LEROY SOMER®

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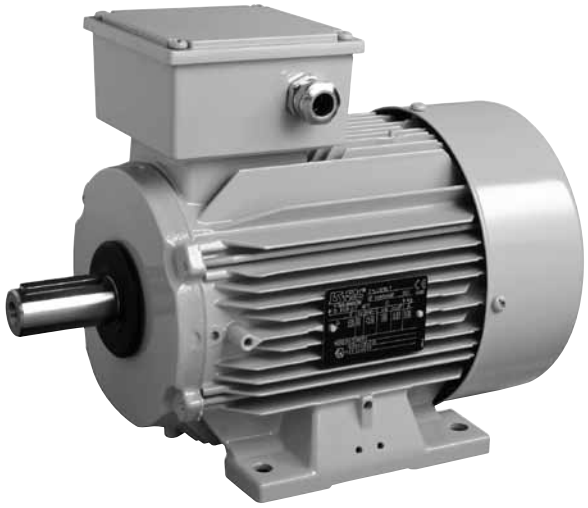

II 2 G

Ex e IIC T3 (or T4) **Gb**

This manual is to be given to the end user

(Addition to specific manual ref. 3606, included with the motor)

LSE - FLSE

Three-phase induction motors

for atmospheres containing explosive gases and dust

General manual: Installation and maintenance

LSE - FLSE

THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

IMPORTANT

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

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

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

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

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

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

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

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

Those persons required to work on electrical installations and equipment in zones where there is a risk of explosion must be specially trained and authorised for this type of equipment.
They must be familiar with not only the electrical risks, but also with those that are due to the chemical properties and physical characteristics of the products used in the installation (gas, vapour, dust), as well as the environment in which the equipment operates. These elements determine the risk of fire and explosion.

In particular, they must be informed and aware of the reasons for the specific safety instructions in order to comply with them. For example:
- Do not open when powered up
- Do not open when powered up in atmospheres containing explosive gas or dust
- Do not repair while powered up
- Do not move when on load
- Wait for a few minutes before opening
- Replace the seals tightly to ensure watertightness

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

NOTE:
LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

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THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

Dear Customer,

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

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

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

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

LEROY-SOMER

EC Declaration of conformity

EC DECLARATION OF CONFORMITY AND INCORPORATION
(F)LSE motor

We, **MOTEURS LEROY SOMER,**

declare, under our sole responsibility, that the following products :

LSE and **FLSE series type "e" increased safety induction motors**

bearing the following markings on their nameplates:

CE 0080 II 2G **Ex e IIC T3** (ou T4) **Gb** (zone 1)
or **CE 0080** II 2GD **Ex e IIC T3** (ou T4) **Gb** **Ex tb IIIC T125°C Db** (zone 1 and 21)
IIC motors can be marqued IIA or IIB for commercial reasons.

Comply with :

- European and international standards : **IEC60079-0:2007** ; **EN60079-0:2009**, **IEC60079-7:2006** ; **EN60079-7:2007**, **IEC60079-31:2008** ; **EN60079-31:2009** (moteurs Ex tb), **IEC-EN60034** ; **IEC-EN60072** ; **IEC-EN60529**
- The Low Voltage Directive: **2006/95/CE**
- The ATEX European Directive: **94/9/EC (decree 96 1010 from 19/10/1996)**
- The type awarded an EC type-examination certificate By the notified body: INERIS (0080) – BP 2 – Parc technologique ALATA 60550 – VERNEUIL EN HALATTE : **INERIS 01ATEX0010 X**

The design and manufacturing requirements are covered by the PRODUCT QUALITY ASSURANCE notifications

Under the responsibility of the notified body : **INERIS**

This conformity permits the use of these ranges of products in machines subject to the application of the Machinery Directive 2006/42/EC, provided that they are integrated or incorporated and/or assembled in accordance with, amongst others, the regulations of standard EN 60204 "Electrical Equipment for Machinery" and the Electromagnetic Compatibility Directive 2004/108/EC.

The products defined above may not be put into service until the machines in which they are incorporated have been declared as complying with the applicable Directive.

Installation of these motors must comply with the regulations, decrees, laws, orders, directives, application circulars, standards, rules or any other document relating to the installation site. LEROY-SOMER accepts no liability in the event of failure to comply with these rules and regulations.

Note: When the motors are supplied via appropriate separate electronic inverters and/or controlled by electronic control or monitoring devices, they must be installed by a professional who will be responsible for ensuring that the electromagnetic compatibility regulations of the country in which the product is installed are observed.

Signature of quality director : P. THERY

Signature of technical director : C.PLASSE

Q1T135 F from 15/11/2011

Included with the manual “Specific recommendations: Installation and Maintenance” (ref. 3606) is supplied with the relevant products.

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THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

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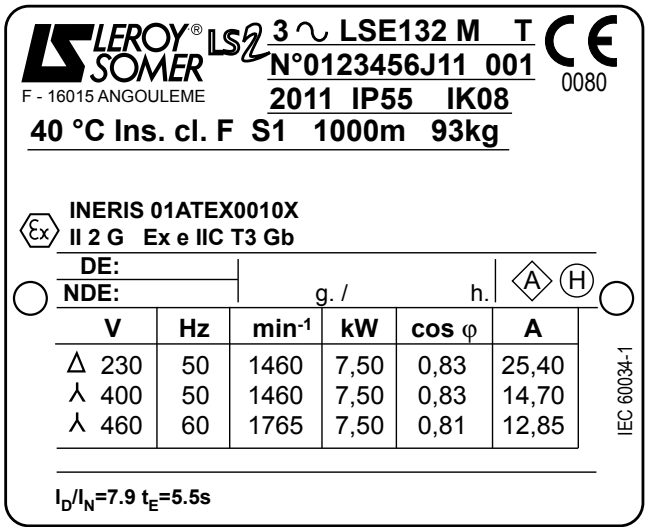
THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

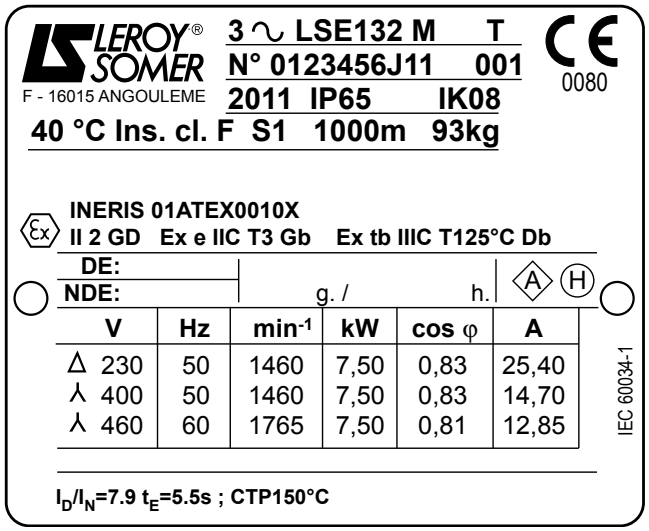
1 - RECEIPT

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 and marking

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





Definition of symbols used on nameplates:

