LEROY SOMER®

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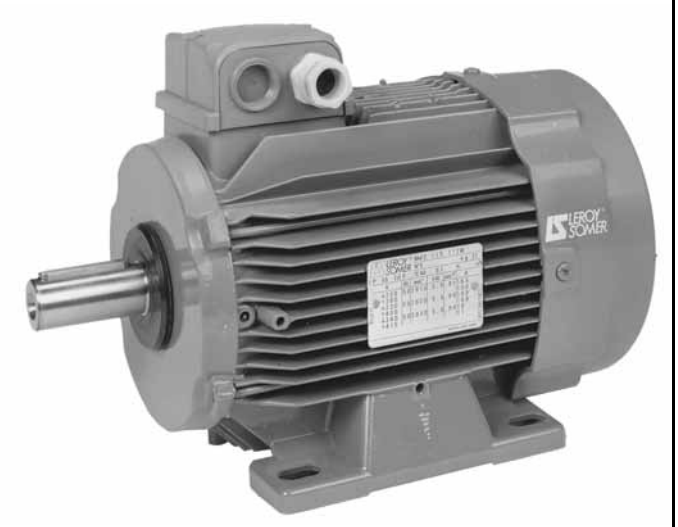
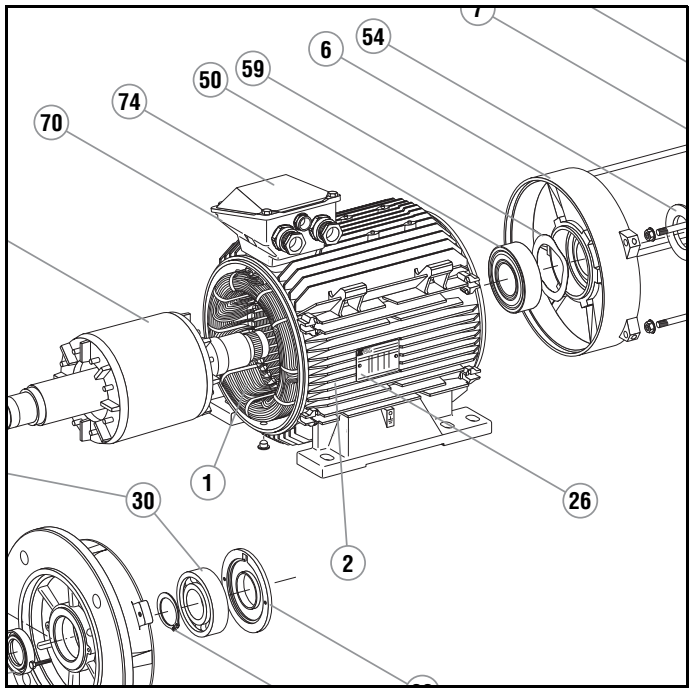


This manual is to be given to the end user



3-phase TEFV induction motors (slip-ring or cage type)

Installation and maintenance

3-phase TEFV induction motors (slip-ring or cage type)

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 authorised personnel.

In accordance with the main requirements of EEC 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 and does not exceed the maximum value of 85 dB(A) pressure at 1 metre.

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

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

3-phase TEFV induction motors (slip-ring or cage type)

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 2000 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 therefore to the Low Voltage Directive 73/23/EEC modified by Directive 93/68, which is demonstrated by their marking with the symbol CE

MOTEURS LEROY-SOMER
USINE

DECLARATION DE CONFORMITE ET D'INCORPORATION

Le constructeur MOTEURS LEROY-SOMER déclare que les composants :

sont en conformité avec la norme harmonisée EN 60 034 (CEI 34) et répondent ainsi aux exigences essentielles de la Directive Basse Tension 73-23 EEC du 19 février 1973 modifiée par la Directive 93-68 EEC du 22 juillet 1993.

Les composants ainsi définis répondent aussi aux exigences essentielles de la Directive Compatibilité Electromagnétique 89-336 EEC du 3 mai 1989 modifiée par les Directives 92-31 CEE du 28 avril 1992 et 93-68 CEE du 22 juillet 1993, s'ils sont utilisés dans certaines limites de tension (CEI 34).

Ces conformités permettent l'utilisation de ces gammes de composants dans une machine soumise à l'application de la Directive Machines 98/37/CE, sous réserve que leur intégration ou leur incorporation ou/et leur assemblage soient effectués conformément entre autres aux règles de la norme EN 60204 "Equipement Electrique des Machines" et à nos instructions d'installation.

Les composants définis ci-dessus ne pourront être mis en service avant que la machine dans laquelle ils sont incorporés n'ait été déclarée conforme aux directives qui lui sont applicables.

Nota : Lorsque les composants sont alimentés par des convertisseurs électroniques adaptés et/ou asservis à des dispositifs électroniques de contrôle et de commande, ils doivent être installés par un professionnel qui se rendra responsable du respect des règles de la compatibilité électromagnétique dans le pays où la machine est utilisée.

Emetteur de la déclaration

Directeur Qualité
MOTEURS LEROY-SOMER

Fait à
le

Signature

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.

3-phase TEFV induction motors (slip-ring or cage type)

CONTENTS

DISMANTLING AND REASSEMBLY PROCEDURES

INDEX

3-phase TEFV induction motors (slip-ring or cage type)

RECEIPT

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.

* LEROY SOMER 3 ~ LS 100 L - TR
N 078594 HA 002 CE
IP 55 IK 08 cl.F 40C S1 kg 18

	V	Hz	min^{-1}	kW	cos φ	A
○	Δ 380	50	2840	3	0.89	6.4 ○
	Δ 400	-	2860	-	0.83	6.3
	Y 690	-	-	-	-	3.6
	Δ 415	-	2870	-	0.79	6.7
	Δ 440	60	3430	3.6	0.90	6.5
	Δ 460	-	3455	-	0.87	6.3

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

LEROY SOMER MOT. 3 ~ FLSC 355 LB
N 703 481 00 HA 002 kg : 1550 CE
IP 55 IK 08 I cl. F 40 C S1 % d/h

	V	Hz	min^{-1}	kW	cos φ	A
	Δ 380	50	1483	300	0.91	525
	Δ 400	-	1485	-	0.90	504
○	Y 690	-	-	-	-	291 ○
	Δ 415	-	1486	-	0.89	493
	Δ 440	60	1777	345	0.91	518
	Δ 460	-	1780	-	-	499

TR
ESSO UNIREX N3 GREASE

DE	6322 C3	60 cm^3	4500 / 3000 H 50/60 Hz
NDE	6322 C3	60 cm^3	4500 / 3000 H 50/60 Hz

LEROY SOMER MOT. 3 ~ FLSB 180 M
N 596 059 GH 001 kg : 208 CE
IP 55 IK 08 I cl. F 40 C S3 40 % 6 d/h

	V	Hz	min^{-1}	kW	cos φ	A
	Δ 220	50	1427	17	0.88	60
○	Y 380	50	1427	17	0.88	35 ○
	U_R 250					I_R 42

ESSO UNIREX N3 GREASE

DE	6310 C3	15 cm^3	11000 / H 50/60 Hz
NDE	6310 C3	15 cm^3	11000 / H 50/60 Hz

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
LS : Series
100 : Frame size
L : Housing symbol
TR : Impregnation index

Motor no.
N° : Motor batch number

for motor types 80 to 355:
H* : Year of production
A** : Month of production
002 : Serial number

***G** = *1996* **H** = *1997*
A = *January* **B** = *February*

IP55 IK08 : Degree of protection
(I) cl. F : Insulation class F
40°C : Contractual ambient operating temperature
S : Duty
% : Operating factor
...d/h : Number of cycles per hour
kg : Weight
V : Supply voltage
Hz : Supply frequency
min^{-1} : Revolutions per minute
kW : Rated power
cos φ : Power factor
A : Rated current
Δ : Delta connection
Y : Star connection
U_R : Rotor voltage
I_R : Rotor current

Bearings
DE : Drive end
Drive end bearing
NDE : Non drive end
Bearing at non drive end
60 cm^3 : Amount of grease at each regreasing (in cm^3)
4500 H : Lubrication interval (in hours) for θ amb stated at 50 Hz frequency
3000 H : Lubrication interval (in hours) for θ amb stated at 60 Hz frequency
UNIREX N3 : Type of grease

3-phase TEFV induction motors (slip-ring or cage type)

ASSEMBLY

1.2 - Storage

Prior to commissioning, machines should be stored:
- 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 2: KYODO SRL2 - ELF CHEVRON SRI 2
- grade 3: ESSO UNIREX N 3 - SHELL ALVANIA G3
- KLUBER BQ 72-72 (for 2P > or = 315 ST)

2 - ASSEMBLY

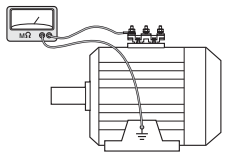
In all cases, compatibility of the motor and its environment must be guaranteed before its installation and also throughout its life.

Electric motors are industrial products. They must therefore be installed by qualified, experienced and authorised 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).



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

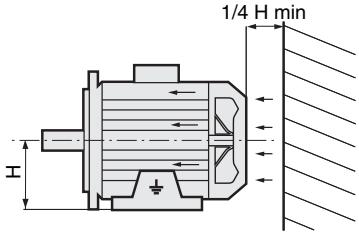
3-phase TEFV induction motors (slip-ring or cage type)

ASSEMBLY

⚠ 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.

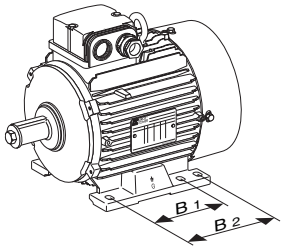
2.2 - Location - ventilation

Our motors are cooled in accordance with method IC 411 (standard IEC 34-6), ie. "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.



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

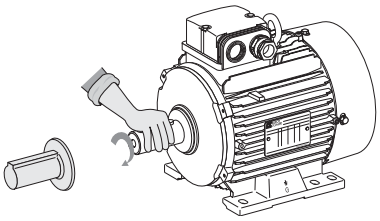


Ensure there is easy access to the terminal box, the condensation drain plugs and, if appropriate, to the grease nipples.
Use lifting equipment which is compatible with the weight of the motor (indicated on the nameplate).

⚠ 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.

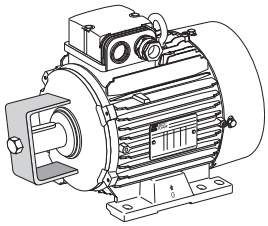
2.3 - Coupling

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).

3-phase TEFV induction motors (slip-ring or cage type)

ASSEMBLY

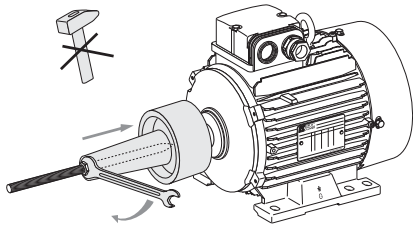
⚠ If a motor is started up without a coupling device having been fitted, carefully immobilise the key in its location.

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.

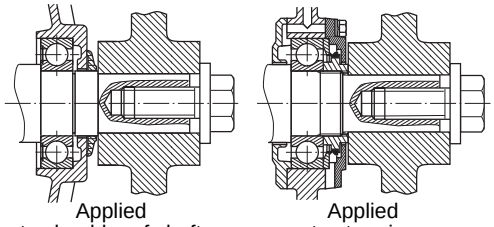
Tolerances and adjustments

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).



Applied to shoulder of shaft — Applied to stop ring

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)
LS 56 F65 M5	11
LS 63 F75 M5 / F85 M6	15
LS 71 F75 M5 / F85 M6	13
LS 80 F100 M6	11
LS 90 F115 M8	11
LS 100 F130 M8	11
LS 112 F130 M8	11
LS 132 F215 M12	11
LS 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.

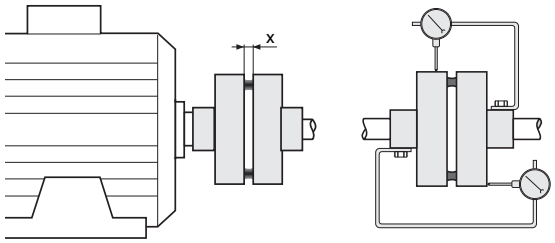
Direct connection using a flexible coupling

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.



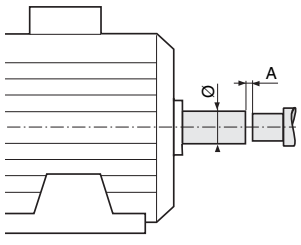
To perfect this adjustment and at the same time check the concentricity of the two shafts, fit 2 gauges as shown in the diagram and slowly turn both shafts.

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

3-phase TEFV induction motors (slip-ring or cage type)

ASSEMBLY

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}.

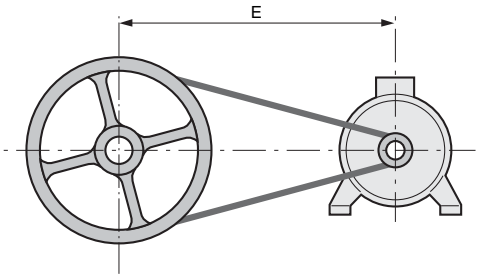
Flat belts cannot be used for rotation speeds of 3000 min^{-1} or more.

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.

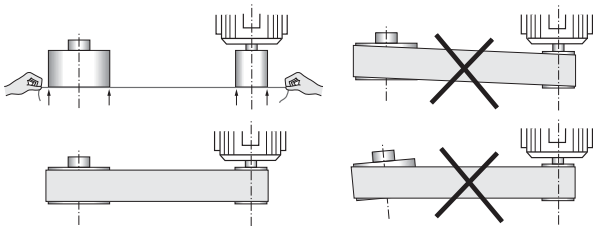
Force must never be used when fitting the belts.

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 centres:

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

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

Adjustable distance between centres:

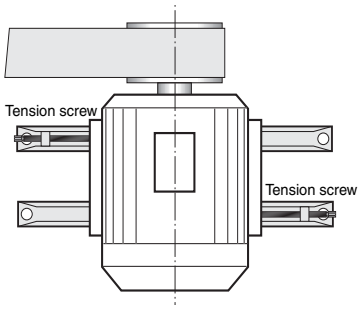
The motor is usually mounted on slide rails, which enables optimum adjustment of the pulley alignment and the belt tension.

Place the slide rails on a 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.

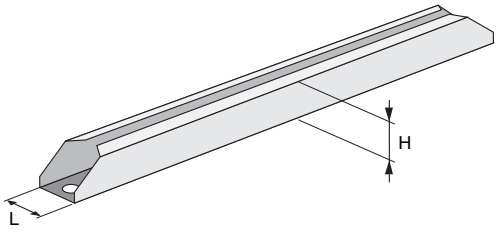
Mount the slide rails firmly with the tension screws in the direction shown in the diagram (the slide rail screw on the belt side between the motor and the machine being driven).

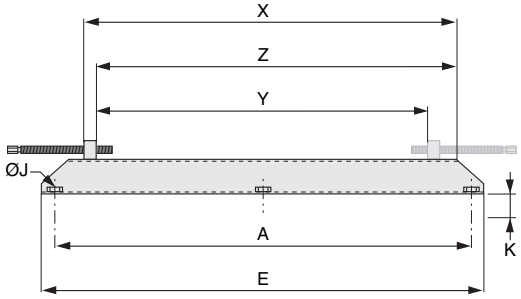
Fix the slide rails onto the baseplate and adjust the belt tension as before.



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	
80 and 90	G 90/8 PM	355	395	40	2.5	50	324	264	294	13	3
100, 112 and 132	G 132/10 PM	480	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 - Maximum power of motors supplied directly (kW) from the mains

This extract from standard NFC 15-100 indicates the limits tolerated for D.O.L. starting of a motor connected to the mains power supply.

Type of motor / Type of premises	Single phase 230 (220) V	3-phase 400 (380) V	
		D.O.L. starting	Other starting modes
Residential areas	1.4	5.5	11
*Other locations**			
Overhead power	3	11	22
Underground	5.5	22	45

** "Other locations" include premises such as those in the service sector, the industrial sector, general housing services, the agricultural sector, etc.*

Prior inspection by the power supply company is necessary for motors driving a high inertia machine, motors with time-delay starting and brake motors or reversers using reverse current.

