Frame	30	Drive end bearing	74	Stator terminal box lid
3	Shaft	33	Inner drive end bearing retainer	81	Cable gland support plate
4	Rotor	38	Snap ring for drive end shaft	256	Preloading spring
5	Drive end shield	40	Drive end cover fixing screw	270	Drive end shield fixing screw
6	Non drive end shield	41	Leaktight toothed lock washer for DE bearing retainer	272	DE shield washer
7	Fan	42	Drive end grease nipples	273	Non drive end shield fixing screw
10	Turbine or fan screw	50	Non drive end bearing	275	Fixing washer for NDE shield
11	Lockwasher	53	Inner non drive end bearing retainer	406	Drive end grease valve cover plate
12	Lock washer	60	Circlip	456	Non drive end grease valve cover plate
13	Fan cover	62	Cover fixing screw	468	Earth terminal plug
21	Drive end shield shaft extension key	63	Fixing washer for NDE bearing retainer	629	Draining plug
25	Lifting ring	64	Non drive end grease nipple		
26	Nameplate	65	Extension for non drive end grease nipple		

12 - PLS/PLSES MOTORS

12.1 - PLS/PLSES 180 LG/LGU 200 M/L/LP/LU/LR, 225 MR motors

12.1.1 - Dismantling

- Remove the screws (27) and grease nipple (64), 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, then remove the fan key or pin.
- 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 (53) fixing screws (62), and remove them.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover the preloading washer (59).
- Remove the circlip (38) and if necessary the circlip (60) (motor with roller bearing).
- Remove the rotor (3) from the stator (1) at the drive end, taking care not to touch the winding with the inner bearing retainer. Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Take care not to knock the running surfaces of the shaft.
- The bearings are removed either separately or with the bearing retainers; to avoid damaging the bearing retainers, heat the inner bearing retainer to make it easier to dismantle (the bearing should be discarded).

12.1.2 - Reassembly

- See section 6.1 before reassembly.
- Insert the inner bearing retainer (33) at the rotor drive end and the inner bearing retainer (53) at the non drive end.
- Fit the new bearings on the shaft, see section 6.1 on mounting bearings.
- Insert the rotor (3) in the stator (1) taking every precaution 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 refitting the shields (5 and 6).
- Position the preloading washer (59) with a small amount of grease at the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6) by positioning it on the stator.
- Fit the shield (5) taking care to position the bearing retainer (33) correctly.
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- Fix the bearing retainers (33) and (53) with their own screws (40) and (62).
- Mount the shield seals with grease: (54) for the non drive end, (39) for the drive end.
- Install the fan key or pin.
- Mount the fan (7) using a drift to bed it into position.

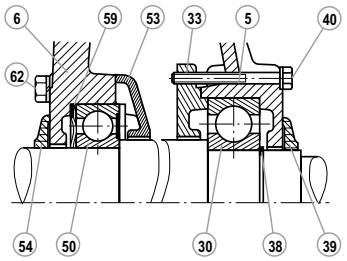
MAKE SURE it is facing the right way!

- 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 grease nipple (64).
- Fill with new grease: the quantity is indicated in the table opposite.

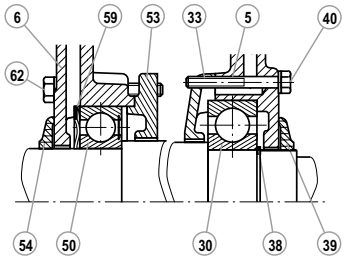
Turn the shaft by hand during greasing.

- Replace the key (21).

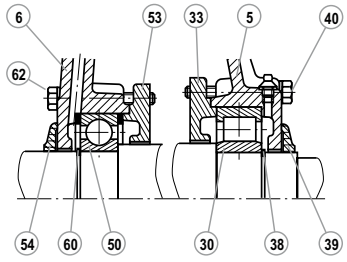
PLS/PLSES 180 LG/LGU
200 M/L/LP/LU/LR
standard bearings