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

	Zone	ATEX marking	Type marking of "Gas" protection	Type marking of "Dust" protection (optional)	Index of protection
ATEX	1&2	Ex II 2 G	EX e IIC T3 Gb Ex e IIC T4 Gb	/	IP 55
ATEX	1 & 21 2 & 22	Ex II 2 GD	EX e IIC T3 Gb Ex e IIC T4 Gb	Ex tb IIIC T125°C Db Ex tb IIIC T125°C Db	IP 65

ATEX specific marking Ex

Ex	: Specific marking for protection against risks of explosion
II 2G or II 2GD	: Group and category of equipment
Ex	: Symbol for equipment designed for potentially explosive atmospheres
e	: Protection type
IIC	: Explosion group
T3 or T4	: Temperature class
Gb	: EPL "Gas" level
Ex tb	: Protection type in "dust" atmospheres (optional)
IIIC T 125°C	: "Dust" group and maximum surface temperature (optional)
Db	: EPL "Dust" level
0080	: INERIS notified Body
INERIS 01ATEX0010 X	: EC type-examination certificate number

Motor

MOT 3 ~	: Three-phase A.C. motor
LSE	: LSE series
132	: Frame size
M	: Frame size

Motor no.

No.	: Serial number
L-M*	: Year of production
F-A**	: Month of production
040-001	: Batch number

* **L** = *2000*, **M** = *2001 ...* **W** = *2009*, **X** = *2010*
****A** = *January*, **F** = *June*

kg	: Weight
IP 55 or 65: Protection index	
IK08	: Shock resistance index
I cl.F	: Insulation class F
40°C	: Maximum ambient operating temperature
S1	: Duty
V	: Supply voltage
Hz	: Supply frequency
min^{-1}	: Revolutions per minute (rpm)
kW	: Rated output power
cos φ	: Power factor
A	: Rated current
Δ	: Connection symbol
I_D/I_N	: Starting current
t_E	: Locked rotor time

Bearings

DE	: Drive end Drive end bearing
NDE	: Non drive end bearing

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2 - STORAGE

Prior to commissioning, machines should be stored:
- Away from humidity: at relative humidity levels above 90%, the machine insulation can drop very rapidly, to just above zero at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.
For very long storage periods the motor can be placed in a sealed enclosure (for example heat-shrunk plastic) containing sachets of desiccant:
- Away from frequent significant variations in temperature, to avoid the risk of condensation. During storage the drain plugs must be removed to allow condensation water to escape.
- If the area is subject to vibration, try to reduce the effect of this vibration by placing the motor on a damping support (rubber plate or similar) and turn the rotor a fraction of a turn once a fortnight to prevent the bearing rings from becoming marked. Remove and replace the rotor locking device if applicable.
- Do not remove the rotor locking device (where there are roller bearings).
Even if the motor has been stored in the correct conditions, certain checks must be carried out before it is started up:

Greasing
The motors must be stored in their original packaging, in a location away from humidity (RH<90%) and vibrations.
- Motors fitted with permanently greased bearings: maximum storage period = 3 years; after this time, replace the bearings with an identical type.
- Motors fitted with grease nipples:

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

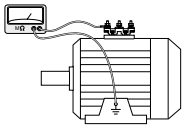
Warning: Do not perform a high voltage test on the auxiliaries.

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

3 - COMMISSIONING

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

This check is essential if the motor has been stored for longer than 6 months or if it has been kept in a damp atmosphere.
This measurement must be carried out using a megohmmeter at 500 V D.C. (do not use a magnetoelectric system).
It is better to carry out an initial test at 30 or 50 volts and if the insulation is greater than 1 megohm, carry out a second test at 500 volts for 60 seconds. The insulation value must be at least 10 megohms in cold state.
If this value cannot be achieved, or if the motor may have been splashed with water or salt spray, or kept for a long period in a very humid place or if it is covered with condensation, it is advisable to dry the stator for 24 hours in a drying oven at a temperature of between 110°C and 120°C.
If it is not possible to place the motor in a drying oven:
- Switch on the motor, with the rotor locked, at 3-phase A.C. voltage reduced to approximately 10% of the rated voltage, for 12 hours (use an induction regulator or a reduction transformer with adjustable outlets).
- Or supply the 3 phases in series with a D.C. current, with the voltage at 1 to 2% of the rated voltage (use a D.C. generator with independent excitation or batteries for motors of less than 22 kW).
- NB: The A.C. current must be monitored using a clamp ammeter, and the D.C. current using a shunt ammeter. This current must not exceed 60% of the rated current.
It is advisable to place a thermometer on the motor housing: if the temperature exceeds 70°C, reduce the indicated voltage or current by 5% of the original value for every 10°C difference.
While it is drying, all the motor orifices must be open (terminal box, drain holes). Before commissioning, all these covers must be replaced so that the motor conforms to IP 55 or 65 degree of protection. Clean or replace the orifices and plugs or breathers before reassembly.



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

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

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THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

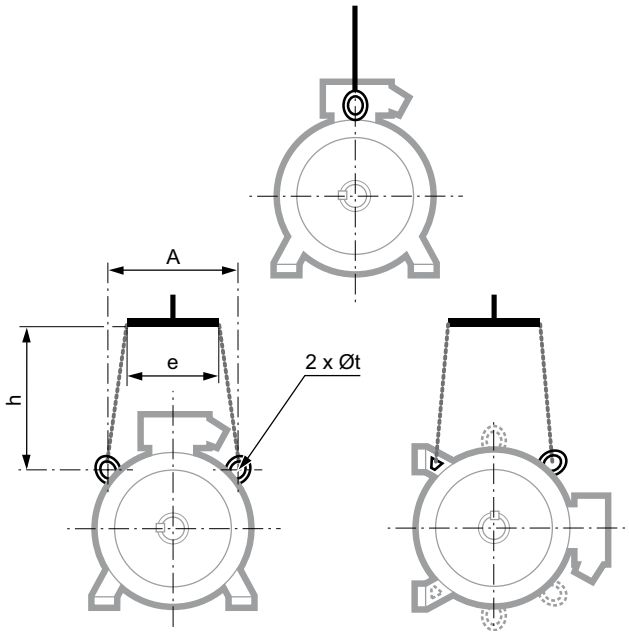
4 - INSTALLATION

4.1 - Position of lifting rings

⚠ The lifting rings are intended for lifting the motor on its own. They must not be used to lift the whole machine once the motor has been fitted to it.

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.