2.4.2 - 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.

2.4.3 - 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.

- 9 to 500 kW models
- Supply: 220 to 700 V - 50/60 Hz

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

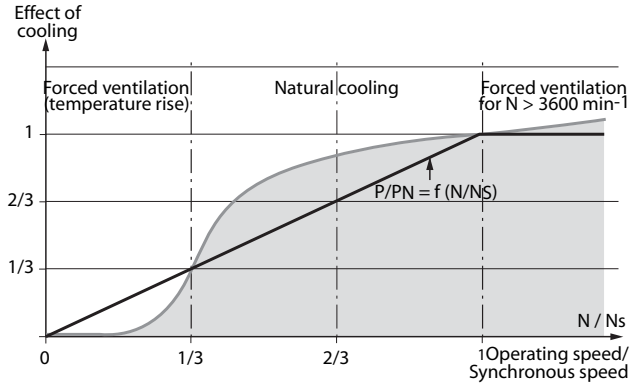
2.4.4 - Other control systems

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.



3-phase TEFV induction motors (slip-ring or cage type)

ASSEMBLY

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 speed values indicated in the table below:

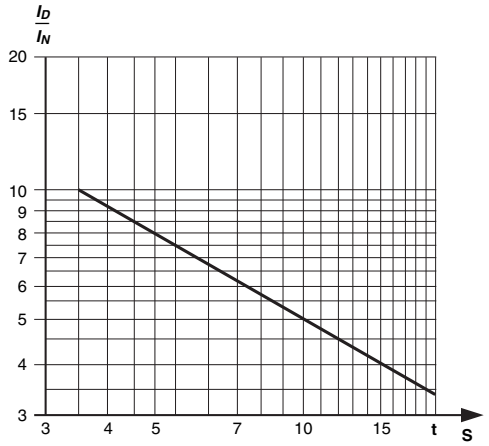
Frame size	Speed of rotation min^{-1}		
	2 poles	4 poles	6 poles
56*	4500	4500	4500
63*	4500	4500	4500
71*	4500	4500	4500
80	15000	15000	15000
90	12000	12000	12000
100	10000	10000	10000
112	10000	10000	10000
132	7500	7500	7500
160	6000	6000	6000
180	5600	5600	5600
200	4500	4500	4500
225	4100	4100	4100
250	4100	4100	4100
280	3600	3600	3600
315	3600	3000	3000
355	3600	3000	3000

** Above these limits, motors have to be specially designed.*

e - For all other frequency and/or voltage limits, additional precautions must be taken for derating, bearings, ventilation, noise, etc: please consult Leroy-Somer.

2.4.5 - 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 for cold starts.

2.4.6 - Earthing (see section 2.5.5)

2.4.7 - Starting slip-ring motors

For a motor with wound slip-ring rotor, place the starting device (electrolytic starter, rheostat, etc) as close as possible to the motor and use cables with the largest possible cross-section.
Any thermal protection devices or space heaters are connected in the terminal box.

For details of the various starting devices (eg: rheostats, LS Polystart), see the relevant installation and maintenance manuals.

2.4.8 - 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).

2.4.9 - Motor protection devices

2.4.9.1 - 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.

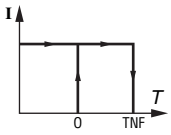
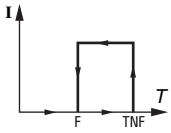
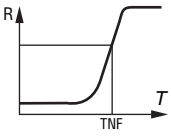
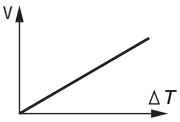
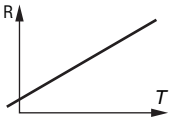
2.4.9.2 - Built-in indirect thermal protection

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.

3-phase TEFV induction motors (slip-ring or cage type)

ASSEMBLY

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number required*
Normally closed thermostat **PTO**	bimetallic strip, indirectly heated operates on opening (O) 		2.5 at 250 V with cos φ 0.4	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) 		2.5 at 250 V with cos φ 0.4	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-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.

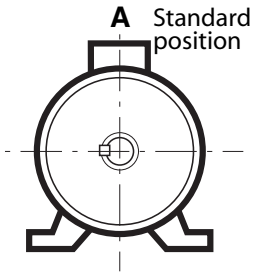
2.5 - Mains connection

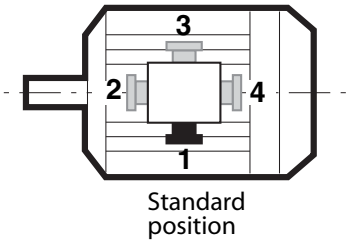
2.5.1 - Terminal box

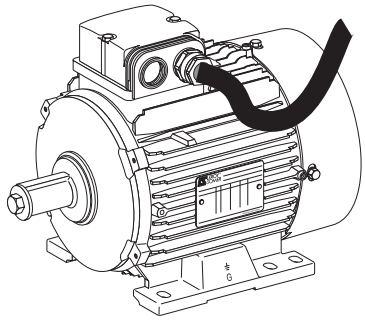
Placed as standard on the top of the motor near the drive end, for forms IM B3, B5, B14, the terminal box has IP 55 protection. Warning: The position of the terminal box cannot be easily modified, even with flanged motors, as the condensation drain holes must be at the bottom.

Cable gland (NFC 68 311 and 312 standards)
The standard position of the cable gland 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 (apart from on 355 LK - 400 - 450) 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.

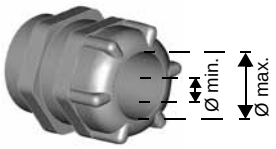






Tightening capacity of cable glands
(NFC 68 311 and 312 standards)

Adapt the cable gland and its reducer if present to the diameter of the cable being used.



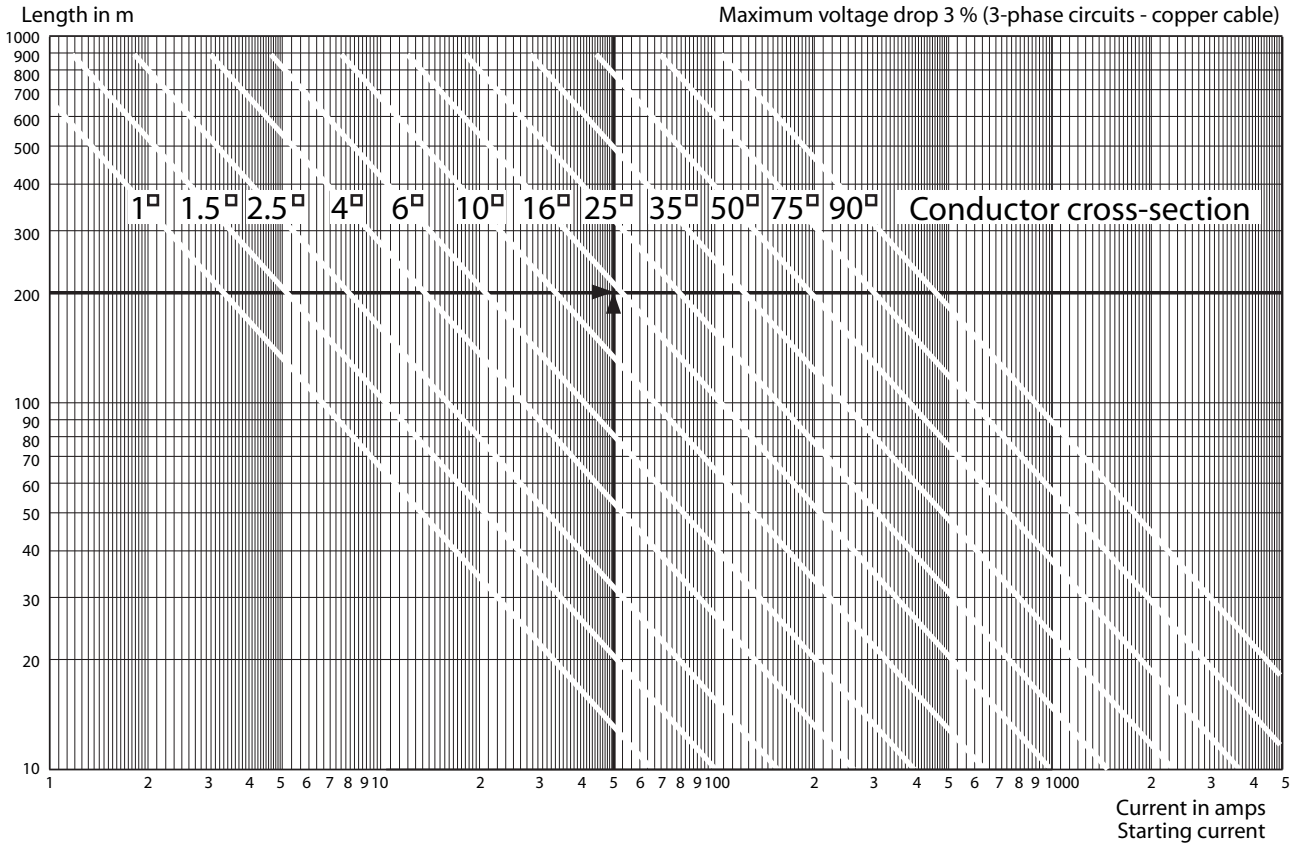
In order to preserve the motor's original IP55 protection, it is essential to tighten the cable gland seal correctly (so that it cannot be unscrewed by hand).
When there are several cable glands and some are not being used, ensure that they are always covered and tighten them so that they also cannot be unscrewed by hand.

Type of cable gland	Min. cable Ø - Max. cable Ø (mm)	
	Polyamide cable gland	Brass cable gland
ISO 16	5 - 10	5.5 - 9.5
ISO 20	9.5 - 15	8.5 - 13
ISO 25	13 - 19	12 - 17
ISO 32	15 - 25	15 - 22
ISO 40	21 - 32	19.5 - 28
ISO 50	26 - 38	25.5 - 36
ISO 63	31 - 44	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.



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

3-phase TEFV induction motors (slip-ring or cage type)

ASSEMBLY

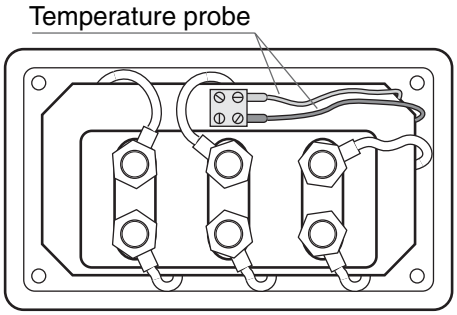
2.5.3 - Terminal block wiring diagram

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.

2.5.4 - 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).



2.5.5 - Earth terminal

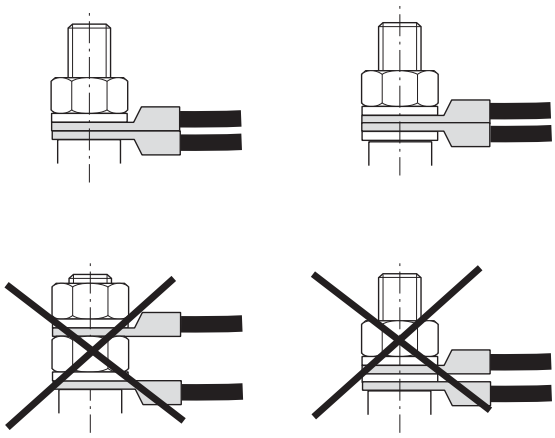
This is situated inside the terminal box; in some cases, the earth terminal may be situated on one of the feet or on one of the cooling fins (round motors).
It is indicated by the symbol: ⏚

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).

2.5.6 - 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	2	3.2	5	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 centre 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.

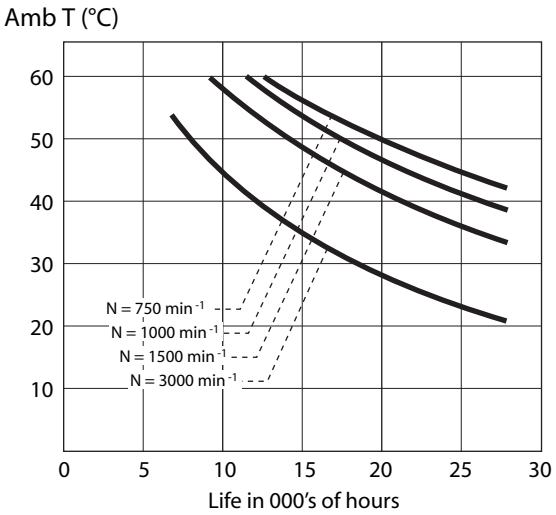
3.1 - Greasing

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 ESSO UNIREX N3 and we recommend that it is used for subsequent lubrication. **Avoid mixing greases.**

3.1.2 - Permanently greased bearings

For **LS motors < or = 180 MT and FLS(C) < or = 132 M**, 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.



3.1.3 - Bearings without grease nipples

LS 180 L and LS 200 LT motors are lubricated in the factory.
Lubricant lifetime under normal operating conditions is given in the table below for a machine with horizontal shaft operating at 50 Hz in ambient temperatures of 25°C and 40°C.

Polarity	*T* amb.	Frame size	Frame size
2 p	40 °C	11,000	9,000
	25 °C	22,000	18,000
4 p	40 °C	23,000	20,000
	25 °C	45,000	40,000
6 p	40 °C	28,000	26,000
	25 °C	45,000	45,000
8 p	40 °C	33,000	31,000
	25 °C	45,000	45,000

3.1.4 - Bearings with grease nipples

The bearings are lubricated in the factory
For LS motors of type 200 LT (or on request for types 160, 180, 200 LT) and for FLS(C) and FLSB motors of type 160 or above, 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.**

3-phase TEFV induction motors (slip-ring or cage type)

ROUTINE MAINTENANCE

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).

3.3 - Slip-ring motors

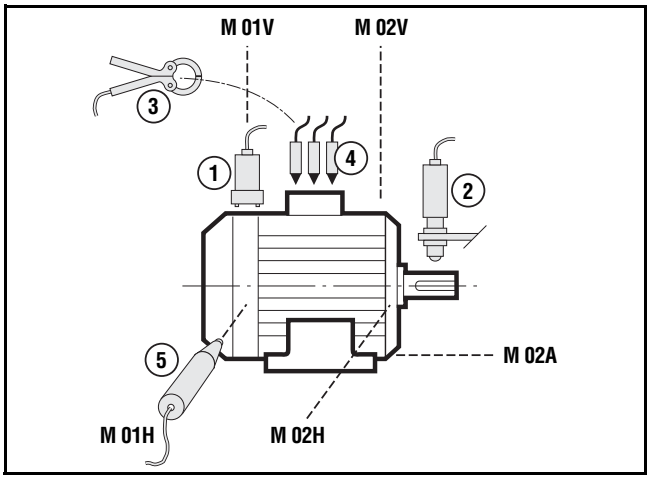
Maintenance of brushes and slip-rings
On slip-ring motors, check the state of the commutator monthly. The slip-rings must be clean, non-greasy, smooth and without surface roughness. If the commutator is dirty, clean it with a petrol-soaked rag.
Check that the brushes:
- Slide freely in their cage
- Are seated uniformly on the slip-rings
- Show no signs of wear as far as the shunt

If there is too much wear, replace them with new brushes of the same number and quality as the original ones and grind the contact surface. To do this:
- Roughen the bend before inserting the brushes in the brush holders
- Continue with a piece of fine emery cloth wound round the slip-rings
- Finish with a piece of very fine sandpaper, rubbing in the normal direction of rotation

After grinding, check that there are no abrasive particles on the brush surfaces and clean them with extreme care.
We also strongly recommend blowing frequently inside the machine with a blast of compressed dry air to clear out any coal dust from the shields, brush holders, commutator, commutator terminals and windings.
The insulating components should be wiped with a clean cloth.
Motor which is rotating: Ensure that there are no sparks under the brushes.