PLS/PLSES 225 MR
standard bearings



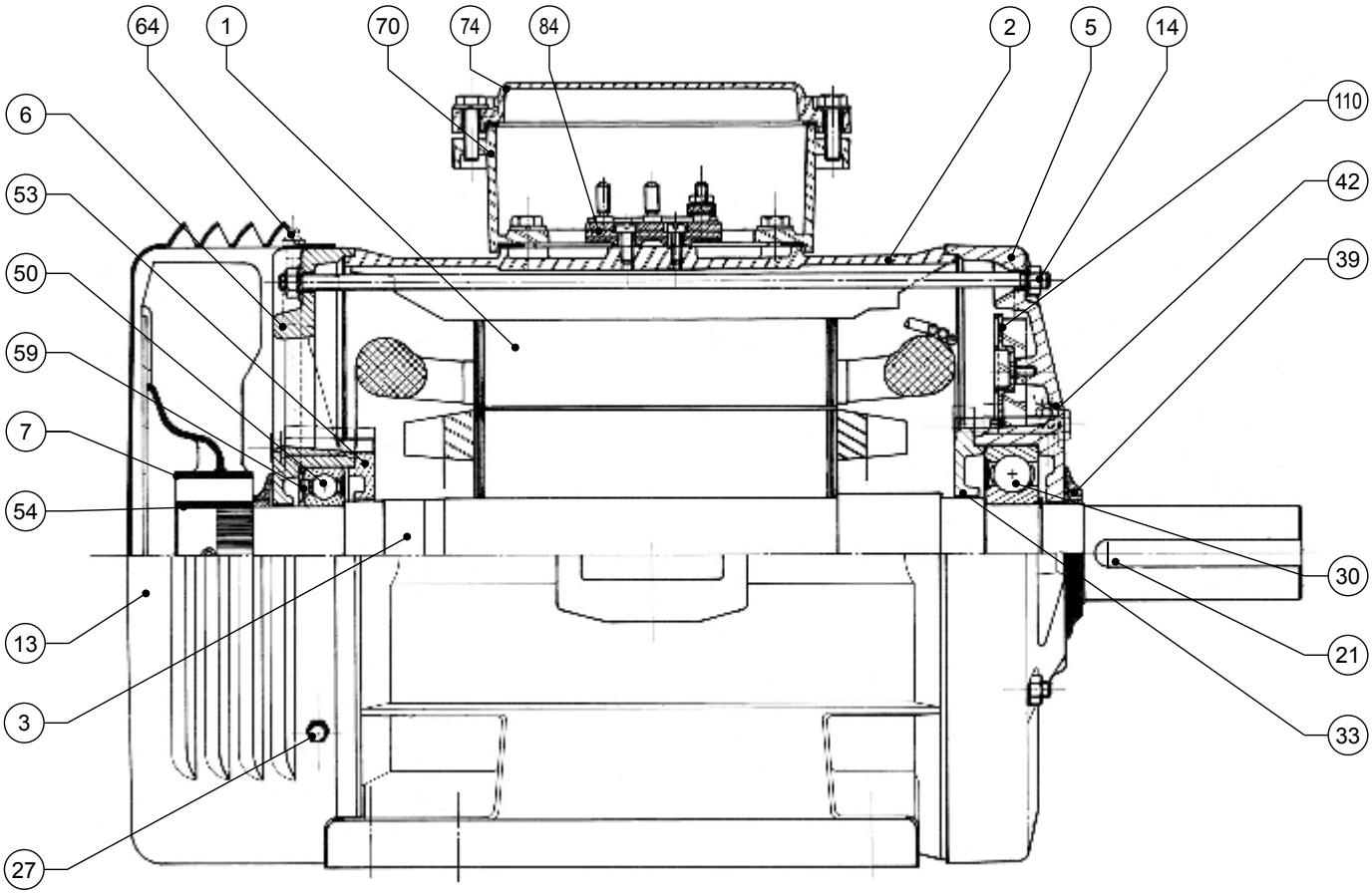
PLS/PLSES 180 LG/LGU
200 M/L/LP/LU/LR - 225 MR
drive end roller bearings



Bearing	g
6212 Z	31
6214	60
6312 or NU312	90
6313 or NU313	93
6314 or NU314	140

(Weight valid for POLYREX EM103 grease with immaculately clean grease track + bearing seat + drain holes).