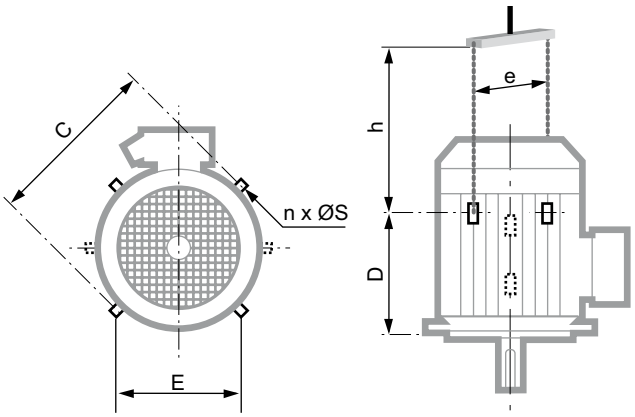
• Horizontal position



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/MR	270	260	250	14
250 MZ	270	260	250	14
250 ME	400	400	500	30
280 SC/MC	400	400	500	30

⚠ Motors intended for use in the vertical position may be delivered in the horizontal position on a pallet. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings may be irreparably damaged.

• Vertical position



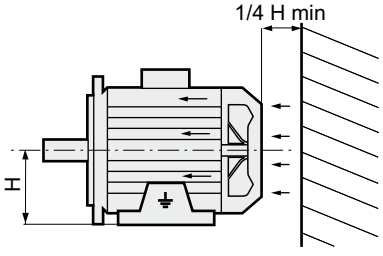
View from above — View from the side

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/MR	410	300	295	2	14	410	450
250 MZ	410	300	295	2	14	410	450
250 ME	500	400	502	2	30	500	500
280 SC/MC	500	400	502	2	30	500	500

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

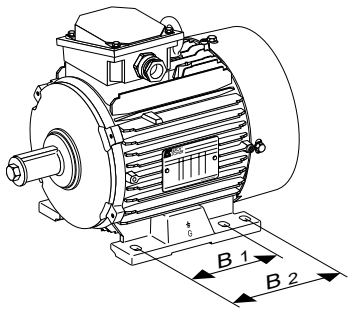
4.2 - Location - Ventilation

Our motors are cooled in accordance with method IC 411 (standard IEC 60034-6), ie. “machine cooled by the surface, using the ambient fluid (air) flowing along the machine”.
The fan at the non drive end cools the motor. Air is sucked in through the grille of a fan cover (which provides protection against the risk of direct contact with the fan in accordance with standard IEC 60034-5) and blown along the housing fins to ensure thermal equilibrium of the motor whatever the direction of rotation.



The motor must be installed in an adequately ventilated area, with clearance for the air intake and outlet of at least one-quarter of the frame size.
Blocking the fan cover grille and the housing fins, even accidentally (clogging), is likely to adversely affect the operation and safety of the motor.
In the case of vertical operation with the shaft extension facing down, it is advisable to fit the motor with a drip cover to prevent the entry of any foreign bodies.
It is necessary to check that the hot air is not being recycled. If it is, pipes must be provided for the intake of cold air and discharge of hot air, in order to prevent abnormal temperature rise of the motor.
In this case, if the air is not circulated by an auxiliary fan, the dimensions of the pipes must be such that the load losses are negligible compared to those of the motor.

Positioning
The motor must be mounted in the position specified on the order, on a base which is rigid enough to prevent distortion and vibration.
Where the motor feet have six fixing holes, it is preferable to use those which correspond to the standard dimensions for the motor power rating (refer to the technical catalogue for induction motors) or, failing that, to those shown at B2.

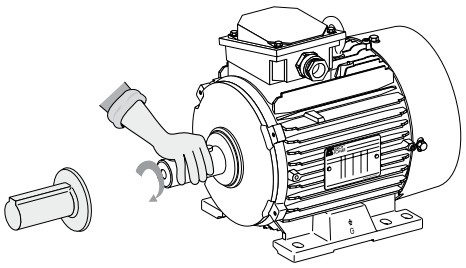


Provide easy access to the terminal box, the condensation drain plugs and, if appropriate, to the grease nipples.
Use lifting equipment which is compatible with the weight of the motor (indicated on the nameplate).

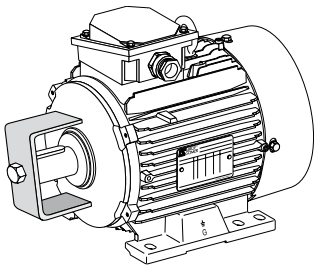
⚠ When the motor is fitted with lifting rings, they are for lifting the motor on its own and must not be used to lift the whole machine after the motor has been fitted to it.
Note 1: When installing a suspended motor, it is essential to provide protection in case the fixing breaks.
Note 2: Never stand on the motor.

4.3 - Coupling

Preparation
Turn the motor by hand before coupling to detect any possible fault due to handling.
Remove any protection from the shaft extension. Drain off any condensation water which may have formed inside the motor (see section 3 page 6).



Rotor locking device
For made-to-order motors with roller bearings, remove the rotor locking device.
In exceptional circumstances when the motor has to be moved after the coupling device has been fitted, the rotor must be re-immobilised.



Balancing
Rotating machines are balanced according to standard IEC 60034-14:
- Half-key when the shaft extension is marked H.

By special request, the balancing can be set:
- No key when the shaft extension is marked N
- Full key when the shaft extension is marked F

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

Motor with 2 shaft extensions:
If the second shaft extension is not used, in order to comply with the balancing class, the half-key or key must be fixed firmly in the keyway so that it is not thrown out during rotation (H or F balancing) and must be protected against direct contact.

5 - ELECTRICAL PARAMETERS LIMIT VALUES

5.1 - Minimizing motor starting problems

In order to protect the installation, any significant temperature rise in the cabling conduits must be prevented, while ensuring that the protection devices are not triggered during starting.

Problems affecting the operation of other devices connected to the same source are due to the voltage drop caused by the current inrush on starting.

Even though mains supplies increasingly allow D.O.L. starting, the current inrush must be reduced for certain installations.

Jolt-free operation and soft starting ensure greater ease of use and an increased lifespan for the machines being driven.

The two essential parameters for starting cage induction motors are:
- Starting torque
- Starting current

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

The five essential modes are:
- D.O.L. starting
- Star/delta starting
- Soft starting with autotransformer
- Soft starting with resistors
- Electronic starting

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

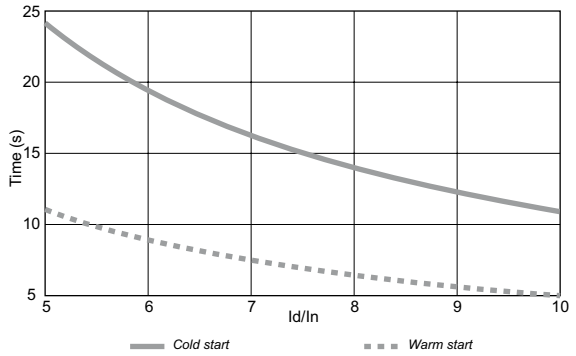
Starting systems must be placed outside the potentially explosive zone or be of an approved type.