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
¿ Accelerometer	For measuring vibrations	●	●	●	●	●				
¡ Photo-electric cell	For measuring speed and phase						●			
¬ Clamp ammeter	For measuring current (D.C. and 3-phase							●	●	●
Ð Voltage probe	A.C. and D.C. voltages							●	●	●
ƒ Infra-red probe	For measuring temperature	●		●						

3-phase TEFV induction motors (slip-ring or cage type)

TROUBLESHOOTING GUIDE

5 - TROUBLESHOOTING GUIDE

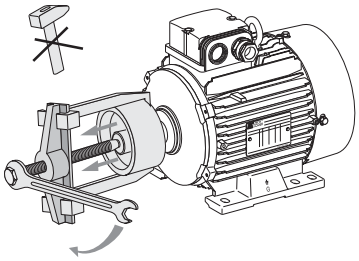
Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	**Mechanical cause**: if the noise persists after switching off the electrical power supply	
	- Vibration	- Check that the key conforms to the type of balancing (see section 2.3)
	- Damaged bearings	- Change the bearings
	- Mechanical friction: ventilation coupling	- Check
	Electrical cause: if the noise stops after switching off the power supply	- Check the power supply at the motor terminals
	- Normal voltage and 3 phases balanced	- Check the connection of the terminal block and the tightening of the connectors
	- Abnormal voltage	- Check the power supply line
	- Phase imbalance	- Check the winding resistance
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
Motor does not start	**No load** - Mechanical seizing - Supply line disconnected	When switched off: - Check by hand that the shaft rotates freely - Check the fuses, electrical protection, starting device
	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
	Slip-ring motors - Rotor circuit open	- Connect the rotor to the starting device

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.

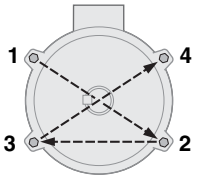
See detailed instructions for the relevant motor ranges in the following pages.

6.4 - Reassembling the motor

Be careful to replace the stator in its original position, so that the stack of laminations is centred correctly (generally with the terminal box facing forward) and the water drain holes are positioned correctly if they are on the housing.

Tightening the tie rods

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



Tie rod tightening torque

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

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.

3-phase TEFV induction motors (slip-ring or cage type)

POSITION OF LIFTING RINGS

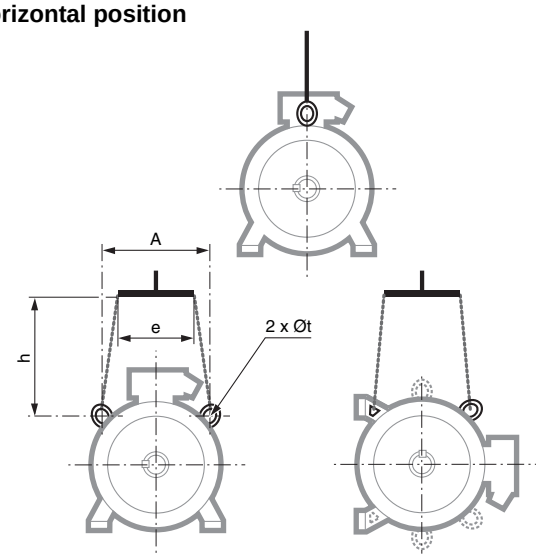
7 - POSITION OF LIFTING RINGS

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.

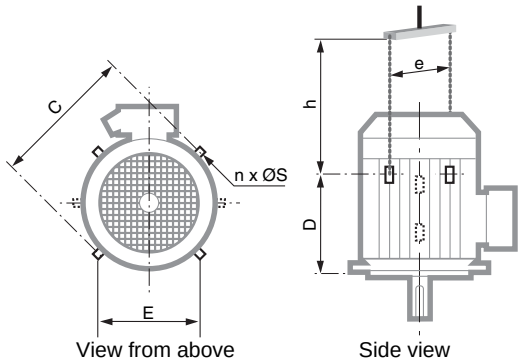
Motors intended for use in the vertical position may be delivered on a pallet in the horizontal position. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings may be irreparably damaged. Moreover, additional special precautions must be taken,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

• Horizontal position



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

• Vertical position



View from above — Side view

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

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

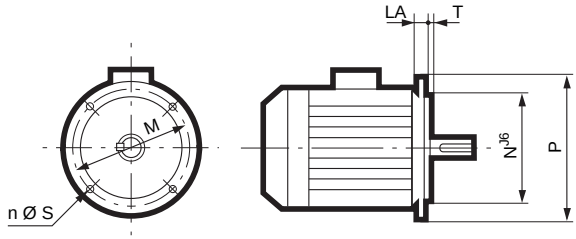
8 - SPARE PARTS

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

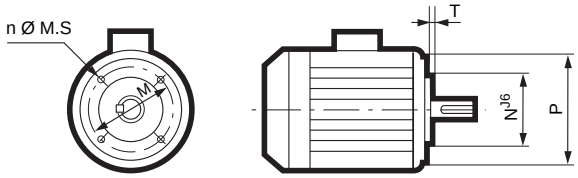
Part numbers can be found on the exploded views and their descriptions in the parts list (section 6).

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 centres 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.

DISMANTLING AND REASSEMBLY PROCEDURES

9 - LS CAGE MOTORS

9.1 - LS 56 to LS 160 MP/LR motors

9.1.1 - 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 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.

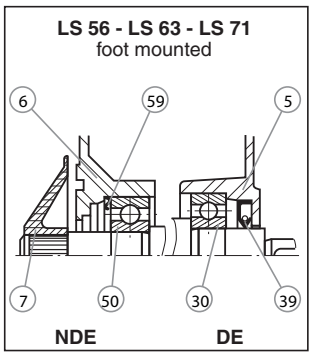
Use a bearing remover to take out the bearings, taking care not to knock the running surfaces of the shaft.

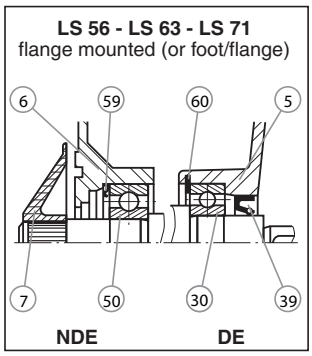
9.1.2 - Reassembling motors without circlip

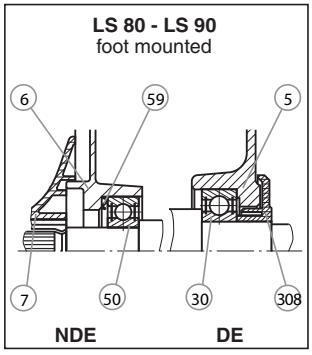
- Mount the bearings on the rotor shaft.
- Insert the rotor into the stator taking all possible precautions not to knock the winding.
- Mount the DE shield (5).
- For LS 56, 63, 71 motors, mount the seal (39) with grease beforehand.
- Place the preloading washer (59) in the bearing housing, then mount 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).

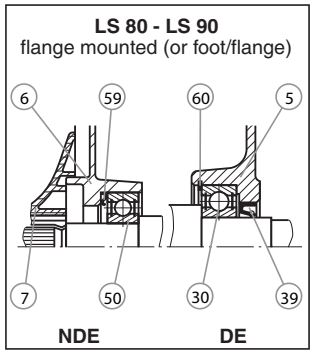
9.1.3 - Reassembling motors with flange and circlip

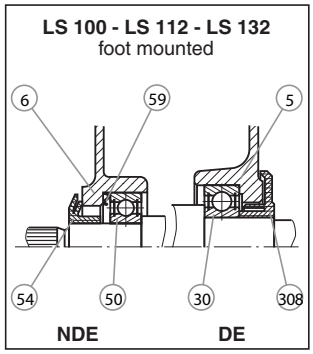
- Mount the DE bearing (30) in the flange (5) using the outer slip-ring for support.
- Fit the circlip (60).
- Mount this assembly on the rotor (3) using the inner slip-ring for support.
- Mount the NDE bearing on the rotor.
- Insert the rotor (3) and shield (5) assembly in the stator taking care not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

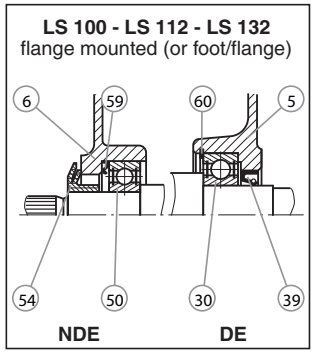


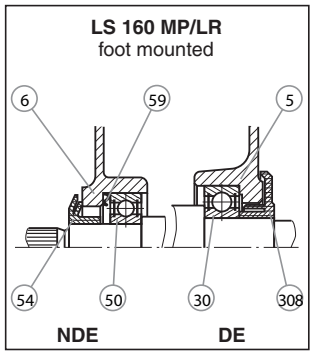


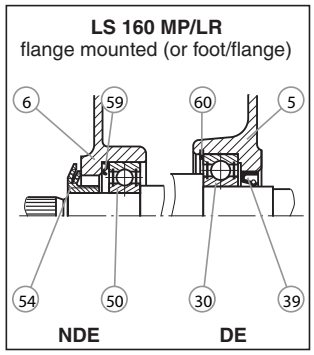








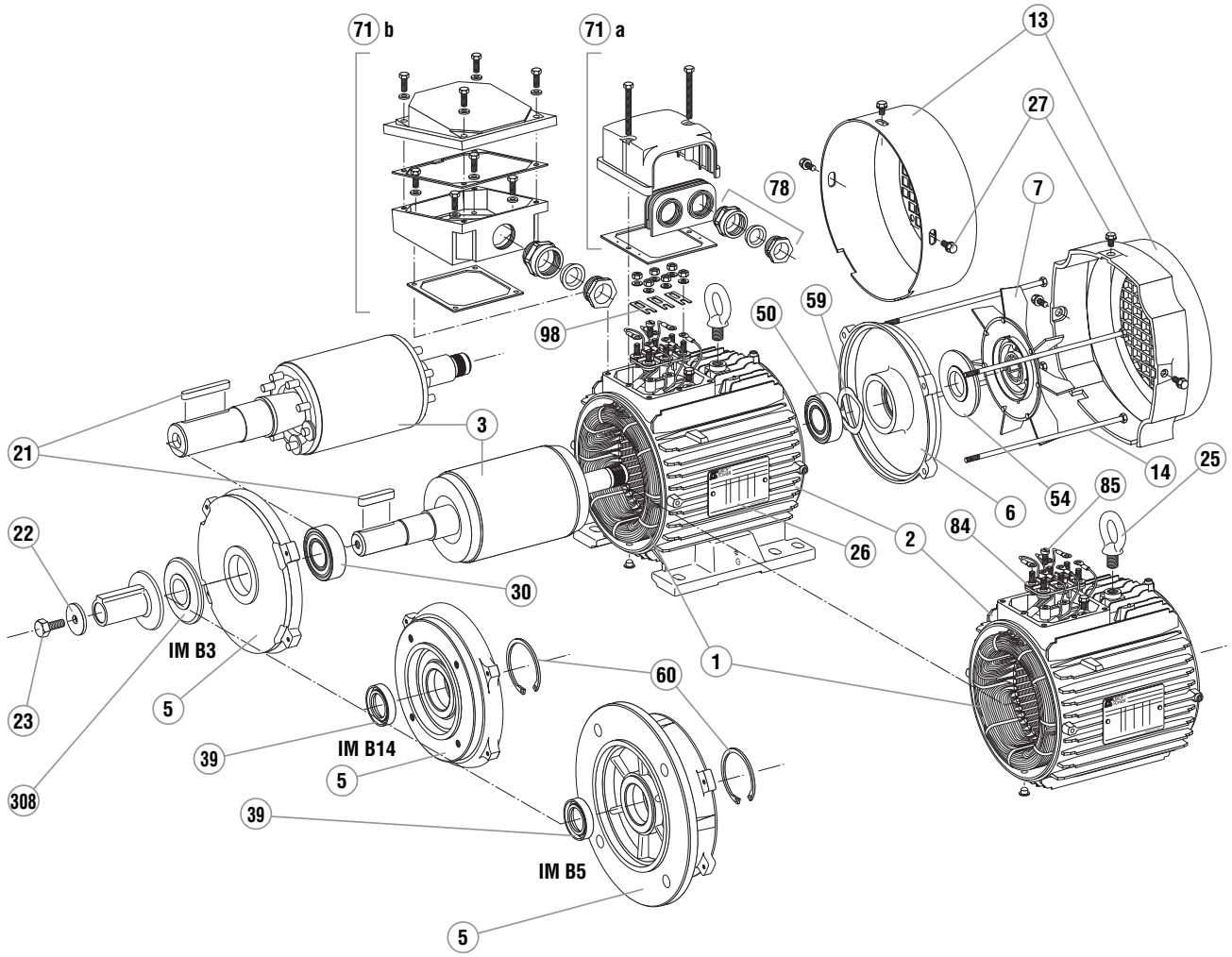




3-phase TEFV induction motors (slip-ring or cage type)

LS CAGE MOTORS

LS 56 to LS 160 MP/LR



LS 56 to LS 160 MP/LR

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	**22**	Shaft end washer	**59**	Preloading (wavy) washer
2	Frame	**23**	Shaft extension screw	**60**	Circlip
3	Rotor	**25**	Lifting ring	**71 a**	Plastic terminal box (< or = frame size 112)
5	DE shield	**26**	Nameplate	**71 b**	Metal terminal box
6	NDE shield	**27**	Fan cover screw	**78**	Cable gland
7	Fan	**30**	Drive end bearing	**84**	Terminal block with terminals
13	Fan cover	**39**	Drive end seal	**85**	Set screw
14	Tie rods	**50**	Non drive end bearing	**98**	Connectors
21	Shaft extension key	**54**	Non drive end seal	**308**	Labyrinth seal

3-phase TEFV induction motors (slip-ring or cage type)

LS CAGE MOTORS

9.2 - LS 160 M/L, LS 180 MT/LR motors

9.2.1 - Dismantling

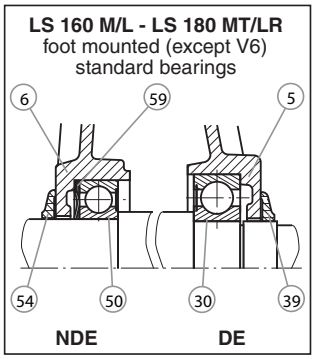
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposed to one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors) (54 for flange mounted motors).
- Unscrew the tie rods (14) then remove them.
- 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.

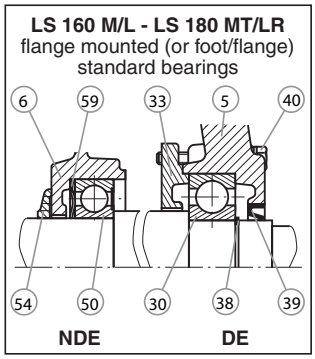
9.2.2 - Reassembly

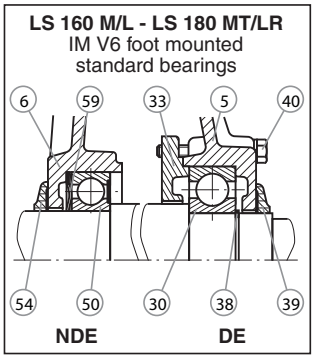
- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- Mount the circlip (38) for flange mounted motors.
- Insert the rotor (3) in the stator (1) taking care not to 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).

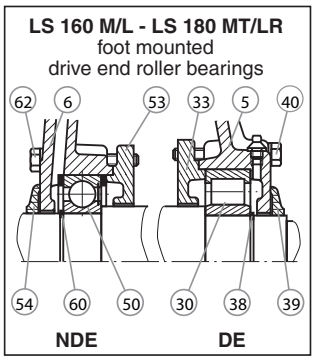
When there is a flange, mount a new seal (39) with the spring facing outwards.

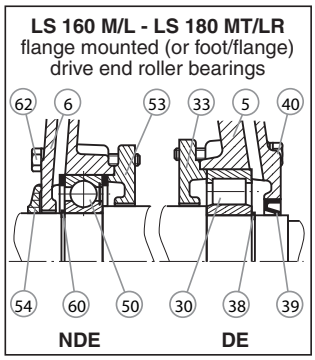
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, fix the bearing retainer (33) with its own screws.
- Mount the shield 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).