PLS/PLSES 180 LG/LGU, 200 M/L/LP/LU/LR, 225 MR



PLS/PLSES 180 LG/LGU, 200 M/L/LP/LU/LR, 225 MR					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**21**	Key	**54**	Non drive end seal
2	Frame	**27**	Fan cover screw	**59**	Preloading (wavy) washer
3	Rotor	**30**	Drive end bearing	**64**	Grease nipple
5	Drive end shield	**33**	Inner drive end bearing retainer	**70**	Terminal box
6	Non drive end shield	**39**	Drive end seal	**74**	Terminal box lid
7	Fan	**42**	Grease nipple	**84**	Terminal block
13	Fan cover	**50**	Non drive end bearing	**110**	Protective grille
14	Tie rods	**53**	Inner non drive end bearing retainer		

12.2 - PLS/PLSES 225 MG, 250, 280 SC/SD/MC/MD motors

12.2.1 - Dismantling

- Remove the screws (27), the grease nipple (64) and its extension (65), 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, then remove the fan key.
- Take out the key (21).
- Unscrew the tie rods (14) then remove them.
- Unscrew the DE bearing retainer (33) and (32) fixing screws (40) and NDE bearing retainer (52) and (53) fixing screws (62), and remove them.
- Unscrew the «Hc» screw of the mobile valve (35) then unscrew the valve using a hook key or a conical bronze drift; unscrew the valve by hand and remove it. The valve holds the seal (39) and its support (386) in place.
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Recover the preloading washer (59).
- Remove the circlip (60).
- Remove the rotor (3) from the stator (1) at the drive end, taking care not to touch the winding with the inner bearing retainer.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft end with a washer. Take care not to knock the running surfaces of the shaft.
- The bearings are removed either separately or with the bearing retainers; to avoid damaging the bearing retainers, heat the inner bearing retainer to make it easier to dismantle (the bearing should be discarded).

12.2.2 - Reassembly

- See section 6.1 before reassembly.
- Insert the inner bearing retainer (33) at the rotor drive end and the inner bearing retainer (53) at the non drive end.
- Fit the new bearings on the shaft, see section 6.1 on mounting bearings.
- Mount the circlip (60).
- Insert the rotor (3) in the stator (1) taking every precaution 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 refitting the shields (5 and 6).
- Position the preloading washer (59) with a small amount of grease at the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6) by positioning it on the stator.
- At the non drive end fit the seal (54) and its support (388), insert the bearing retainer (52) and the locking screws (62) for the bearing retainers (52) and (53).
- At the drive end fit the shield (5) taking care to position the bearing retainer (33) correctly.
- Mount the mobile valve (35) by either screwing it or locking it having carefully mounted the seal (39) and its support (386).
- Mount the shield seals with grease: (54) for the non drive end, (39) for the drive end.
- Mount the outer bearing retainer (32) with the bearing retainer locking screws (40), making sure that the grease drain hole is at the bottom.
- Put the tie rods (14) in place, not forgetting the feet of the protective cover (380), tighten the nuts diagonally without locking them so that the feet of the protective cover can be positioned when it is mounted.
- Install the fan key.
- 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.

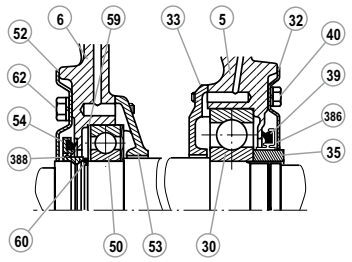
MAKE SURE it is facing the right way!

- 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 (64) and its extension (65).
- Tighten the rod nuts (14), always diagonally, up to the torque recommended in section 6.1.
- Fill with new grease: the quantity is indicated in the table below.

Turn the shaft by hand during greasing.

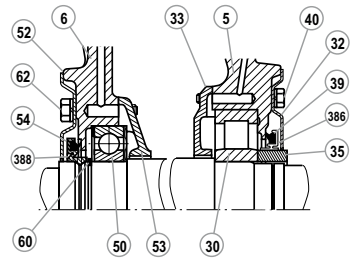
- Replace the key (21).