5.2 - Supply voltage

The rated voltage is indicated on the nameplate.

5.3 - Starting time

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



Permissible motor starting time as a function of the ratio I_D/I_N.

5.4 - Locked rotor time t_E

t_E is the maximum locked rotor time permitted to conform to the rated temperature class. The t_E value is indicated on the motor nameplate.

If the rotor locks, a protective device should switch off the power supply in a time less than t_E.

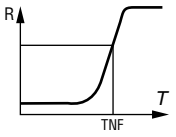
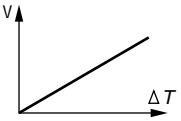
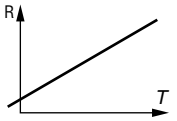
Protection devices must be placed outside the potentially explosive zone or be of an approved type.

5.5 - Supply by frequency inverter

(See section 7.1)

6 - USE

Thermal protection (see section 8) and space heaters.

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

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

* The number of devices relates to the winding protection.

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

Protection against condensation: space heaters
Identification: 1 red label
A glass fibre flexible resistor is fixed on 1 or 2 coil end turns. This resistor heats the machines when stopped and thus prevents condensation inside the machines. The space heaters must be switched off when the machine is in use.
Power supply: 230 V single-phase unless otherwise specified by the customer.
The drain plugs underneath the motor must be opened approximately every 6 months. They must be replaced with new seals to ensure IP 55 or IP 65 protection of the motor.

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

Built-in indirect thermal protection
The motors can be equipped with optional heat sensors. These sensors can be used to monitor temperature changes at “hot spots”:
- Overload detection
- Cooling check
- Monitoring strategic points for maintenance of the installation

- Ensuring the temperature of the hot spots is monitored.

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

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

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

Temperature sensor operating thresholds:
- Maximum surface temperature: 125°C (GD)
  - winding sensor: 120°C ± 5°C
  - DE shield sensor: 120°C ± 5°C
- Maximum surface temperature: 130°C (class T4)
  - winding sensor: 120°C ± 5°C
  - DE shield sensor: 120°C ± 5°C
- Maximum surface temperature: 195°C (class T3)
  - winding sensor: 150°C ± 6°C
  - DE shield sensor: 120°C ± 5°C

7 - SPECIAL OPERATING CONDITIONS

- Thermal protection (see sections 6 & 8)

- Space heaters (see section 6)

- Temperatures: storage and ambient
Note: T_a = ambient temperature

If the motor has been stored at a temperature lower than -10°C, heat it (see section 3) and turn the shaft manually before starting up the machine.

If it is to be used at a temperature lower than - 20°C, the motor may be equipped with space heaters.

Our standard motors are designed to operate at an ambient temperature T_a of between -20°C and 40°C.

If T_a < -25°C, the shaftway seals must be made of silicon and the fan must be metal. The flat seals of the terminal box must be silicon.

- Surface temperature
As standard, the maximum surface temperature of our motors is 200°C for T3 or 135°C for T4 with an ambient temperature of ≤ 40°C (G).

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

- Installation zones
Motors with IP 65 protection are designed for use in atmospheres containing explosive dust IIIC (zone 21).

In atmospheres containing explosive gas, the degree of protection is IP 55.

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

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

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

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

- Workforce safety
Protect all rotating devices before power-up.

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

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

Beware of backdriving when the motor is switched off. The appropriate precautions must be taken:
- For example, for pumps a non-return valve must be installed.

- LEROY-SOMER "Digistart" electronic starter
This is a multi-function electronic system with a microcontroller, which is used with all 3-phase cage induction motors.
It provides soft starting of the motor with:
- Reduction of the starting current
- Gradual, jolt-free acceleration, achieved by controlling the current absorbed by the motor.
After starting, the DIGISTART performs additional motor control functions in its other operating phases: steady state and deceleration.
- 18 to 1600 A models
- Supply: 220 to 700 V - 50/60 Hz
DIGISTART is economical to install, as a fused switch is the only additional device needed.

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

- Contactors - Isolators
In all cases, contactors, isolators, etc, must be installed and connected in an enclosure outside the danger zone or be of an approved type.

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

7.1 - Use with a variable speed drive

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

- Check that the drive switching frequency is at least 3 kHz.

- Check that the motor has a second nameplate indicating the maximum motor characteristics when used with a variable speed drive.

- The reference voltage, usually 400 V at 50 Hz, is indicated on the motor nameplate. The drive must deliver a constant voltage/frequency signal to the motor.

- Program in the drive the maximum current value and also the min. and max. frequency values indicated on the second motor nameplate.

- Each type of "e" motor should have been tested first on load with a drive of exactly the same type as the one it will be controlled with.

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

7.1.1 - Special conditions for safe operation

- As standard, the motor shock resistance corresponds to a “low” risk of mechanical danger, and they should therefore be installed in an environment with a low risk of shocks.
- The motor must be fitted with thermal sensors in the winding (all frame sizes) and on the DE bearing (frame size 160 and above) in the following cases:
  - Motor supplied by a frequency inverter
  - Motor in a good air-flow (IC418) and not self-cooled
  - Motor adapted so as to no longer be self-cooled (IC410)
  - Motor fitted with a backstop.

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

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

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

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

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

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

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

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

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

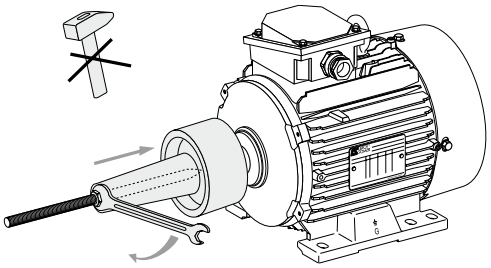
8 - MECHANICAL ADJUSTMENTS

Tolerances and adjustments

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

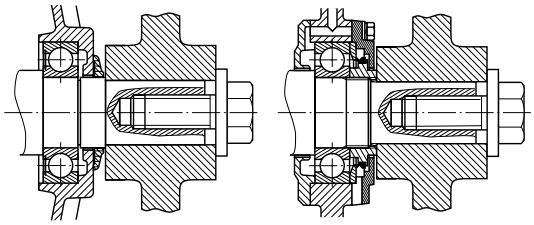
- Users must adhere strictly to the instructions provided by the transmission device supplier.
- Avoid impacts which could damage the bearings.

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



The hub of the transmission device must be:

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



Resting on shoulder of the shaft

Resting on 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.

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

Direct connection onto the machine

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

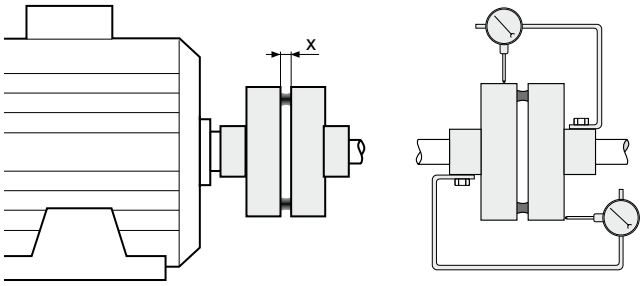
Direct connection using a flexible coupling

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

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

The two parts of the coupling sleeve must be assembled provisionally to assist their movement in relation to one another.