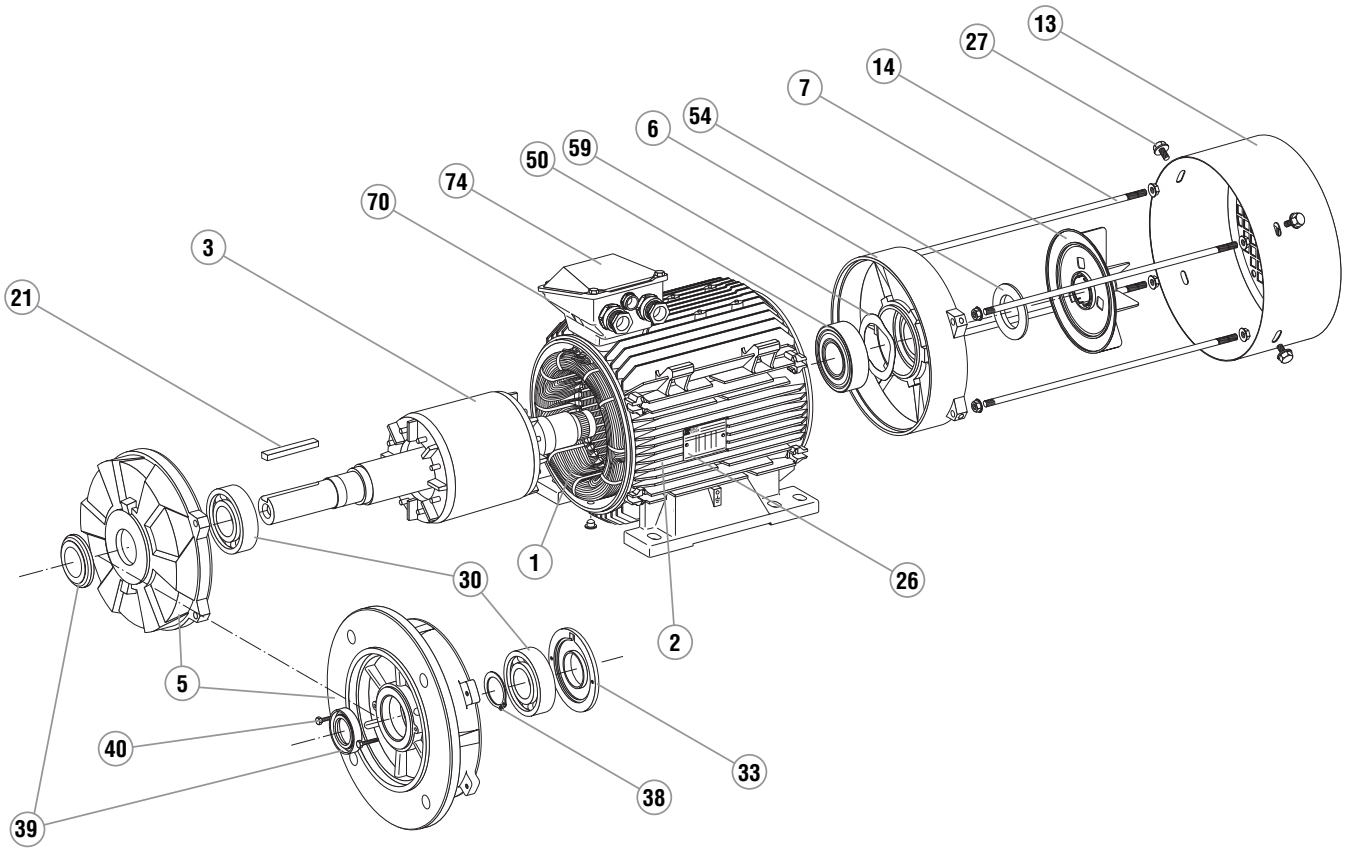




3-phase TEFV induction motors (slip-ring or cage type)

LS CAGE MOTORS

LS 160 M/L, LS 180 MT/LR



LS 160 M/L, LS 180 MT/LR

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

3-phase TEFV induction motors (slip-ring or cage type)

LS CAGE MOTORS

9.3 - LS 180 L, LS 200, LS 225 ST/MT/MR motors

9.3.1 - Dismantling

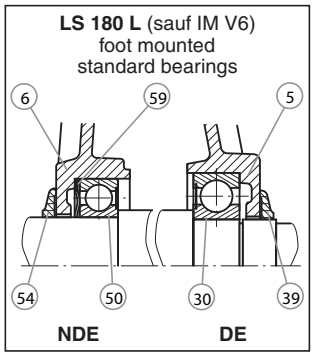
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposed to one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors) (54 for flange mounted motors).
- Unscrew the tie rods (14) then remove them.
- 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.

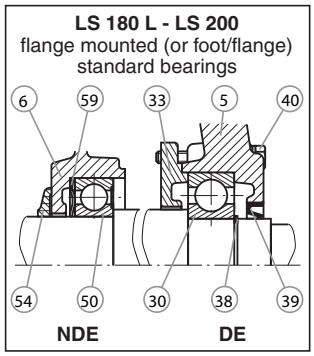
9.3.2 - Reassembly

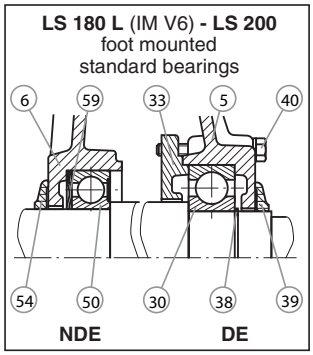
- See section 6.1 before reassembly.
- If necessary, insert the inner bearing retainer (33) at the rotor drive end, then mount new bearings on the shaft, see section 6.3 mounting bearings.
- Fill with new grease: the correct amount of new grease for the bearing is 50% of the free space.
- Mount the circlip (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).

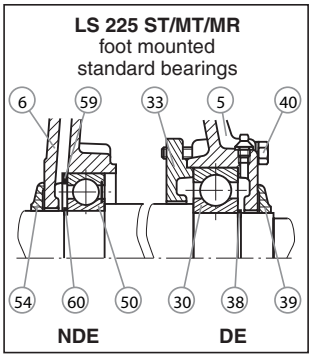
When there is a flange, mount a new seal (39) with the spring facing outwards.

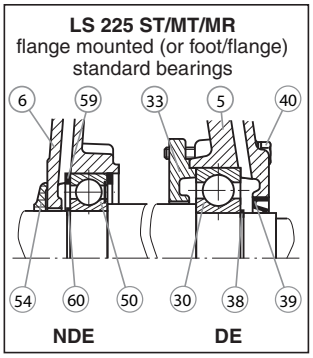
- Remount the shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the tie rods (14) in position and tighten the nuts diagonally up to the recommended torque (see section 6.1).
- If necessary, fix the bearing retainer (33) with the screws (40).
- Mount the shield 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).

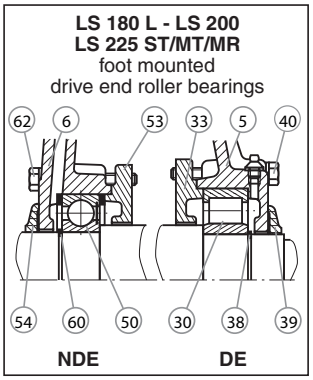


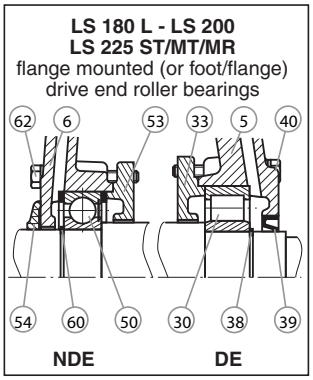








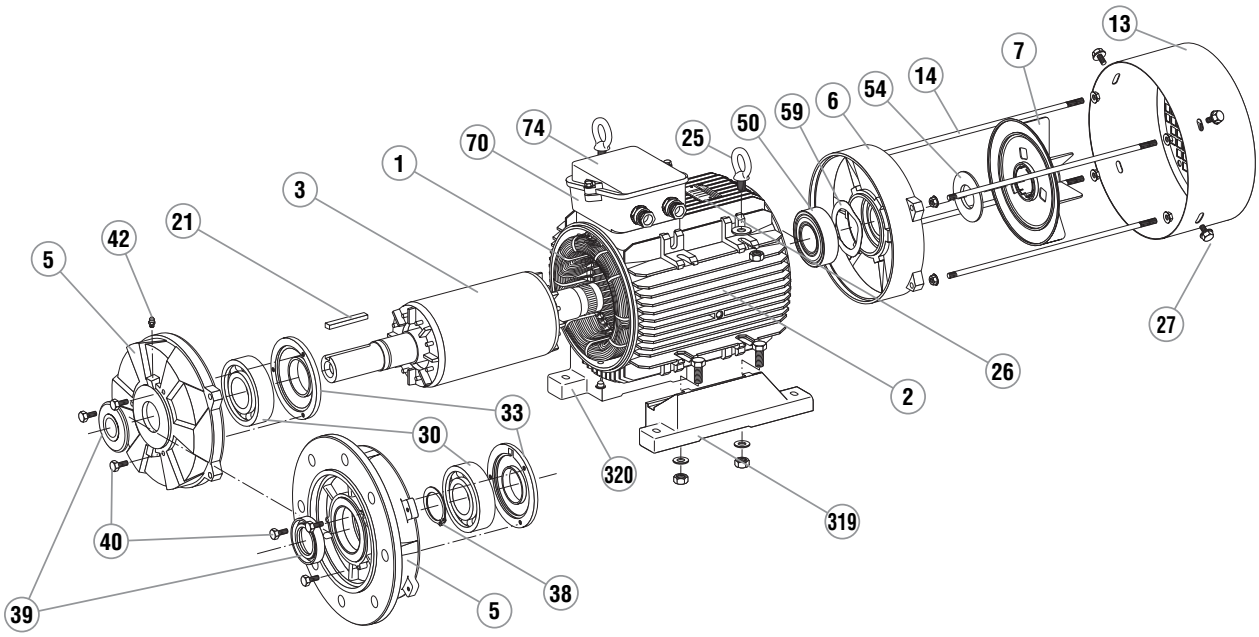




3-phase TEFV induction motors (slip-ring or cage type)

LS CAGE MOTORS

LS 180 L, LS 200, LS 225 ST/MT/MR



LS 180 L, LS 200, LS 225 ST/MT/MR					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**25**	Lifting ring	**50**	Non drive end bearing
2	Frame	**26**	Nameplate	**54**	Non drive end seal
3	Rotor	**27**	Fan cover screw	**59**	Preloading (wavy) washer
5	DE shield	**30**	Drive end bearing	**70**	Terminal box
6	NDE shield	**33**	Inner DE bearing retainer	**74**	Terminal box lid
7	Fan	**38**	Drive end bearing circlip	**319**	Right foot
13	Fan cover	**39**	Drive end seal	**320**	Left foot
14	Tie rods	**40**	Cover fixing screw		
21	Key	**42**	Grease nipples (optional for LS 180 L, LS		

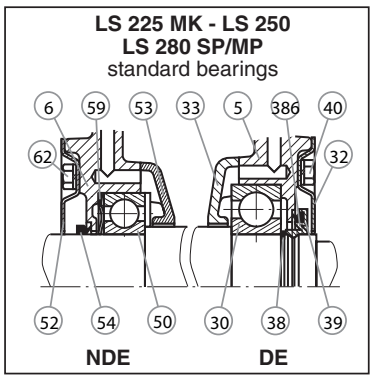
9.4 - LS 225 MK, LS 250, LS 280 SP/MP motors

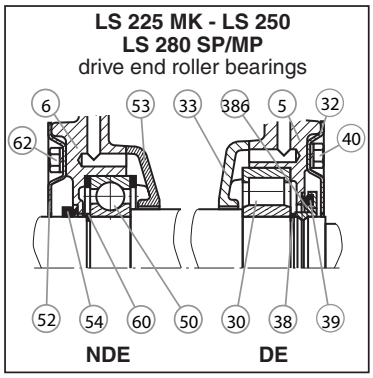
9.4.1 - Dismantling

- 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).
- Unscrew the tie rods (14) then remove them.
- 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).

9.4.2 - 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.
- 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.
- At the drive end fit the seal (39) and its support (386), 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).

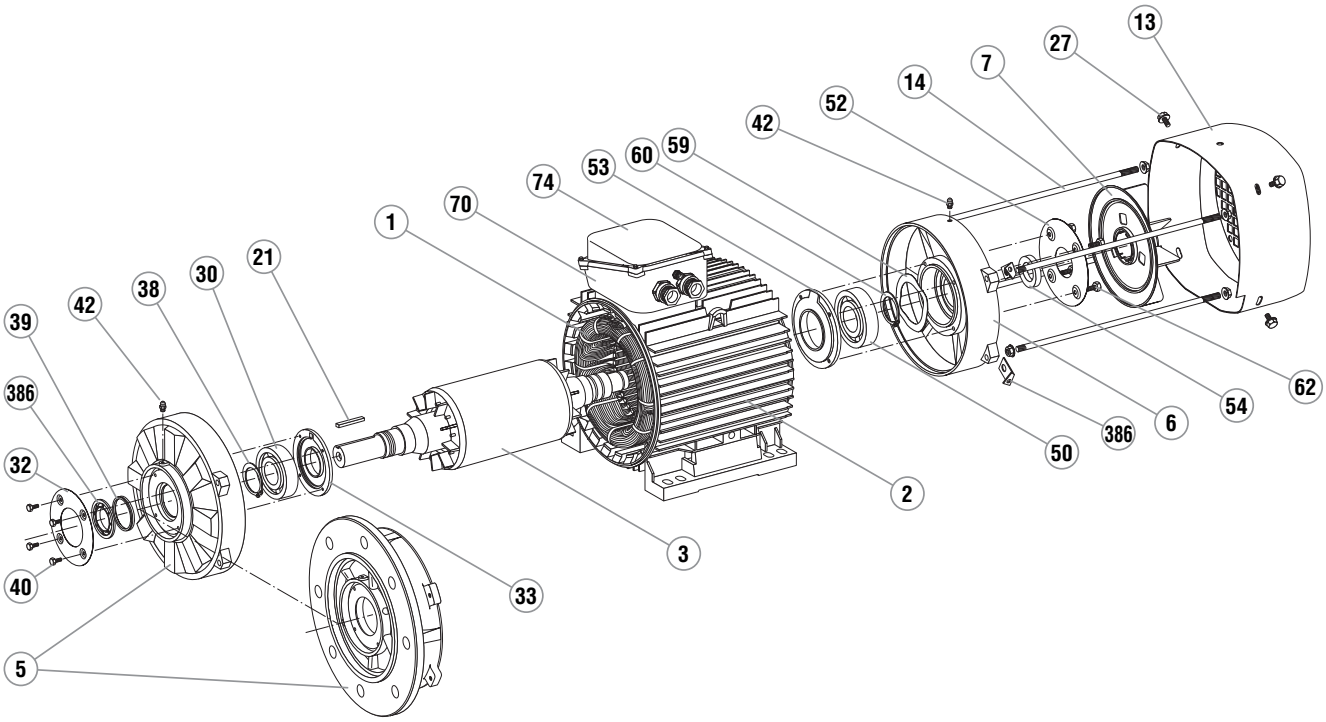




3-phase TEFV induction motors (slip-ring or cage type)

LS CAGE MOTORS

LS 225 MK, LS 250 and LS 280 SP/MP



LS 225 MK, LS 250 and LS 280 SP/MP					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**30**	Drive end bearing	**54**	Non drive end seal
2	Frame	**32**	Outer DE bearing retainer	**59**	Preloading (wavy) washer
3	Rotor	**33**	Inner DE bearing retainer	**60**	Non drive end bearing circlip
5	DE shield	**38**	Drive end bearing circlip	**62**	Cover fixing screw
6	NDE shield	**39**	Drive end seal	**70**	Terminal box
7	Fan	**40**	Cover fixing screw	**74**	Terminal box lid
13	Fan cover	**42**	Grease nipples	**380**	Protective cover feet
14	Tie rods	**50**	Non drive end bearing	**386**	DE seal support
21	Key	**52**	Outer NDE bearing retainer		
27	Fan cover screw	**53**	Inner NDE bearing retainer		

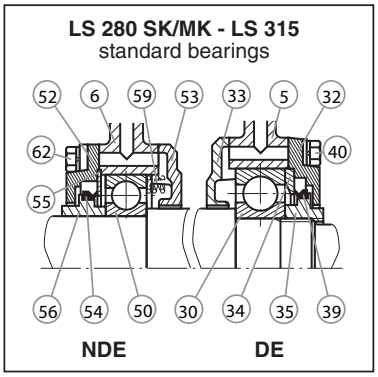
9.5 - LS 280 SK/MK, LS 315 motors

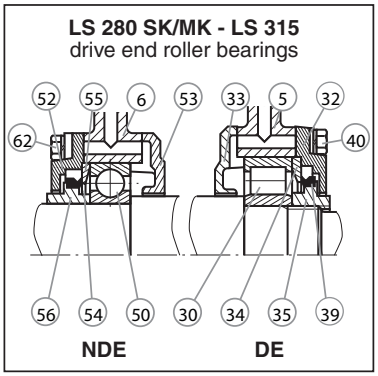
9.5.1 - Dismantling

- 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).