PLS/PLSES 225 MG - 250
280 SC/SD/MC/MD
standard bearings



NDE DE

PLS/PLSES 225 MG - 250
280 SC/SD/MC/MD
drive end roller bearings

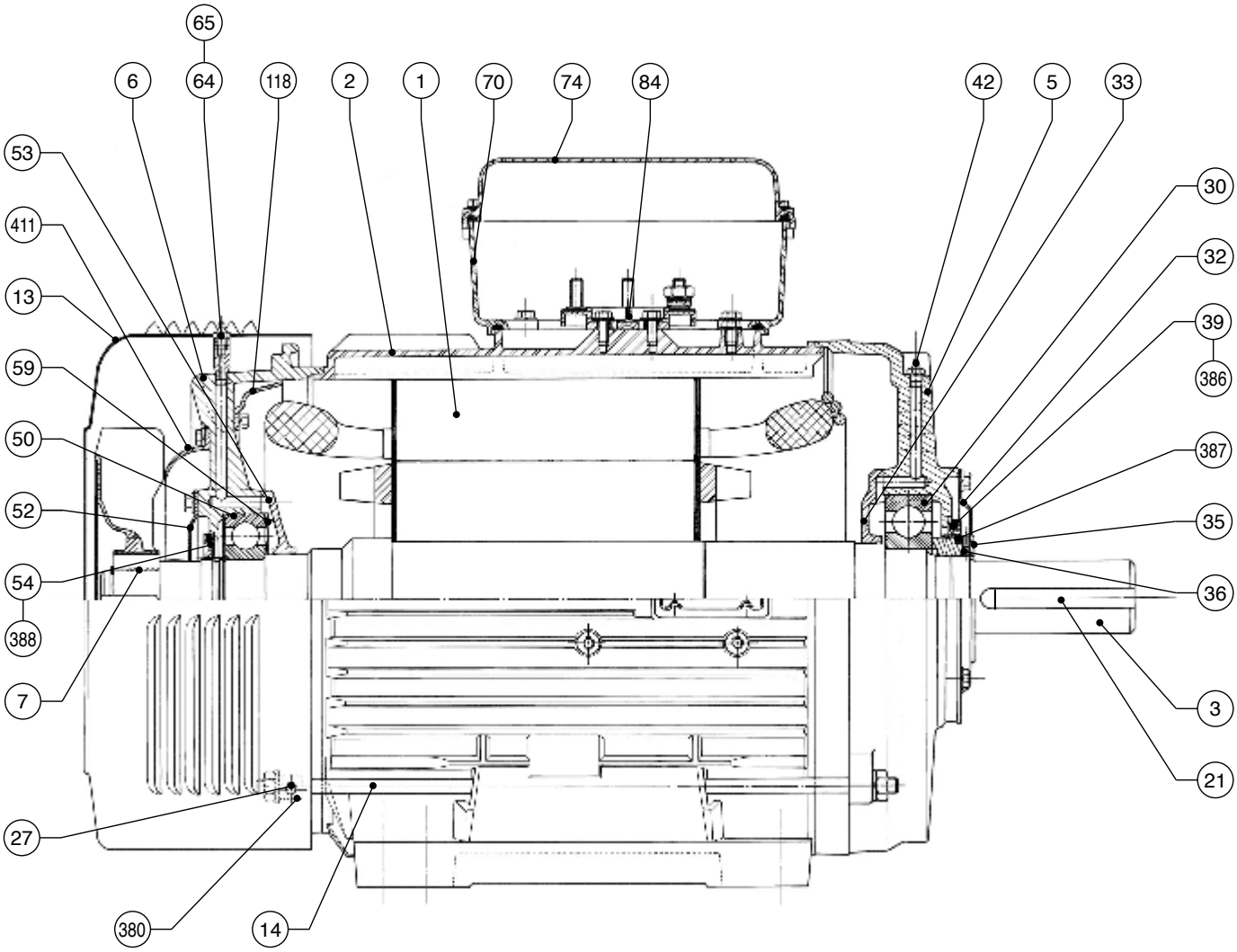


NDE DE

Bearing	g
6314	105
6315	140
6317 or NU317	180
6318 or NU318	220

(Weight valid for POLYREX EM103 grease with immaculately clean grease track + bearing seat + drain holes).