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



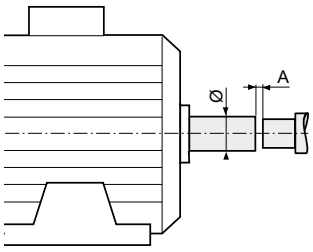
To perfect this adjustment and at the same time check the concentricity of the two shafts, fit 2 gauges as shown in the diagram and slowly turn both shafts.

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

Direct connection using a rigid coupling

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

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



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

LSE - FLSE

THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

Transmission via belt pulleys

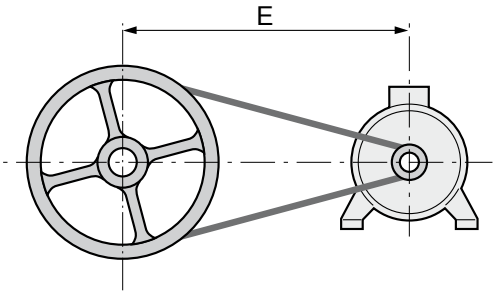
⚠ **With a belt/pulley assembly, check that the motor can cope with radial loads.**

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

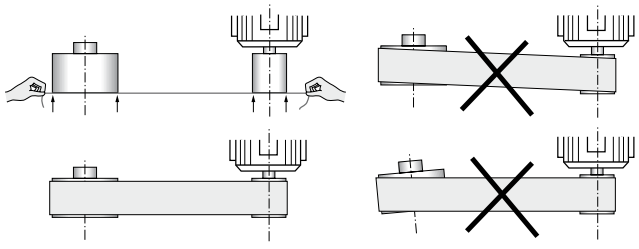
Positioning the belts

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

So that the belts can be correctly positioned, allow for possible adjustment of approximately 3% with respect to the calculated distance E.
Force must never be used when fitting the belts.
For notched belts, position the notches in the pulley grooves.



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



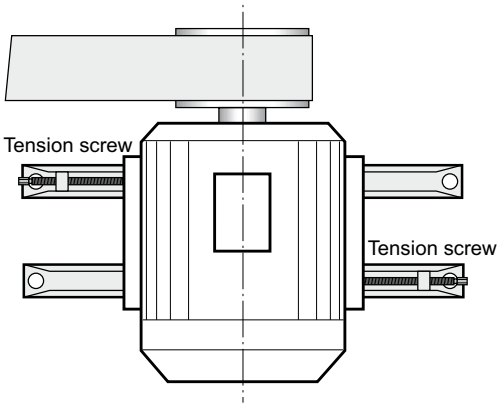
⚠ **Protect all rotating devices before power-up**.

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

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

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

Adjustable distance between centres:
The motor is usually mounted on slide rails, which enables optimum adjustment of the pulley alignment and the belt tension.
Place the slide rails on a completely horizontal baseplate.
The lengthways position of the slide rails is determined by the length of the belt, and the crossways position by the pulley of the machine being driven.
Mount the slide rails firmly with the tension screws in the direction shown in the diagram (slide rail screw on the belt side between the motor and the machine being driven).
Fix the slide rails onto the baseplate and adjust the belt tension as before.



Thermal protection
On-line protection
Setting the thermal protection (see section 6)
This should be adjusted to the value of the current read on the motor nameplate for the connected mains voltage and frequency.

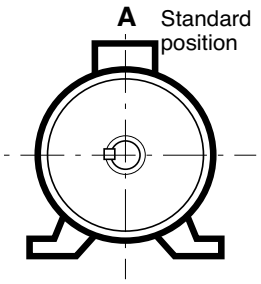
9 - SUPPLY CONNECTION

9.1 - Terminal box

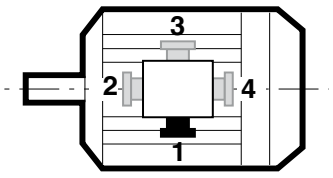
This is placed as standard on the top of the motor near the drive end. It has IP 55 (G) or IP 65 (GD) protection and is fitted with a cable gland according to the table below.

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

Terminal box positions



Cable gland positions



Standard position

Cable gland

If the thread(s) on the orifice(s) designed to take one or more cable glands or conduits is (are) metric, there will be no particular marking on the motor; if the thread type is different or mixed, the type(s) will be marked on the equipment.
The standard position of the cable gland (1) is on the right, seen from the motor drive end.
Due to the symmetrical construction of the terminal box, it can be placed in any of the four directions, except position 2 on flange-mounted motors (B5), apart from on 355 LK - 400 - 500.
A cable gland must never open upwards.
Check that the incoming bend radius of the cables prevents water entering via the cable gland.

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

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

Cable size

⚠ Adapt the cable gland and its reducer or amplifier, if fitted, to the diameter of the cable being used, in accordance with the manual specific to the cable gland.
To maintain the original stated IP protection of the motor, it is essential to make a watertight seal between the rubber ring and the cable, by tightening the cable gland correctly (it should not be possible to unscrew it without a tool).
Unused cable glands must be replaced with threaded plugs.
Unused orifices must also be closed off using threaded plugs. When fitting cable glands or blocking holes, a seal of perbunan, or silicon or polyurethane mastic, must be inserted between the cable glands, the plugs, the reducers or (and) the amplifiers and the support or the terminal box.
For connections using screwed conduit entries, the thread seal can be reinforced with grease. These threads must be rendered watertight by using polyurethane or silicon mastic, or anti-vibration adhesive.

LSE - FLSE

THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

AVERTISSEMENT

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

WARNING

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

ref. HS51A 31
PSI070EA050

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

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

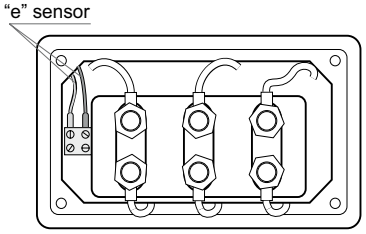
9.2 - Wiring diagram for terminal block or isolators

All motors are supplied with a wiring diagram in the terminal box. If required, this diagram should be obtained from the supplier, specifying the motor type and number (shown on the motor nameplate).
The connector links required for coupling can be found inside the terminal box.
Single speed motors have a block with 6 Exe approved safety terminals, whose marking complies with IEC 60034-8 (or NFC 51-118).

9.3 - Direction of rotation

When the motor is powered by U1, V1, W1 or 1U, 1V, 1W from a direct mains supply L1, L2, L3, it turns clockwise when seen from the drive shaft end.
If 2 phases of the power supply are changed over, the motor will rotate anti-clockwise (the motor should be checked to ensure that it has been designed to rotate in both directions).
If the motor is fitted with accessories (thermal protection or space heater), these must be connected on mini-terminals.