9.5.2 - 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).

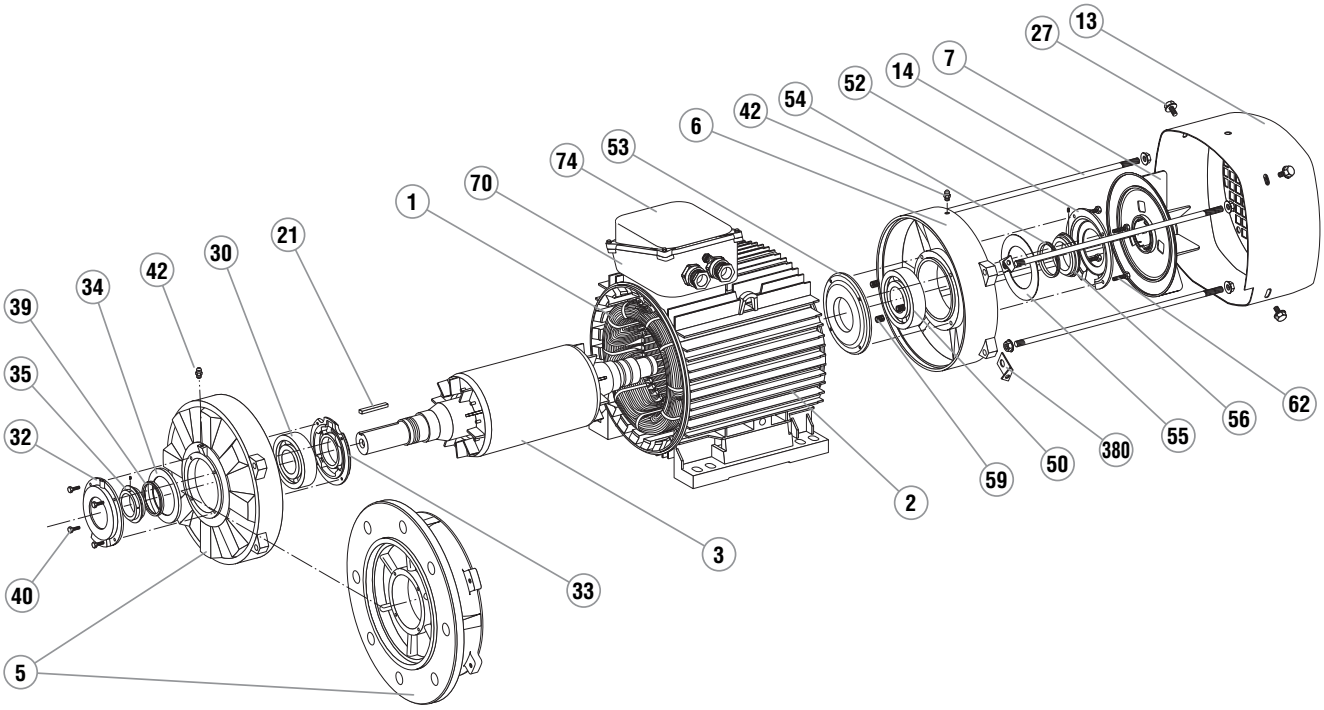




3-phase TEFV induction motors (slip-ring or cage type)

LS CAGE MOTORS

LS 280 SK/MK and LS 315



LS 280 SK/MK and LS 315

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

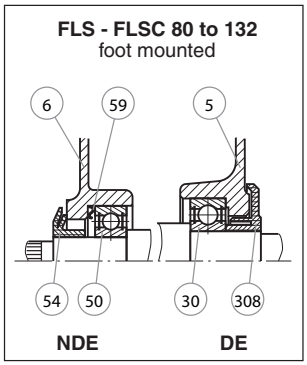
10 - FLS-FLSC CAGE MOTORS

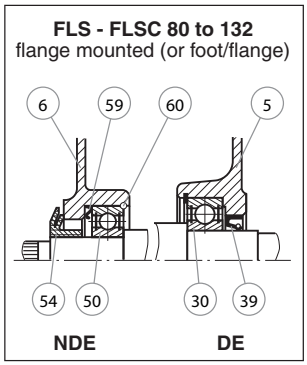
10.1 - FLS-FLSC 80 to 132 motors

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).
- 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.





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).
- 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).

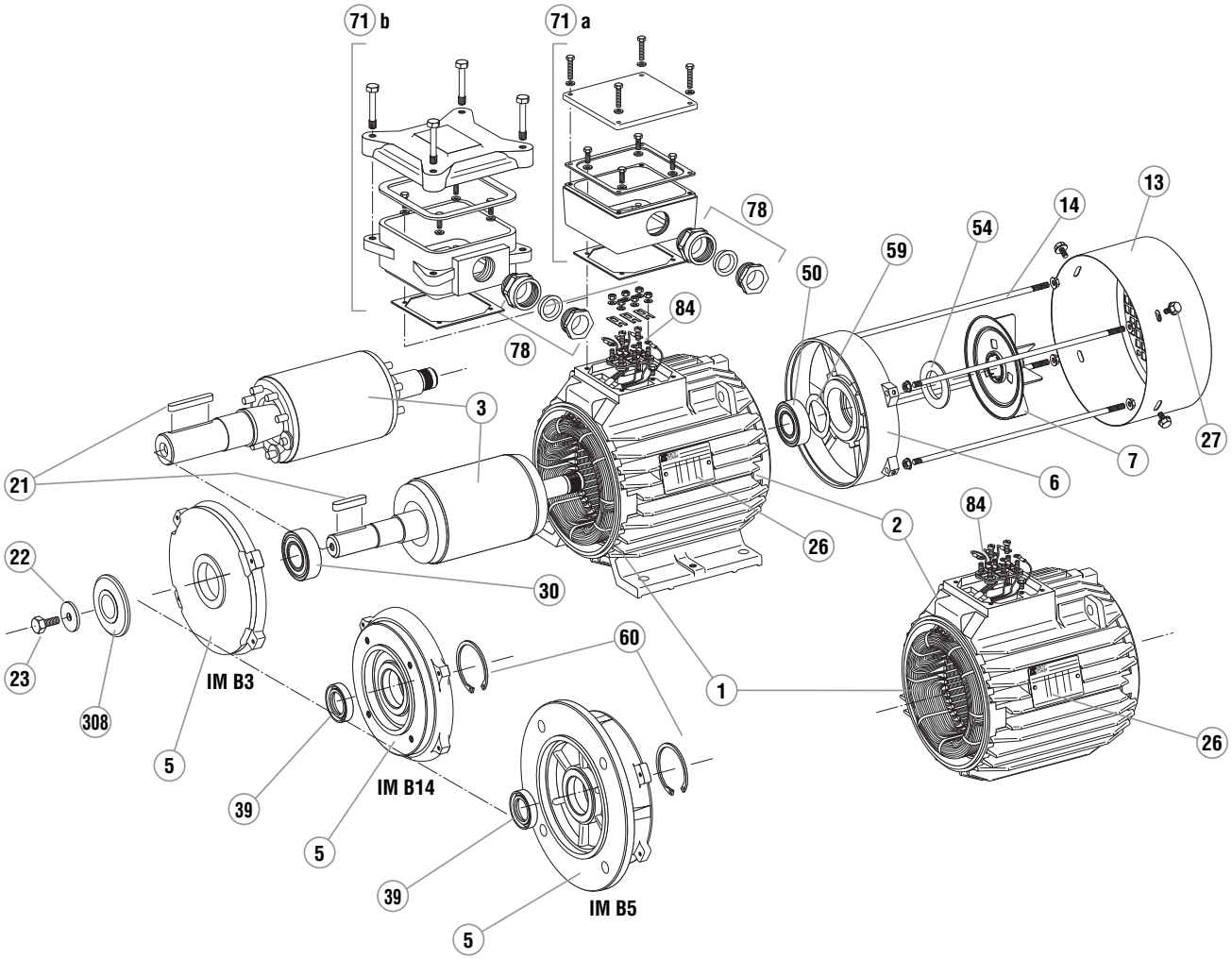
10.1.3 - Reassembling motors with flange and circlip

- Mount the DE bearing (30) in the flange (5) using the 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).

3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

FLS-FLSC 80 to 132



FLS-FLSC 80 to 132

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

10.2 - FLS-FLSC 160 and 180 motors

10.2.1 - Dismantling the NDE shield

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

10.2.2 - Dismantling the DE shield

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

10.2.3 - Changing the antifriction bearings

- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrink-fitting only).

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

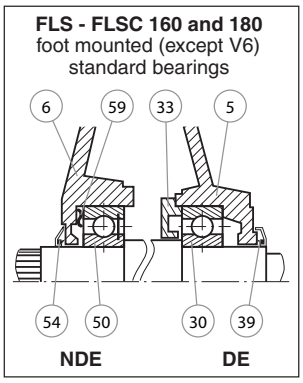
10.2.4 - Reassembly

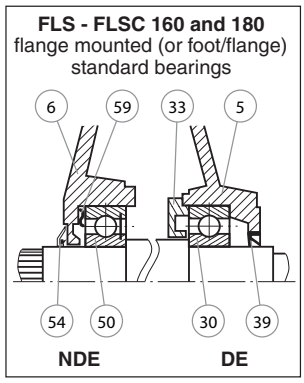
- Mount the bearings on the rotor shaft (not forgetting the inner DE bearing retainer (33)!).
- Slide the DE shield (5) onto the bearing (30).
- Replace the fixing screws (40) on the inner bearing retainer (33).
- Insert the rotor + shield assembly in the stator without knocking the winding.
- Present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

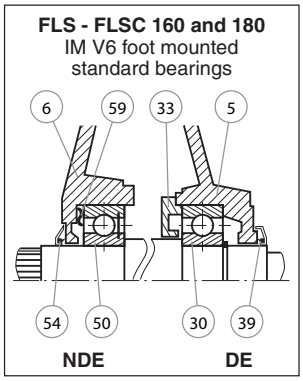
From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

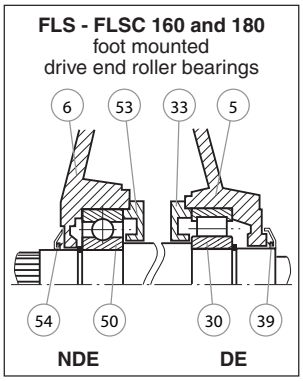
- Replace the shield fixing screws (270) and (273).
- Use a drift to fit a new seal (54).
- Replace the fan (7).
- Replace the cover (13) and reinsert the fixing screws (27).
- Use a drift to fit the new seal (39).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.

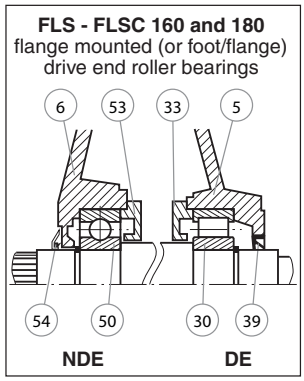
Amount of grease for ball bearings:
- Frame size 160: DE = 40 cm^3/NDE = 20 cm^3
- Frame size 180: DE = 50 cm^3/NDE = 35 cm^3
  (except for 180 MR NDE = 20 cm^3)







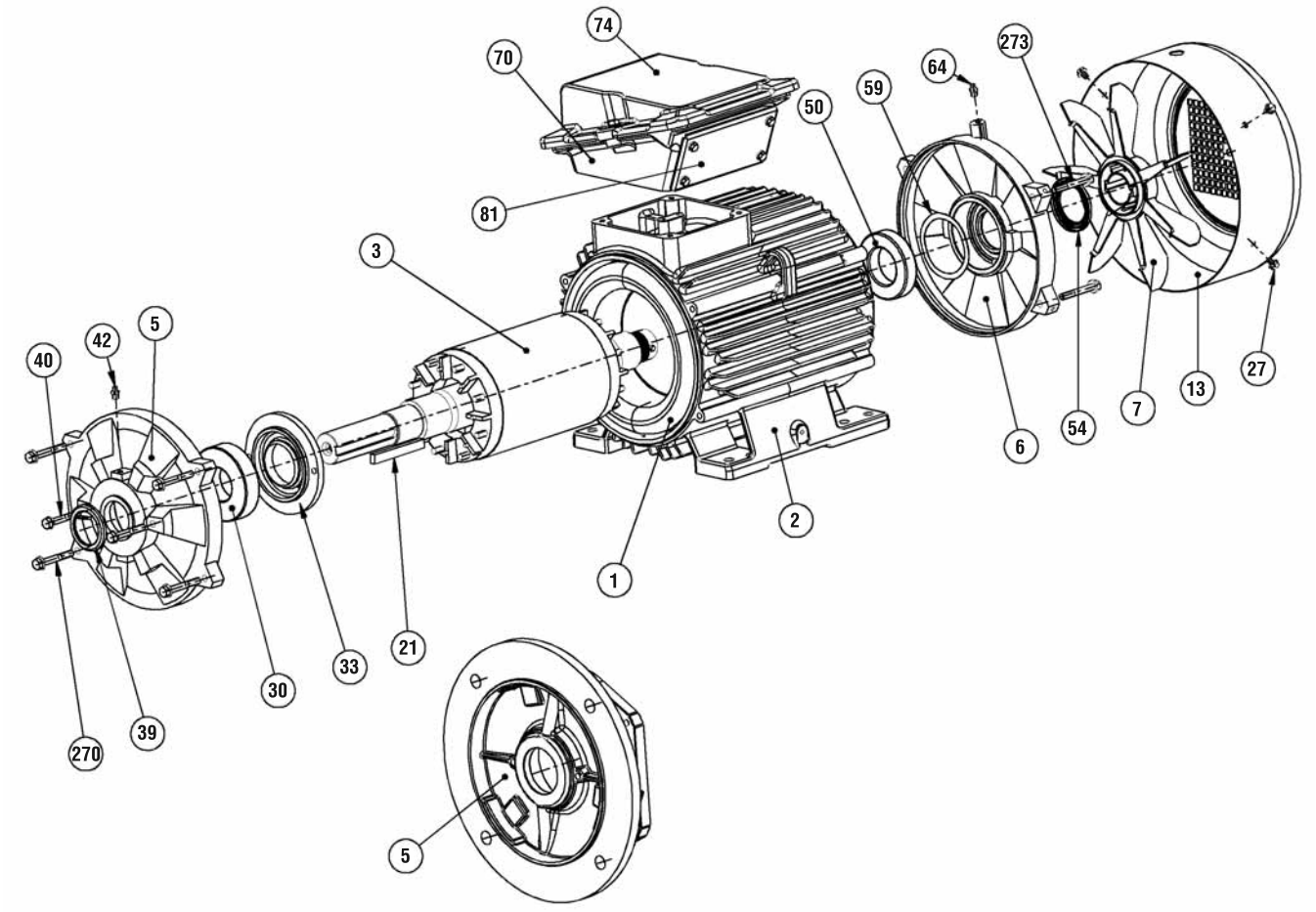




3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

FLS-FLSC 160 and 180



FLS-FLSC 160 and 180					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**27**	Fan cover screw	**59**	NDE preloading (wavy) washer
2	Housing	**30**	Drive end bearing	**64**	NDE grease nipple
3	Rotor	**33**	Inner DE bearing retainer	**70**	Stator terminal box
5	DE shield	**39**	DE seal	**74**	Terminal box lid
6	NDE shield	**40**	Cover fixing screw	**81**	Cable gland support plate
7	Fan	**42**	DE grease nipple	**270**	DE shield fixing screw
13	Fan cover	**50**	Non drive end bearing	**273**	NDE shield fixing screw
21	Shaft extension key	**54**	NDE seal		

10.3 - FLS-FLSC 200 to 225 ST motors

10.3.1 - Dismantling the NDE shield

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

10.3.2 - Dismantling the DE shield

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

10.3.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- The moving parts of the grease valve (35) for the drive end and (56) for the non-drive end follow.
- Put the components to one side (55) - (56) for the non-drive end and (34) - (35) for the drive end.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrink-fitting only).