PLS/PLSES 225 MG, 250, 280 SC/SD/MC/MD



PLS/PLSES 225 MG, 250, 280 SC/SD/MC/MD

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	**32**	Outer drive end bearing retainer	**65**	Extension for grease nipple
2	Frame	**33**	Inner drive end bearing retainer	**70**	Terminal box
3	Rotor	**35**	Drive end mobile grease valve	**74**	Terminal box lid
5	Drive end shield	**39**	Drive end seal	**84**	Terminal block
6	Non drive end shield	**42**	Grease nipple	**118**	Internal deflector
7	Fan	**50**	Non drive end bearing	**380**	Protective cover feet
13	Fan cover	**52**	Outer non drive end bearing retainer	**386**	Drive end seal support
14	Tie rods	**53**	Inner non drive end bearing retainer	**388**	Non drive end seal support
21	Key	**54**	Non drive end seal	**411**	External deflector
27	Fan cover screw	**59**	Preloading (wavy) washer		
30	Drive end bearing	**64**	Grease nipple		

12.3 - PLS/PLSES 280 MG, 315 motors

12.3.1 - Dismantling

- Remove the screws (27), the grease nipple (64) and its extension (65), 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 mounting screws (14) then remove them.
- Unscrew the DE bearing retainer (32) and (33) fixing screws (40) and NDE bearing retainer (52) and (53) fixing screws (62), and remove them.
- Unscrew the «Hc» screws of the mobile valves (35 and 56) then unscrew the valves using a pin spanner; unscrew the valves by hand and remove them.

The valves hold the supports (386) and (388) for the seals (39 and 54) in place.

- 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 end with a washer. Take care not to knock 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 inner bearing ring (the bearing should be discarded).
- Recover the preloading washer or springs (59) from the bearing retainer (53).

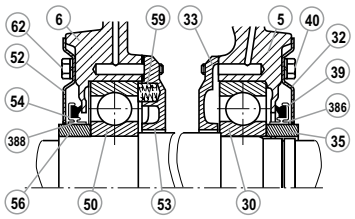
12.3.2 - Reassembly

- See section 6.1 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) with a little grease.
- Fit the new bearings (30 and 50) on the shaft, see section 6.1 on mounting bearings.
- Insert the rotor (3) in the stator (1) taking every precaution 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 refitting the shields (5 and 6).
- Check that the preloading springs are properly installed.
- Mount the NDE shield (6) by positioning it on the stator.
- Mount the mobile valve (56) by either screwing it or locking it, having carefully installed the seal (54) with its support (388).
- 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 DE shield (5) by positioning it on the stator.
- Mount the mobile valve (35) by either screwing it or locking it, having carefully installed the seal (39) with its support (386).
- Mount the shield seals with grease: (54) for the non drive end, (39) for the drive end.
- Mount the outer bearing retainer (32) with the bearing retainer locking screws (40), making sure that the grease drain hole is at the bottom.
- Put the tie rods (14) and the feet of the protective cover (380) in place, tighten the nuts diagonally without locking them so that the feet of the protective cover can be positioned when it is mounted.
- Install the fan key.
- 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.

MAKE SURE it is facing the right way!

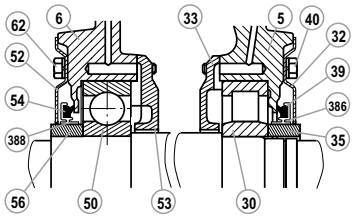
- Check that the motor turns freely by hand and that there is no axial play.
- Replace the protective cover (13) and fix it with the screws (27), replace the grease nipple (64) and its extension (65).
- Fill with new grease: the quantity is indicated in the table below. Turn the shaft by hand during greasing.
- Tighten the nuts (14), always diagonally, up to the torque recommended in section 6.1.
- Replace the key (21).