Motor fitted with a terminal block



9.4 - Earth terminal

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

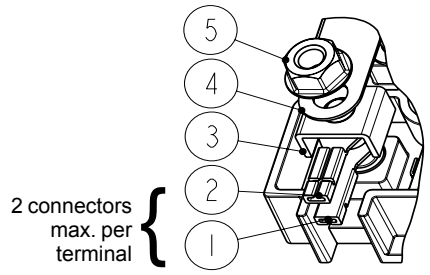
One earth terminal is located inside the terminal box, and another is outside the enclosure. They are marked: ⏚
They must be protected against self-release by a jumper, lock washer, screw or locknut, or anti-vibration adhesive.
The sizing of the cables must comply with the specifications of standard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

9.5 - Connecting the power supply cables to the terminal block

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

9.5.1 - Terminal block with round connectors Ex e M5 and M6 (LSE/FLSE 80 to 160)

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



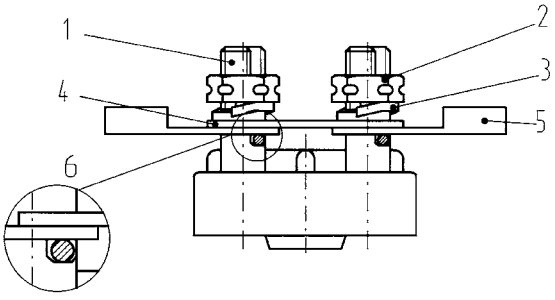
Each terminal consists of the following items, positioned in order:
- 1: motor cable connector, shank locked
- 2: power supply cable connector, shank locked
- 3: terminal washer
- 4: Y or Δ connector link
- 5: “Serpress” brake nut

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

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

9.5.2 - Terminal block with slotted terminals (LSE 180-280)

The motor winding connecting cable is attached to the connector for a slotted terminal, either tinned brass KA type (open shank) for soldering, or tinned copper QUCA type (open shank) for crimping with a suitable tool.
The cable connecting the electrical mains supply is laid in the terminal slot, under the connector, and tightened to the recommended tightening torque, as are the connector and the connector link, using the nut.



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

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

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

Max. connection cross-section on slotted terminal blocks

Terminal		KS7A	KS8A	KS10A	KS14A	KS18A
Solid or stranded cable	mm²	2.5	4	6	10	-
Solid cable	mm²	4	6	10	16	-
Max. current (solid cable)	A	35	46	63	85	-

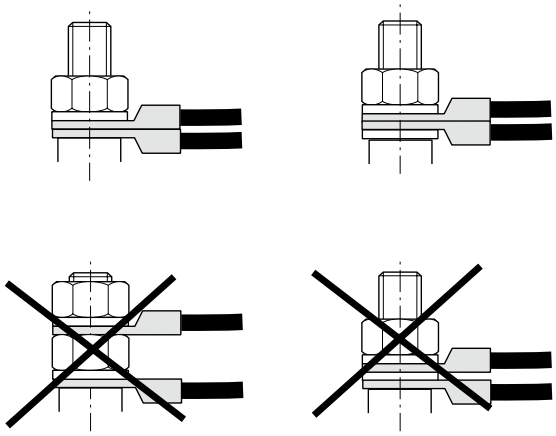
As a general rule, check that no nut, washer or other foreign body has fallen into the terminal box and/or come into contact with the winding.

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

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

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

- Connecting the power supply cables to the terminal block:
The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter.
They must be crimped in accordance with the connector supplier's instructions.
Connection must be carried out with connector resting on connector (see the diagrams below):



10 - MAINTENANCE

10.1 - General information

10.1.1 - Frequent monitoring

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

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

10.1.2 - Repairs

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

WARNING:

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

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

10.1.3 - Spare parts

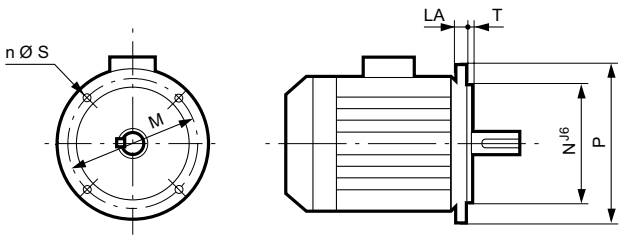
When ordering spare parts, you must indicate the complete motor type, its serial number and the information given on the nameplate (see section 1).

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

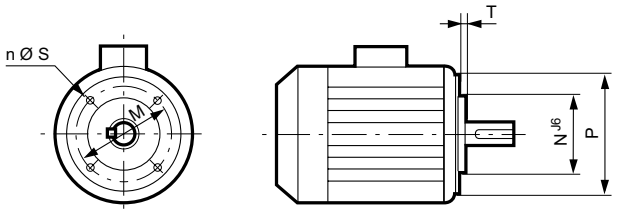
Routine maintenance kits can be obtained from our After Sales Service.

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

Flange mounted motor



Face mounted motor



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

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

10.2 - Corrective maintenance: general information

CAUTION:

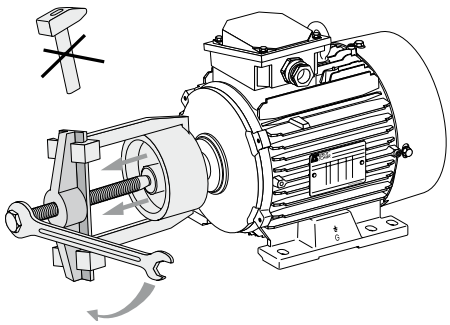
Corrective maintenance can only be performed by a Service Centre that has been trained and approved in the repair of ATEX products.

10.2.1 - Dismantling the motor

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

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

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



10.2.2 - Checks before reassembly

Stator:

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

Rotor:

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

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

End shields:

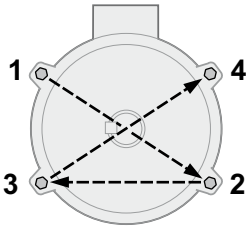
- Clean off any traces of dirt (old grease, accumulated dust, mastic sealant, etc).
- Clean the bearing housings and the spigot.
- If necessary, apply some antiflash varnish to the insides of the end shields.
- Carefully clean the bearing retainers and the grease valves (if these are fitted on the motor).

10.2.3 - Mounting the bearings on the shaft

This operation is extremely important, as the slightest indentation of a ball on the bearing tracks would cause noise and vibration. Lightly lubricate the running surfaces of the shaft.
There are a number of ways of mounting the bearings correctly:
- Cold state: The bearings must be mounted without any impact, using a spanner (do not use a hammer). The force applied must not be transferred to the bearing track. You should therefore use the internal cage for support (taking care not to press on the seal shield for sealed bearings).
- Hot state: Heat the bearing to between 80 and 100°C: using a bearing heater, in a drying cabinet, an oven or on a heating plate. (A blowtorch or an oil bath must never be used).