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

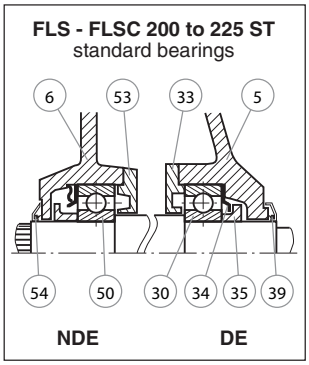
10.3.4 - Reassembly

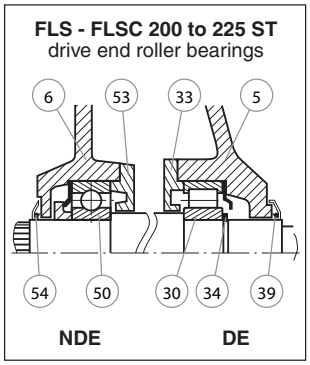
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33)!), and also the NDE bearing (50) if and only if the stator inner Ø allows the inner NDE bearing retainer (53) to pass through.
- Install the fixed part of the grease valves (no. (55) for the non-drive end and (34) for the drive end).
- Shrink-fit the moving part of the grease valves (no. (56) for the non-drive end and (35) for the drive end). Make absolutely sure that it is resting on the inner slip-ring.
- Insert the rotor into the stator taking care not to knock the winding. Install the NDE bearing if this has not already been done.
- Present the shields, grease nipples facing upwards. Begin with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes **so that the grease inlet pipes fully correspond**. Slide it into position.
- End with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Lift the rotor slightly and fit the shields onto the housing.

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

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

Amount of grease for ball bearings:
- DE and NDE = 100 cm^3

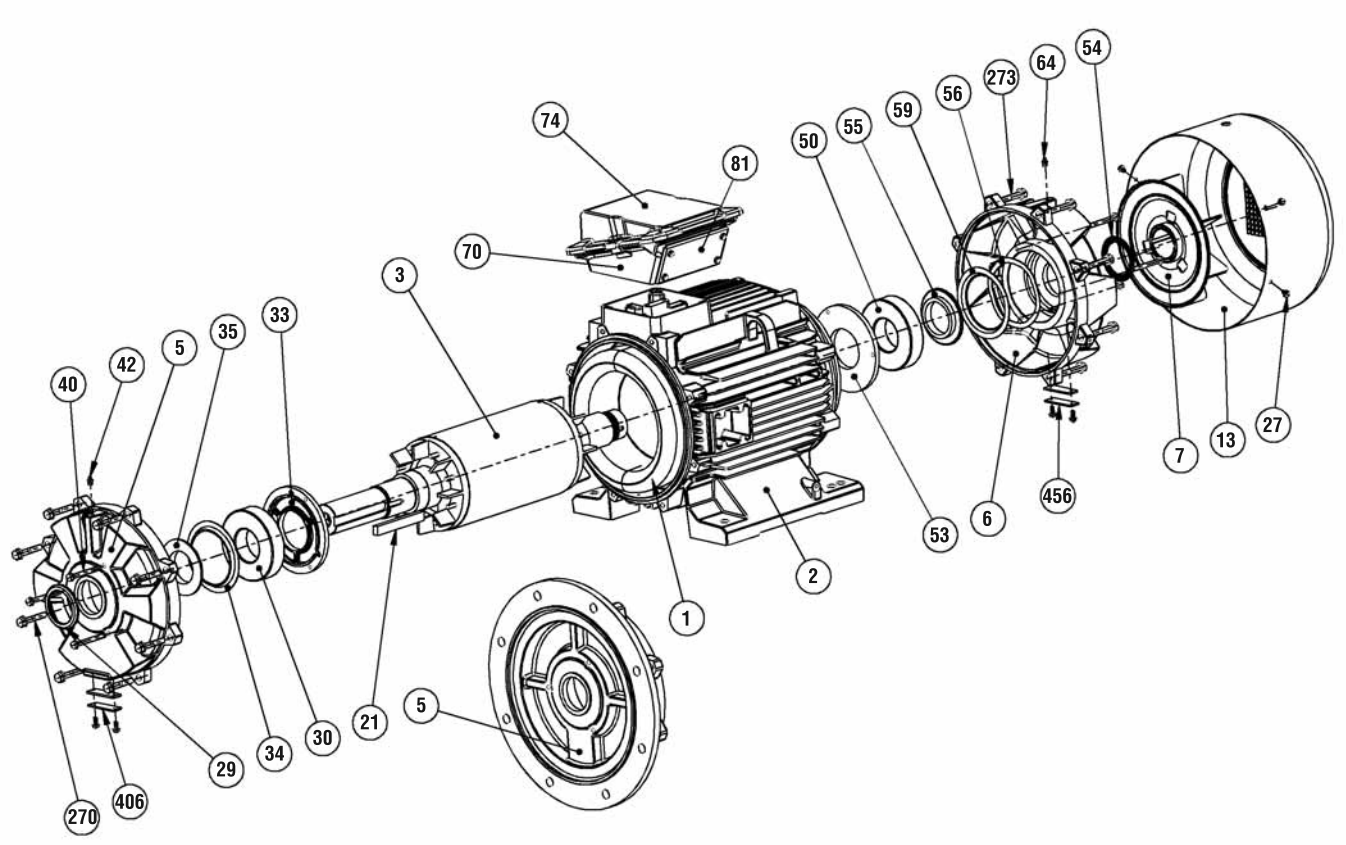




3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

FLS-FLSC 200 to 225 ST



FLS-FLSC 200 to 225 ST

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

3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

10.4 - FLS-FLSC 225 M to 280 motors

10.4.1 - 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.

10.4.2 - 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.

10.4.3 - 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 (shrink-fitting only).

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

10.4.4 - 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.

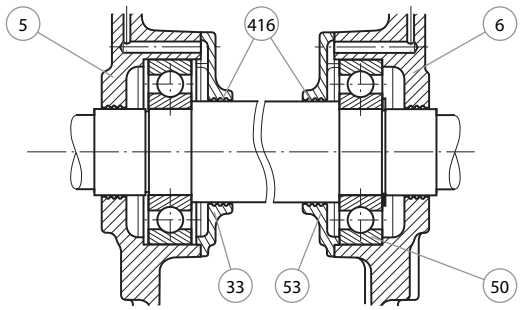
From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

- 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.

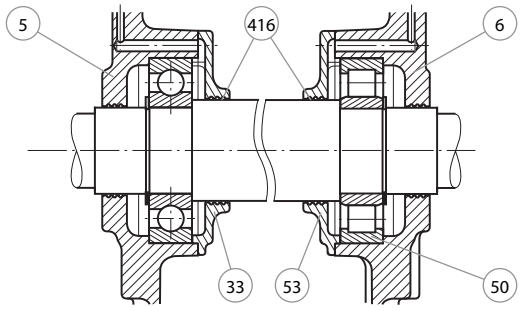
Amount of grease for ball bearings:

- Frame size 225 - 250: DE and NDE = 120 cm^3
- Frame size 280: DE = 170 cm3/NDE = 120 cm^3

FLS - FLSC 225 M to 280
standard bearings



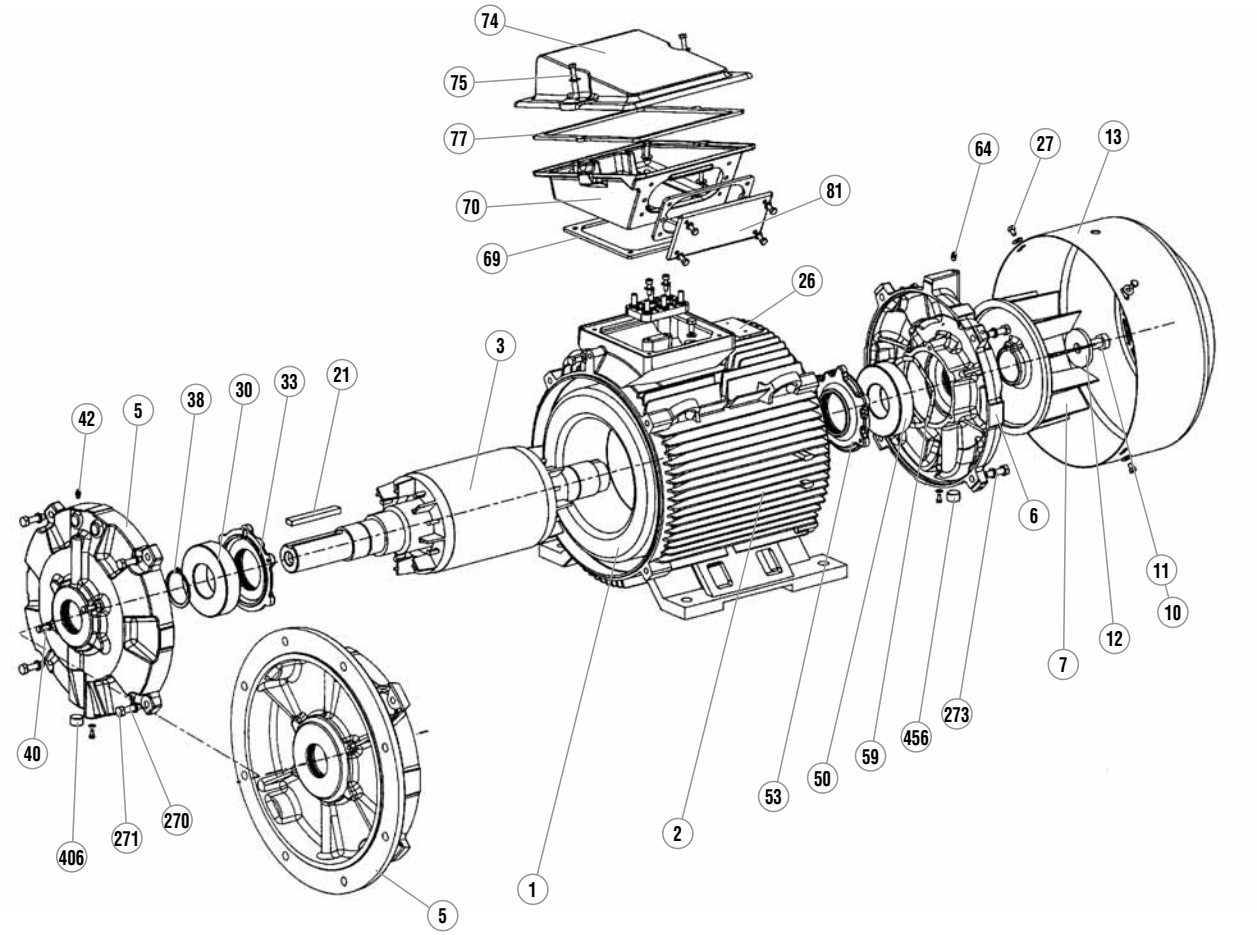
FLS - FLSC 225 M to 280
drive end roller bearings



3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

FLS-FLSC 225 M to 280



FLS-FLSC 225 M to 280					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**26**	Nameplate	**69**	Terminal box base seal
2	Housing	**27**	Fan cover screw	**70**	Stator terminal box
3	Rotor	**30**	Drive end bearing	**74**	Stator terminal box lid
5	DE shield	**33**	Inner DE bearing retainer	**75**	Terminal box lid fixing screw
6	NDE shield	**38**	DE bearing circlip	**77**	Terminal box lid seal
7	Fan	**40**	Cover fixing screw	**81**	Cable gland support plate
10	Turbine or fan screw (280 - 4p)	**42**	DE grease nipple	**270**	DE shield fixing screw
11	Lock washer (not shown) (280 - 4p)	**50**	Non drive end bearing	**271**	DE shield fixing nut
12	Lock washer (280 - 4p)	**53**	Inner NDE bearing retainer	**273**	NDE shield fixing screw
13	Fan cover	**59**	NDE preloading (wavy) washer	**406**	DE grease valve cover plate (plug)
21	Shaft extension key	**64**	NDE grease nipple	**456**	NDE grease valve cover plate (plug)

10.5 - FLS-FLSC 315 to 355 LD motors

Note:
- There is a stirrer at the drive end of the 315 M up to the 355.
- Types 315 M and L, and all 355s have fixed NDE bearings: the preloading washer (59) is therefore at the drive end.
- Type 315 S has a fixed DE bearing, and the preloading washer (59) is therefore at the non-drive end.
This should be taken into account during dismantling/ reassembly operations.

10.5.1 - Dismantling the NDE shield

- Remove the grease nipple extension (65).
- Remove the fixing screws (27) and then take off the cover (13).
- Remove the screws and washer from the shaft extension.
- Take out the fan (7).
- Take out the fan key (not shown) and the moving part of the grease valve (56).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Using two levers or a flexible hammer, disengage the NDE shield (6). Remove the shield by sliding it along the shaft.
- Put the dismantled components to one side and recover the preloading washers (59), which should be replaced in their housing (for the 315 S).

10.5.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
- Take out the key (21).
- Heat the moving part of the DE grease valve (35). Unscrew and remove it.
- Remove the fixing screws from the inner DE bearing retainer (33).
- Remove the fixing screws (270) from the DE shield.
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
- Remove the shield by sliding it along the shaft.
- Place the dismantled components to one side and recover part no. (35) which should be replaced in its housing, along with the preloading washers (59) (for the 315 M to 355 LD).

10.5.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings in accordance with the instructions described in the General information in section 6 (shrink-fitting only).

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

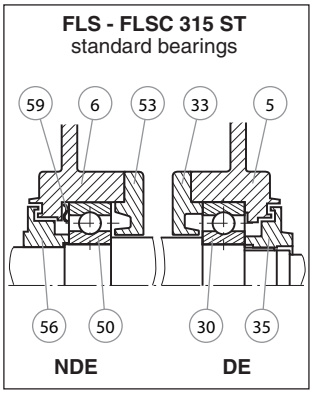
10.5.4 - Reassembly

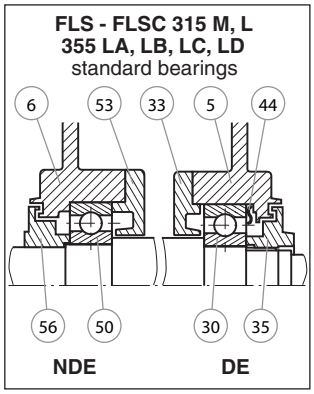
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33)!), and also the NDE bearing (50) and the inner NDE bearing retainer (53).
- Insert the rotor in the stator taking care not to knock the winding.
- Don't forget to replace the preloading washers (59)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

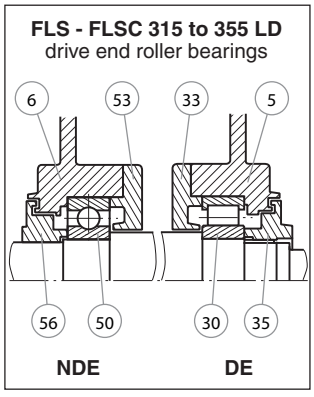
From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.
- Replace the shield fixing screws (270) and (273).
- Replace the inner bearing retainer fixing screws (33) and (53).
- Refit the moving part of the grease valve (56).
- Replace the fan (7) with its key.
- Replace the shaft extension screw with its washer.
- Replace the cover (13).
- Coat the thread of the moving part of the DE grease valve (35), with anti-vibration adhesive. Screw it tight.
- Lubricate the DE and NDE bearings.