PLS/PLSES 280 MG - 315
standard bearings



NDE DE

PLS/PLSES 280 MG - 315
drive end roller bearings

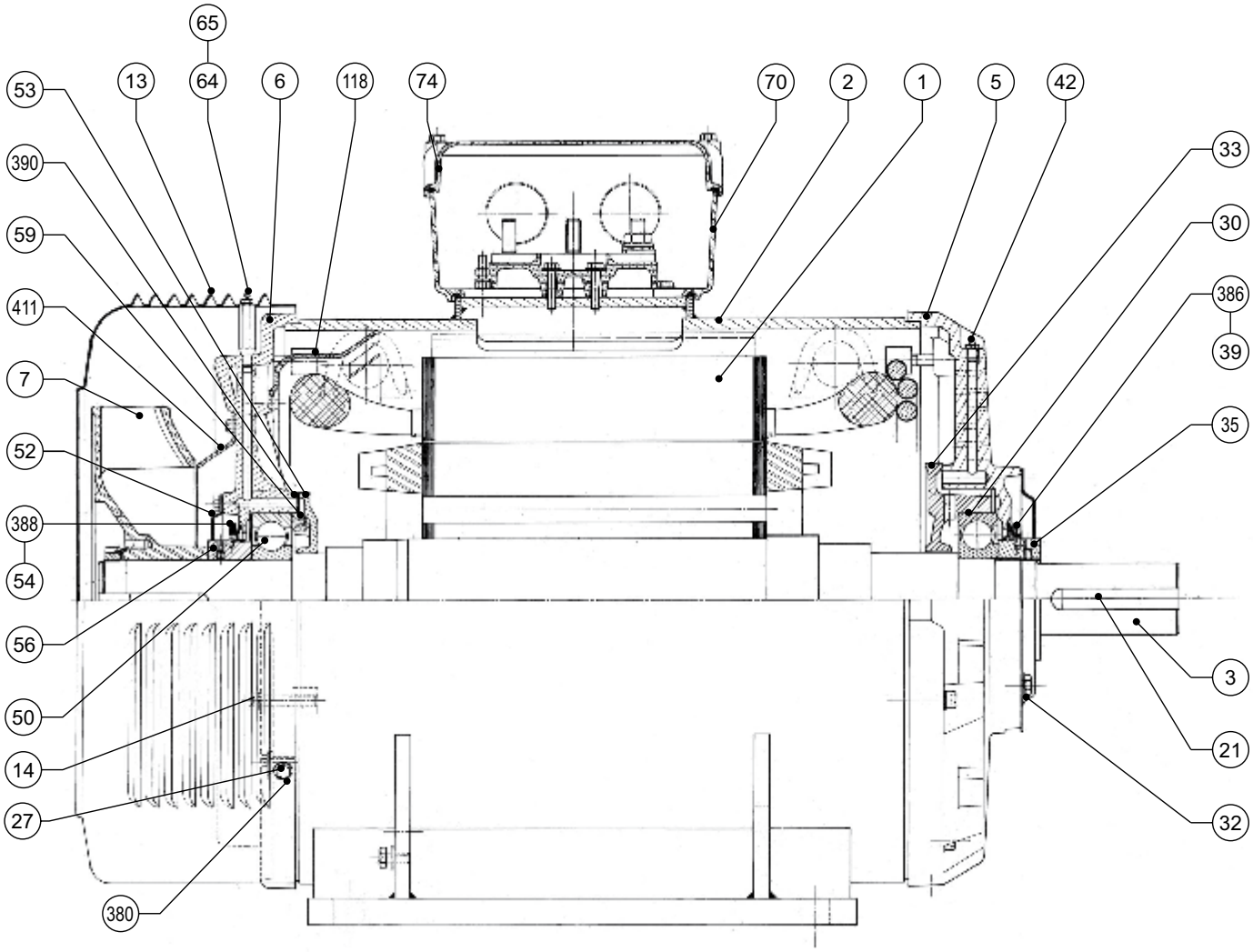


NDE DE

Bearing	g
6316	160
6320	385
NU320	385
6219	215
6224	244

(Weight valid for POLYREX EM103 grease with immaculately clean grease track + bearing seat + drain holes).

PLS/PLSES 280 MG, 315



PLS/PLSES 280 MG, 315

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	**32**	Outer drive end bearing retainer	**64**	Grease nipple
2	Frame	**33**	Inner drive end bearing retainer	**65**	Extension for grease nipple
3	Rotor	**35**	Drive end mobile grease valve	**70**	Terminal box
5	Drive end shield	**39**	Drive end seal	**74**	Terminal box lid
6	Non drive end shield	**42**	Grease nipple	**84**	Terminal block
7	Fan	**50**	Non drive end bearing	**118**	Internal deflector
13	Fan cover	**52**	Outer non drive end bearing retainer	**380**	Protective cover feet
14	Tie rods	**53**	Inner non drive end bearing retainer	**386**	Drive end seal support
21	Key	**54**	Non drive end seal	**388**	Non drive end seal support
27	Fan cover screw	**56**	Non drive end mobile grease valve	**390**	Non drive end inner bearing retainer strut
30	Drive end bearing	**59**	Preloading (wavy) washer	**411**	External deflector

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