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

10.2.4 - Reassembling the motor



Tie rod tightening torque

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

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

Tightening the tie rods

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

10.2.5 - Reassembling the terminal box

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

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

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

10.3 - Safety regulations

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

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

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

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

10.4 - Routine maintenance

Inspection after commissioning

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

Cleaning

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

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

Dry cleaning (vacuuming or compressed air) is always preferable to wet cleaning.

When cleaning the motor, be careful to avoid any built-up of static.

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

Draining condensation water

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

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

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

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

10.4.1 - Lubrication

10.4.1.1 - Grease life

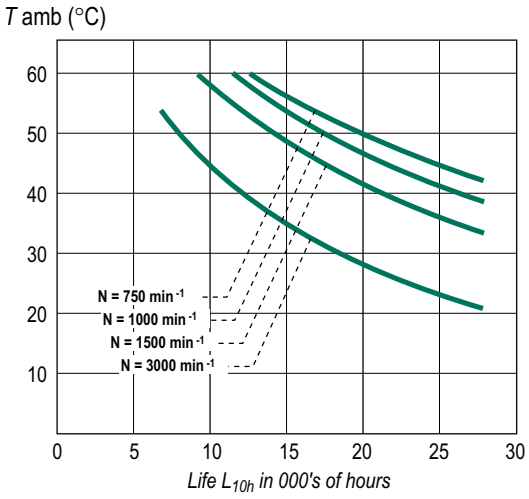
The lifetime of a lubricating grease depends on:

- the characteristics of the grease (type of soap and base oil, etc),
- service stress (type and size of bearing, speed of rotation, operating temperature, etc),
- contamination.

10.4.1.2 - Permanently greased bearings

For motors from 80 to 132 frame size, the type and size of the bearings make for long grease life and therefore lubrication for the lifetime of the machine. The grease life L_{10h} as a function of speed of rotation and ambient temperature is shown on the chart below.

Grease life L_{10h} in 000s of hours, for frames sizes < 132



10.4.1.3 - Bearings with grease nipples

The chart below shows the regreasing intervals, depending on the type of motor, for standard bearing assemblies of frame size ≥ 160 fitted with grease nipples, operating at an ambient temperature of 40°C on a horizontal shaft machine.

Note: You should comply with the quality and quantity of grease and the regreasing intervals shown on the machine nameplate.

Caution: Too much grease in a bearing is just as harmful as insufficient lubrication.

10.4.1.4 - Special assembly

For special assemblies (motors fitted with DE roller bearings or other assemblies), machines of frame size ≥ 160 have bearings with grease nipples. Instructions for bearing maintenance are given on the nameplates on these machines.

10.5 - Reconditioning the bearings

Bearings without grease nipples

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

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

Bearings with grease nipples

Always begin by cleaning the waste grease channel

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

If a different grease from that on the nameplate is being used, the motor must be dismantled and the bearings and accessories cleaned with degreasing agent (carefully clean the grease inlet and outlet 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 must be recently manufactured, of an equivalent performance level and must not contain any impurities (dust, water, etc).

10.6 - IP 55 or IP 65 protection for the motor

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

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

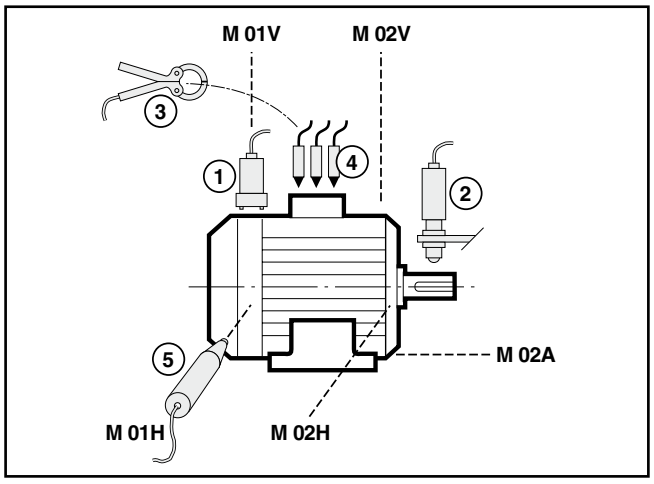
⚠ If the terminal box cover is removed, clean all the parts and replace the seal with a new seal of the same type, if its condition no longer provides the required degree of protection.

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

Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	**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 10.3)
	- Damaged bearings	- Change the bearings
	- Mechanical friction: ventilation, coupling	- Check
	Electrical cause: if the noise stops after switching off the electrical 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 (current)	- Check the winding resistance and the balancing of the mains supply (voltage)
Motor heats up 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 - Broken power supply line	When switched off: - Check by hand that the shaft rotates freely - Check the fuses, electrical protection, starting device, electrical continuity
	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

10.8 - Preventive maintenance

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



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

LSE - FLSE

Three-phase induction motors for atmospheres containing explosive gases and dust

LSE - FLSE

THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

11 - DISMANTLING AND REASSEMBLY PROCEDURE

11.1 - LSE 80 to LSE 160 MP/LR motors

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 LSE 100, 112 and 132 motors.
- Remove the circlip (60) from flanged motors using angled circlip pliers.
- Separate the DE shield from the rotor shaft.
- The shaft can then be seen with its 2 bearings and, if appropriate, the circlip.

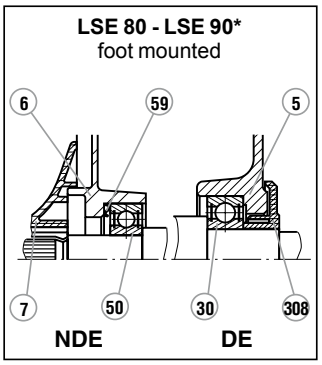
Use a bearing remover to take out the bearings, taking care not to knock the running surfaces of the shaft.