Amount of grease for ball bearings:
- frame size 315S: DE and NDE = 235 cm^3/frame size 315 M/L: DE and NDE = 335 cm^3/frame size 355: DE and NDE = 445 cm^3

Amount of grease for DE roller bearings:
- frame size 315S: 350 cm^3/frame size 315 M/L: 500 cm^3/ frame size 355: 665 cm^3



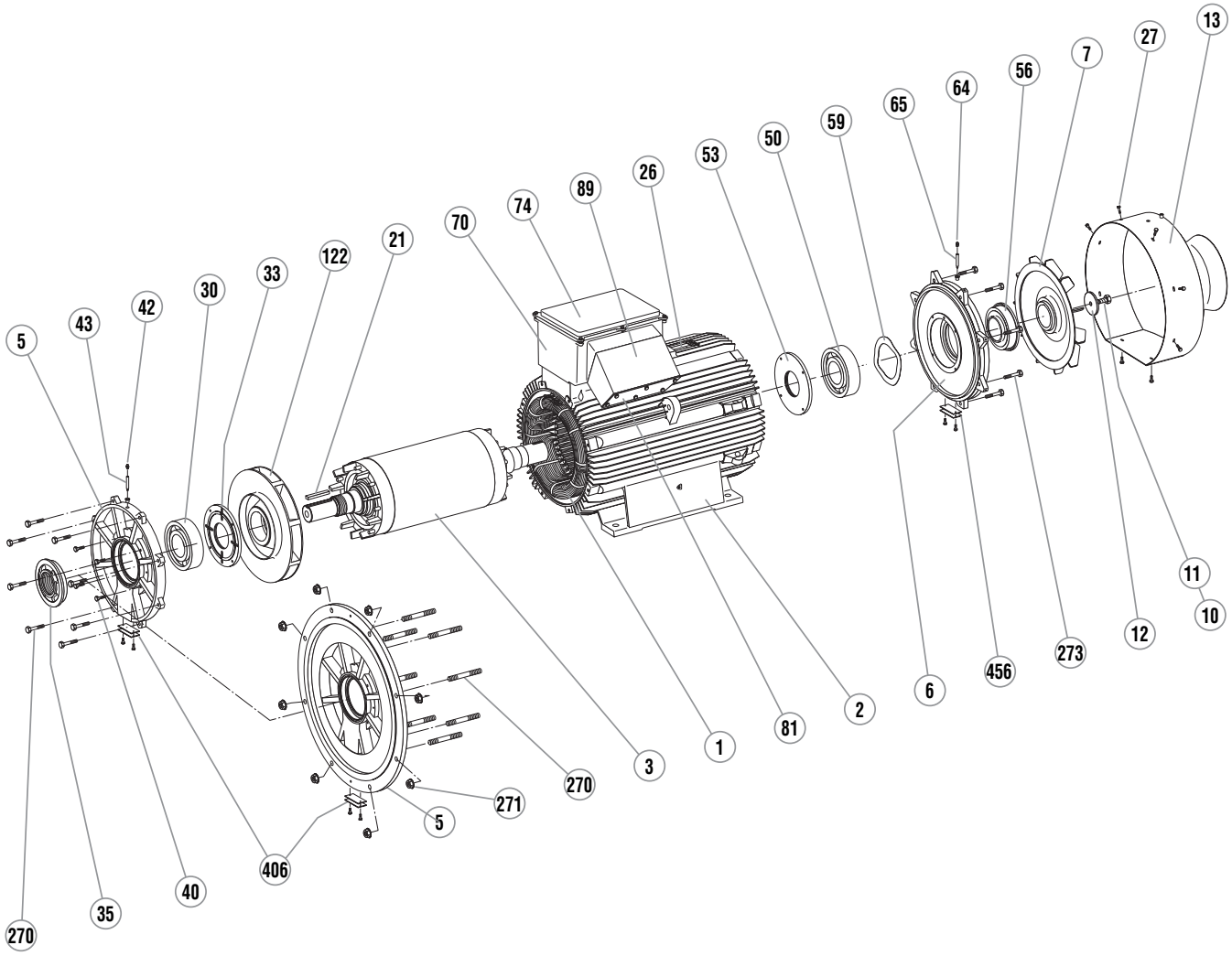




3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

FLS-FLSC 315 to 355 LD



FLS-FLSC 315 to 355 LD

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	**27**	Fan cover screw	**65**	Extension for NDE grease nipple
2	Housing	**30**	Drive end bearing	**70**	Stator terminal box
3	Rotor	**33**	Inner DE bearing retainer	**74**	Stator terminal box lid
5	DE shield	**35**	Moving part of DE grease valve	**81**	Cable gland support plate
6	NDE shield	**40**	Cover fixing screw	**89**	Connection - Terminal box
7	Fan	**42**	DE grease nipple	**122**	Stirrer (only from 315 M to 355 LD)
10	Turbine or fan screw	**43**	Extension for DE grease nipple	**270**	DE shield fixing screw
11	Lock washer (not shown)	**50**	Non drive end bearing	**271**	DE shield fixing nut
12	Lock washer	**53**	Inner NDE bearing retainer	**273**	NDE shield fixing screw
13	Fan cover	**56**	Moving part of NDE grease valve	**406**	DE grease valve cover plate
21	Shaft extension key	**59**	NDE preloading (wavy) washer	**456**	NDE grease valve cover plate
26	Nameplate	**64**	NDE grease nipple		

3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

10.6 - FLS-FLSC 355 LK to 450 motors

10.6.1 - Dismantling the NDE shield

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

10.6.2 - Dismantling the DE shield

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

10.6.3 - Changing the antifriction bearings

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

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

10.6.4 - Reassembly

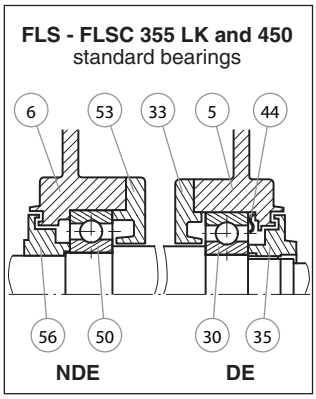
- Mount the DE bearing (30) and NDE bearing (50) on the rotor shaft.
- Don't forget to replace the preloading washers (59) in their housing.
- Start with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes so that the grease inlet pipes fully correspond.
- End with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes so that the grease inlet pipes fully correspond.
- Engage the shield on the bearing. Turn it so that the grease nipple is brought to the top.
- Slide it into position.
- Lift the rotor slightly and fit the shields onto the housing.
- Replace the shield fixing screws.
- Replace the cover fixing screws.
- Refit the moving part of the grease valve.
- Replace the fan (7) with its key.
- Replace the shaft extension screw with its washers (10) (11) (12).
- Replace the cover.
- Replace the grease nipple extension (65).
- Coat the thread of the moving part of the DE grease valve (35), with anti-vibration adhesive. Screw it tight.
- Lubricate the DE and NDE bearings.

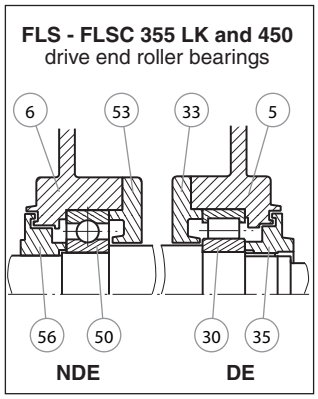
Amount of grease for ball bearings:
- frame size 355 LK - 400 L: DE and NDE = 575 cm^3/
  frame size 400LK - 450: DE and NDE = 855 cm^3

Amount of grease for DE roller bearings:
- frame size 355 LK - 400 L: 860 cm^3/
  frame size 400LK - 450: 1,280 cm^3

Note: Removing the rotor if necessary

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

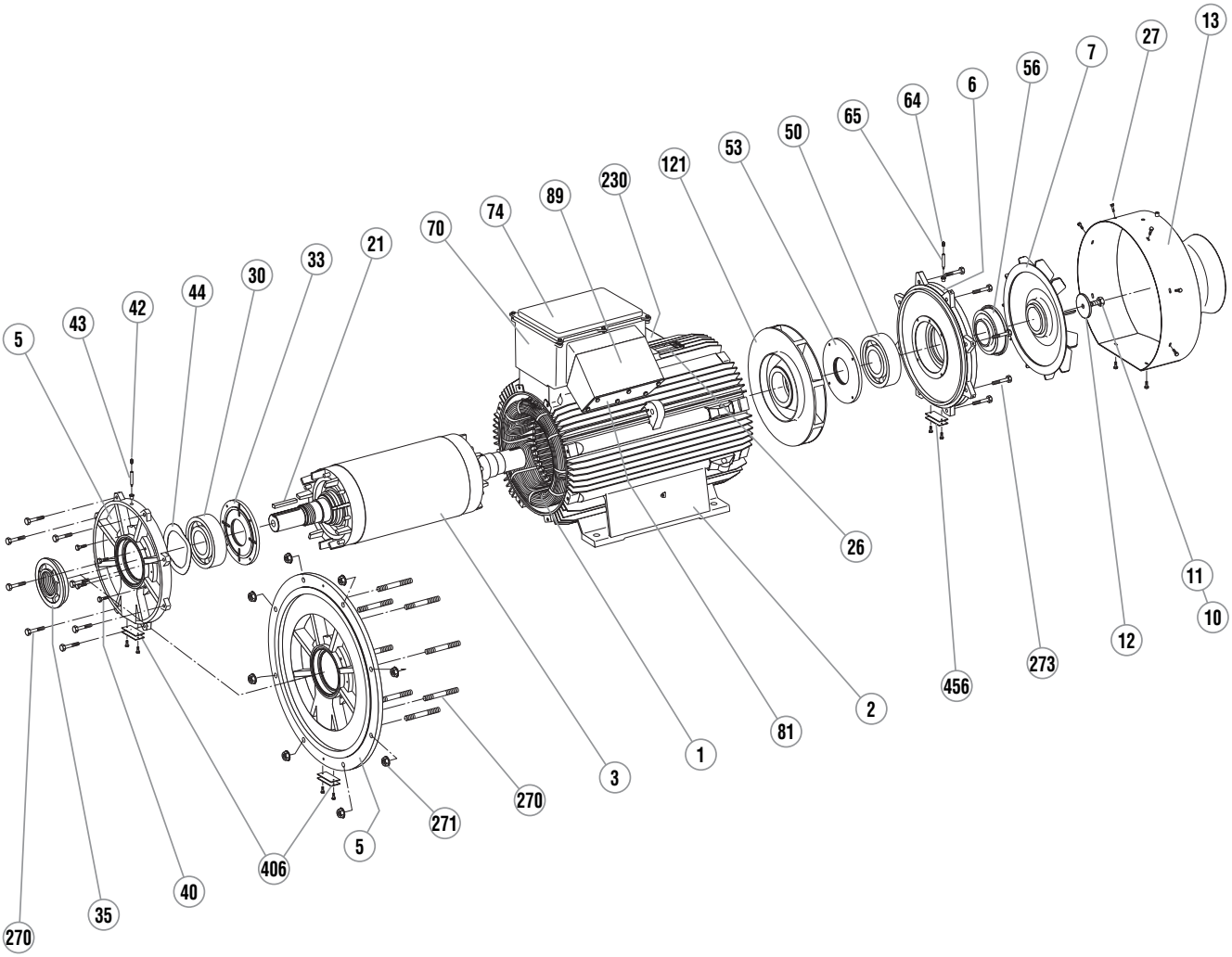




3-phase TEFV induction motors (slip-ring or cage type)

FLS-FLSC CAGE MOTORS

FLS-FLSC 355 LK to 450



FLS-FLSC 355 LK to 450

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

11 - FLSB-FLSLB SLIP-RING MOTORS

11.1 - FLSB-FLSLB 160, 180 and 200 motors

11.1.1 - Dismantling the NDE shield

- Remove the cover (13).
- Pull out the pin (not marked) while holding the fan.
- Take out the fan (7).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the inspection door (140).
- Disconnect the wires on the brush holders (149).
- Remove the fixing screws (136) from the NDE shield.
- Using two levers or a flexible hammer, disengage the NDE shield (136) taking care not to place it aslant.

Remove the shield by sliding it along the NDE bearing (50).

11.1.2 - Dismantling the DE shield

- Take out the key (21) from the shaft.
- Remove the labyrinth seal (47). This part cannot be dismantled without damaging it. Replace it with a new part.
- Remove the fixing screws from the inner DE bearing retainer.
- Remove the fixing screws from the DE shield (5).
- 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 DE bearing (30)

11.1.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the DE bearing (30) and NDE bearing (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 under General information in section 6 (shrink-fitting only).

11.1.4 - Monitoring the set of brushes and slip-rings

- Regular servicing (see section 3.3).
- Check the state of the slip-rings (patina - colour - scratches - micropitting). The slip-rings can be precision ground if necessary. Leave at least 5/10 depth of thread free of dust.
- Check the state of the brushes. The minimum acceptable height is 20 to 25 mm high.

11.1.5 - Reassembly

- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer, and also the NDE bearing (50) and the inner bearing retainer (53)).
- Insert the rotor in the stator taking care not to knock the winding.
- Present the shields, grease nipples facing upwards.
- Start with the NDE shield (50). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.
- End with the DE shield (30). Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond.**
- Lift the rotor slightly and fit the shields onto the housing.

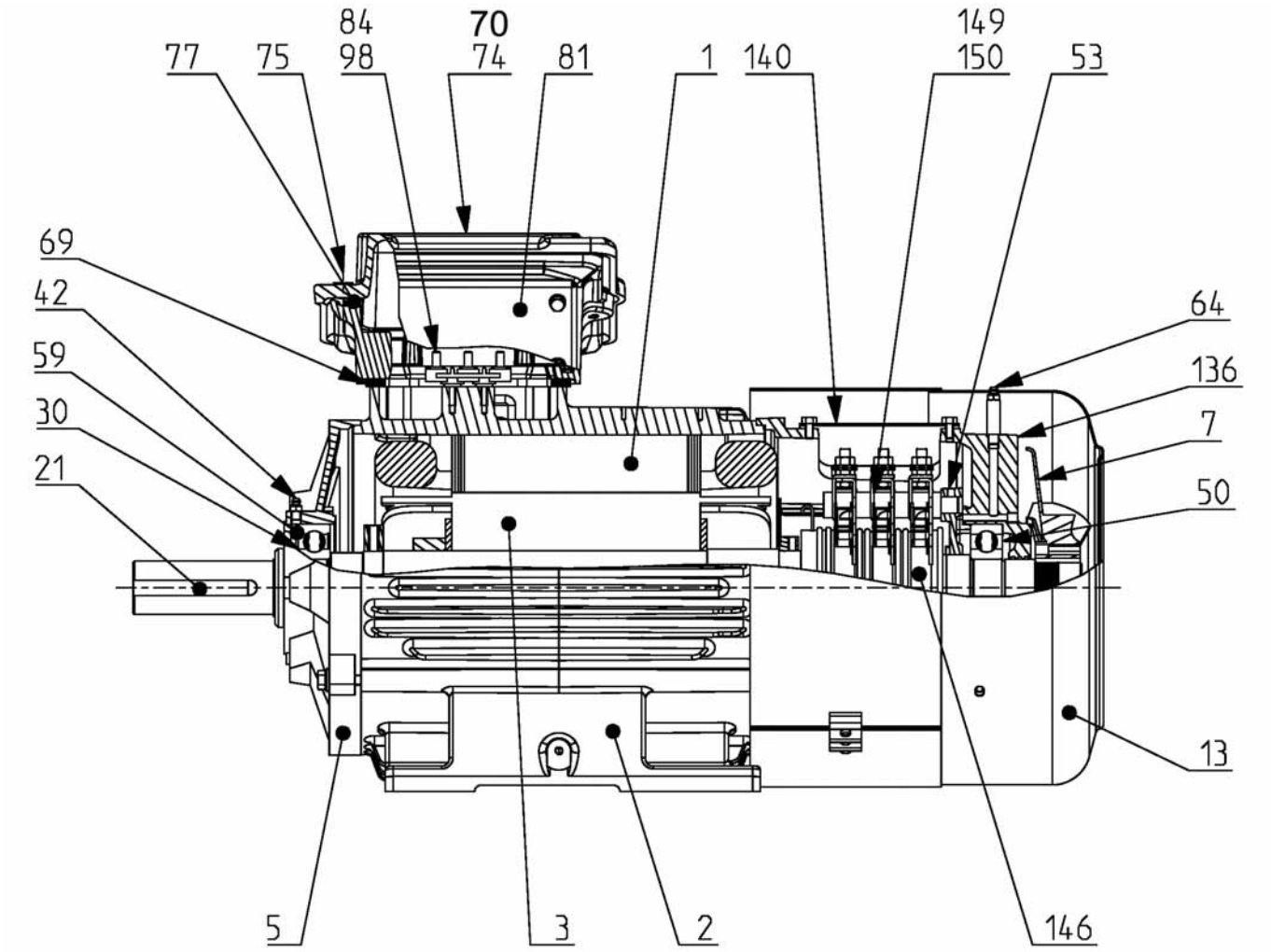
From now on we recommend checking, at every step, that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws (not marked).
- Reconnect the wires on the brush holders and replace the inspection door.
- Replace the fan (7) with its rotation stop pin.
- Replace the cover (13) and the fixing screws.
- Lubricate the DE and NDE antifriction bearings in accordance with the information on the nameplate.

3-phase TEFV induction motors (slip-ring or cage type)

FLSB-FLSLB SLIP-RING MOTORS

FLSB-FLSLB 160, 180 and 200



FLSB-FLSLB 160, 180 and 200

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	**50**	NDE bearing	**81**	Cable gland support plate
2	Housing	**53**	Inner NDE bearing retainer	**84**	Terminal block with terminals
3	Wound rotor	**59**	Preloading (wavy) washer	**98**	Stator connector links
5	DE shield	**64**	NDE grease nipple	**136**	Slip-ring housing
7	Fan	**69**	Stator terminal box seal	**140**	Inspection door
13	Fan cover	**70**	Stator terminal box	**146**	Commutator
21	Shaft extension key	**74**	Stator terminal box lid	**149**	Brush holder
30	Drive end bearing	**75**	Stator terminal box screws	**150**	Brushes
42	DE grease nipple	**77**	Stator terminal box lid seal		

11.2 - FLSB-FLSLB 225 and 250 motors

11.2.1 - Dismantling the NDE shield

- Remove the cover (13).
- Pull out the shaft extension screw (not marked) while holding the fan.
- Take out the fan (7).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the inspection door (140).
- Remove the fixing nut from the brush holder rod (149).
- Using two levers or a flexible hammer, disengage the NDE shield (136) taking care not to place it aslant.

Remove the shield by sliding it along the NDE bearing (50)

11.2.2 - Dismantling the DE shield

- Take out the key (21) from the shaft.
- Remove the labyrinth seal (47b).
- Remove the screws from the inner DE bearing retainer (33).
- Remove the fixing screws from the DE shield (5).
- 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 DE bearing (30).

11.2.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the DE grease valve (34).
- Remove the DE bearing (30) and NDE bearing (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 under General information in section 6 (shrink-fitting only).

11.2.4 - Checking the set of brushes and slip-rings

- Regular servicing (see section 3.3).
- Check the state of the slip-rings (patina - colour - scratches - micropitting). The slip-rings can be precision ground if necessary. Leave at least 5/10 depth of thread free of dust.
- Check the state of the brushes. The minimum acceptable height is 20 to 25 mm high.

11.2.5 - Reassembly

- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33)!), and also the NDE bearing (50) and the inner bearing retainer (53).
- Insert the rotor in the stator taking care not to knock the winding.
- Present the shields, grease nipples facing upwards.
- Begin with the DE shield (30). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.
- End with the NDE shield (50). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.
- Lift the rotor slightly and fit the shields onto the housing.

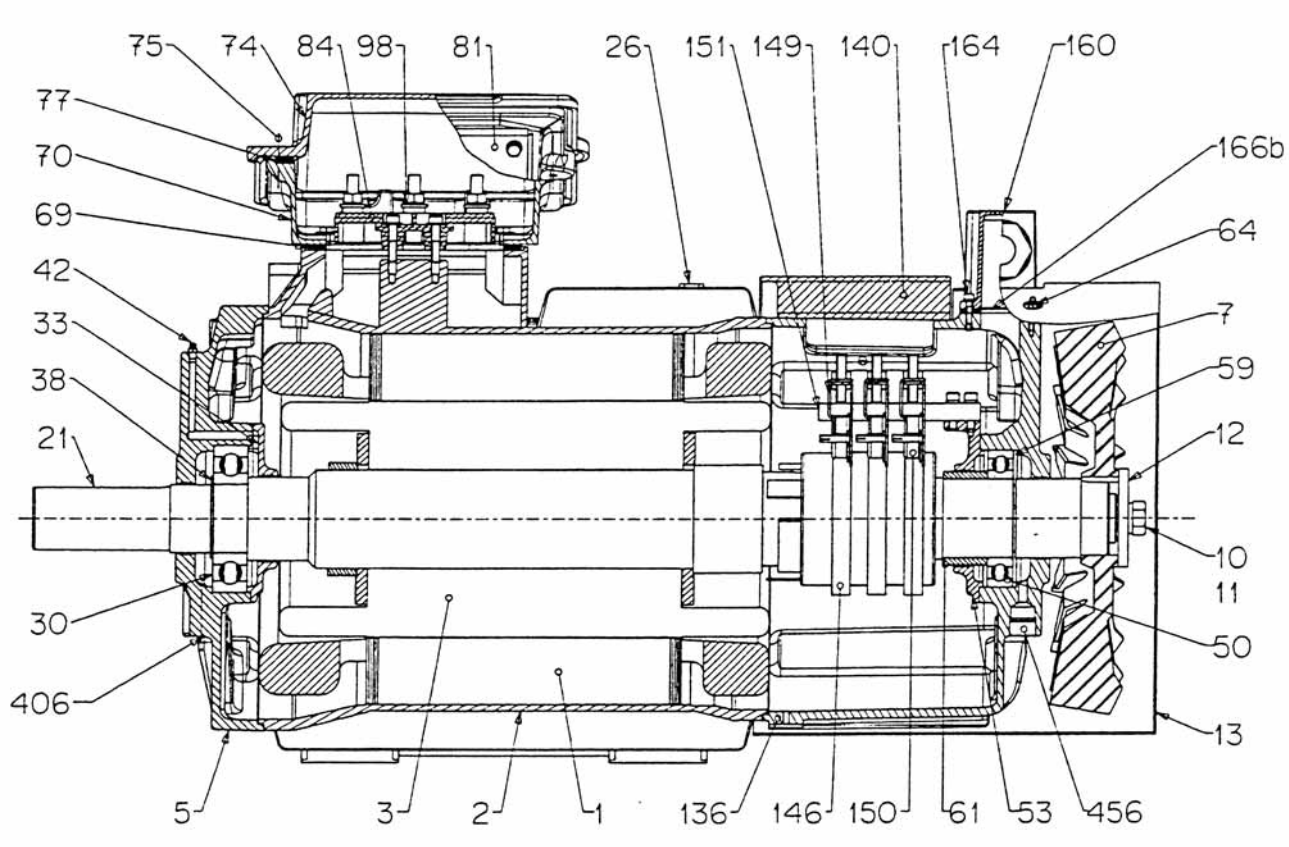
From now on we recommend checking, at every step, that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws.
- Replace the brush holder rod fixing nut and the inspection door.
- Replace the fan (7).
- Replace the cover (13) and the fixing screws.
- Lubricate the DE and NDE antifriction bearings in accordance with the information on the nameplate.

3-phase TEFV induction motors (slip-ring or cage type)

FLSB-FLSLB SLIP-RING MOTORS

FLSB-FLSLB 225 and 250



FLSB-FLSLB 225 and 250

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	**38**	DE bearing circlip	**84**	Terminal block with terminals
2	Housing	**42**	DE grease nipple	**98**	Stator connector links
3	Wound rotor	**50**	NDE bearing	**136**	Slip-ring housing
5	DE shield	**53**	Inner NDE bearing retainer	**140**	Inspection door
7	Fan	**59**	NDE preloading (wavy) washer	**146**	Commutator
10	Fan screw	**61**	NDE spacer ring	**149**	Brush holder
11	Lock washer	**64**	NDE grease nipple	**150**	Brushes
12	Lock washer	**69**	Stator terminal box seal	**151**	Brush holder rod
13	Fan cover	**70**	Stator terminal box	**160**	Rotor cable gland plate
21	Shaft extension key	**74**	Stator terminal box lid	**164**	Rotor cable gland plate screw
26	Nameplate	**75**	Stator terminal box screws	**166b**	Rotor cable gland plate seal
30	Drive end bearing	**77**	Stator terminal box lid seal	**406**	DE grease valve cover plate
33	Inner DE bearing retainer	**81**	Cable gland support plate	**456**	NDE grease valve cover plate

11.3 - FLSB-FLSLB 280 to 355 motors

11.3.1 - Dismantling the NDE shield

- Remove the cover (13).
- Unscrew the SKF nut (9).
- Take out the fan (7).
- Take out both the inner and outer NDE bearing retainer fixing screws (52) and (53).
- Pull out the outer bearing retainer (52).
- Remove the inspection door (140).
- Disconnect the wires on the brush holders (149).
- Remove the fixing screws (136) from the NDE shield.
- Using two levers or a flexible hammer, disengage the NDE shield (136) taking care not to place it aslant.

Remove the shield by sliding it along the NDE bearing (50).

11.3.2 - Dismantling the DE shield

- Take out the key (21) from the shaft.
- Remove both the fixing screws from the DE labyrinth seal (47).
- Remove the labyrinth seal (47).
- Take out both the inner and outer NDE bearing retainer screws (32) and (33).
- Pull out the outer bearing retainer (32).
- Remove the fixing screws from the DE shield (5).
- 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 DE bearing (30)

11.3.3 - Changing the antifriction bearings

- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Unscrew the DE bearing SKF nut (30).
- Remove the DE bearing (30) and NDE bearing (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 under General information in section 6 (shrink-fitting only).

11.3.4 - Checking the set of brushes and slip-rings

- Regular servicing (see section 3.3).
- Check the state of the slip-rings (patina - colour - scratches - micropitting). The slip-rings can be precision ground if necessary. Leave at least 5/10 depth of thread free of dust.
- Check the state of the brushes. The minimum acceptable height is 20 to 25 mm high.

11.3.5 - Reassembly

- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33)!), and also the NDE bearing (50) and the inner bearing retainer (53).
- Insert the rotor in the stator taking care not to knock the winding.
- Present the shields, grease nipples facing upwards.
- Begin with the DE shield (30). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.
- End with the NDE shield (50). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Slide it into position.
- Lift the rotor slightly and fit the shields onto the housing.

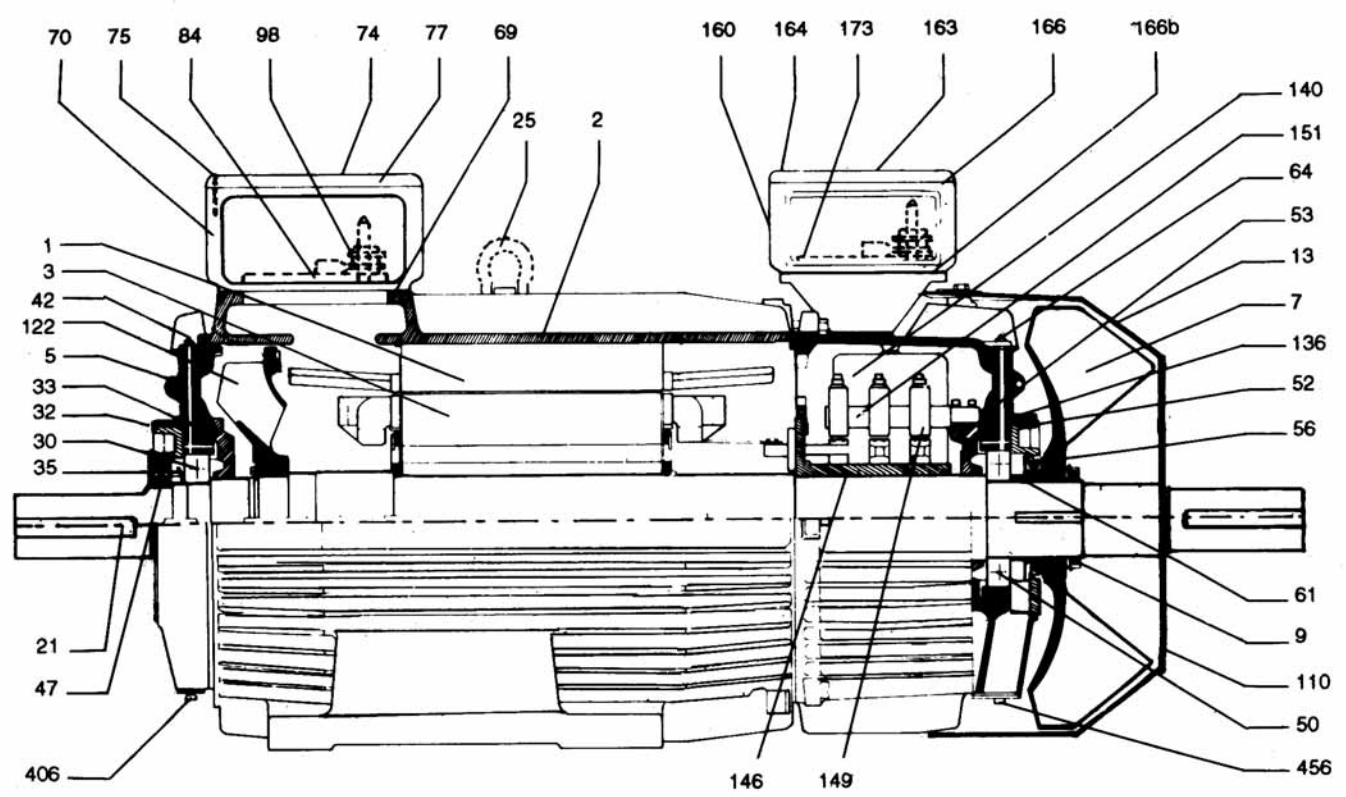
From now on we recommend checking, at every step, that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws.
- Replace the outer bearing retainer (32) on the DE shield (30).
- Replace the labyrinth seal (47).
- Reconnect the wires on the brush holders and replace the inspection doors.
- Replace the outer bearing retainer (52) on the NDE shield (50) with its SKF nut (9).
- Replace the fan (7).
- Replace the cover (13) and the fixing screws.
- Lubricate the DE and NDE antifriction bearings in accordance with the information on the nameplate.

3-phase TEFV induction motors (slip-ring or cage type)

FLSB-FLSLB SLIP-RING MOTORS

FLSB-FLSLB 280 to 355



FLSB-FLSLB 280 to 355

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	**50**	Non drive end bearing	**136**	Slip-ring housing
2	Housing	**52**	Outer NDE bearing retainer	**140**	Inspection door
3	Wound rotor	**53**	Inner NDE bearing retainer	**146**	Commutator
5	DE shield	**56**	Moving part of NDE grease valve	**149**	Brush holder
7	Fan	**61**	NDE spacer ring	**151**	Brush holder rod
9	Nut	**64**	NDE grease nipple	**160**	Rotor terminal box
13	Fan cover	**69**	Stator terminal box seal	**163**	Rotor terminal box lid
21	Shaft extension key	**70**	Stator terminal box	**164**	Rotor terminal box screws
25	Lifting ring	**74**	Stator terminal box lid	**166**	Rotor terminal box lid seal
30	Drive end bearing	**75**	Stator terminal box screws	**166b**	Rotor terminal box seal
32	Outer DE bearing retainer	**77**	Stator terminal box lid seal	**173**	Rotor terminal box baseplate
33	Inner DE bearing retainer	**84**	Terminal block with terminals	**406**	DE grease valve cover plate
35	Moving part of DE grease valve	**98**	Stator connector links	**456**	NDE grease valve cover plate
42	DE grease nipple	**110**	Louvres		
47	Bearing labyrinth seal (drive end)	**122**	Stirrer		

3-phase TEFV induction motors (slip-ring or cage type)

NOTES

3-phase TEFV induction motors (slip-ring or cage type)

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3-phase TEFV induction motors (slip-ring or cage type)

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MOTEURS LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE

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