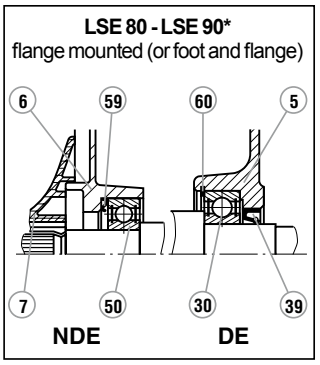
11.1.2 - Reassembling motors without circlip

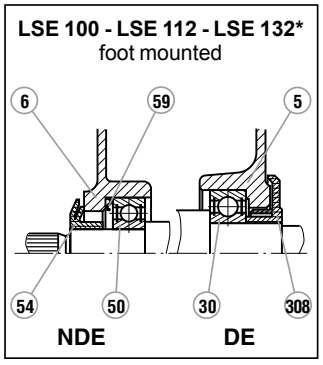
- Mount the bearings on the rotor shaft.
- Insert the rotor into the stator taking all possible precautions not to knock the winding.
- Mount the DE shield (5).
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten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

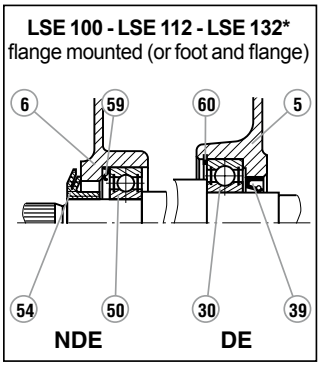
11.1.3 - Reassembling motors with flange and circlip

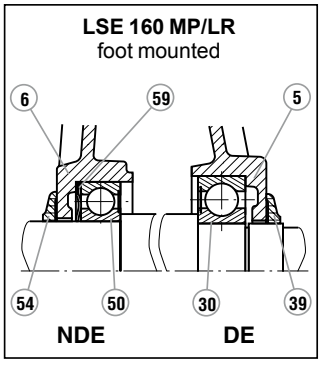
- Mount the DE bearing (30) in the flange (5) using the outer slip-ring for support.
- Fit the circlip (60).
- Mount this assembly on the rotor (3) using the inner slip-ring for support.
- Mount the NDE bearing on the rotor.
- Insert the rotor (3) and shield (5) assembly in the stator taking care not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

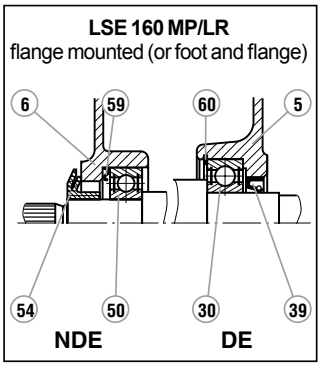










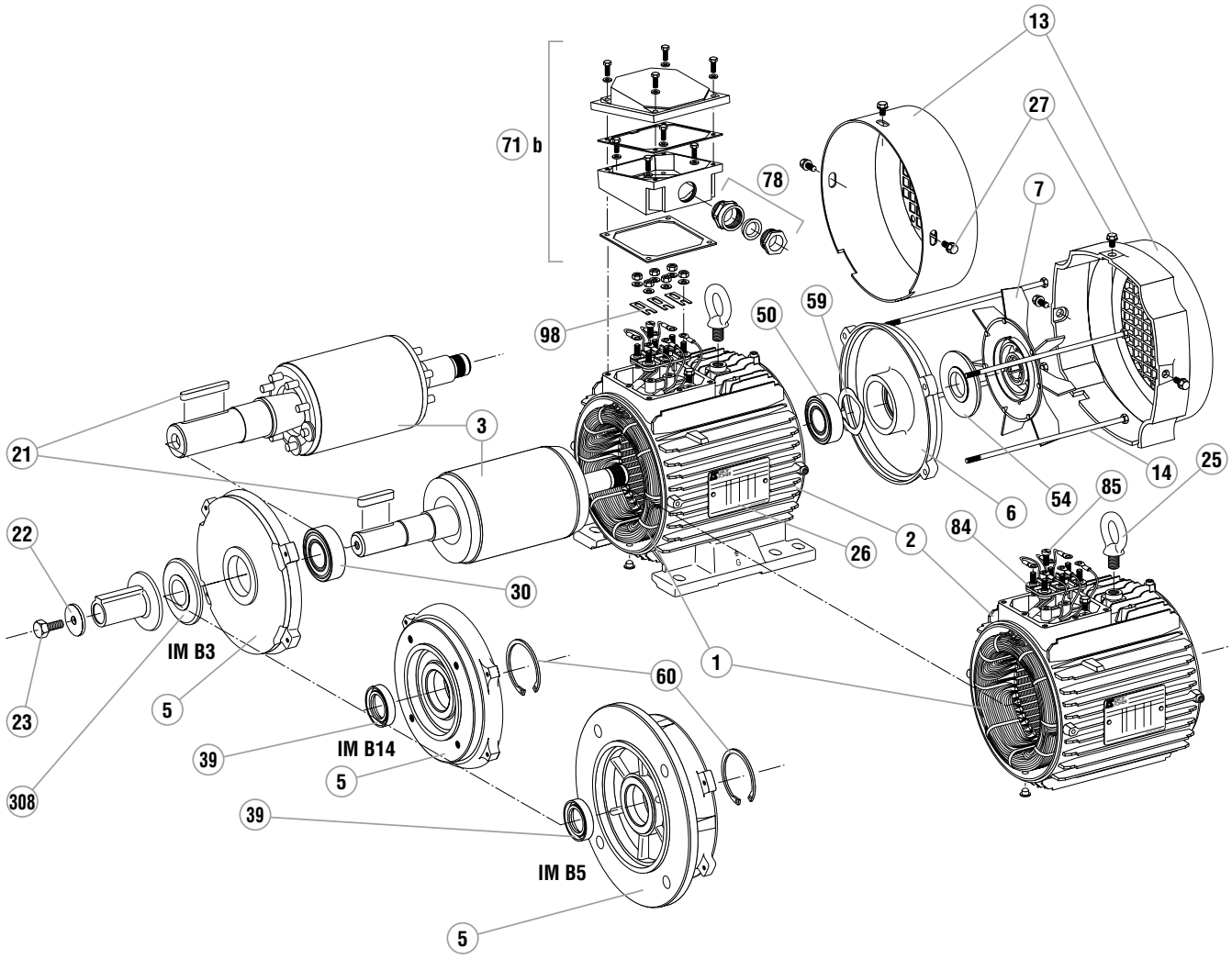


** same as for FLSE motors.*

LSE - FLSE

THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

LSE 80 to LSE 160 MP/LR
FLSE 80 to FLSE 132



LSE 80 to LSE 160 MP/LR

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

11.2 - LSE 160 M/L, LSE 180 MT/LR motors

11.2.1 - Dismantling

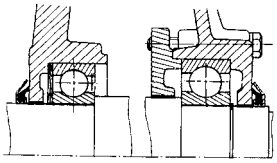
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposite one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors, 54 for flange mounted motors).
- Unscrew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

11.2.2 - Reassembly

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

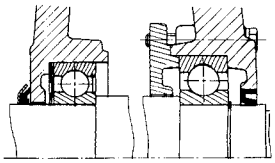
The shields must be fitted with a DE inner bearing retainer.

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



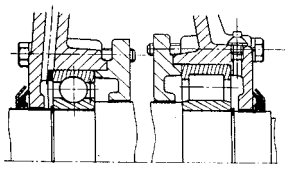
NDE DE

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



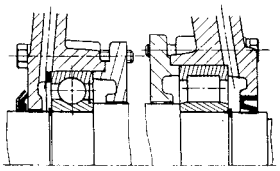
NDE DE

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



NDE DE

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

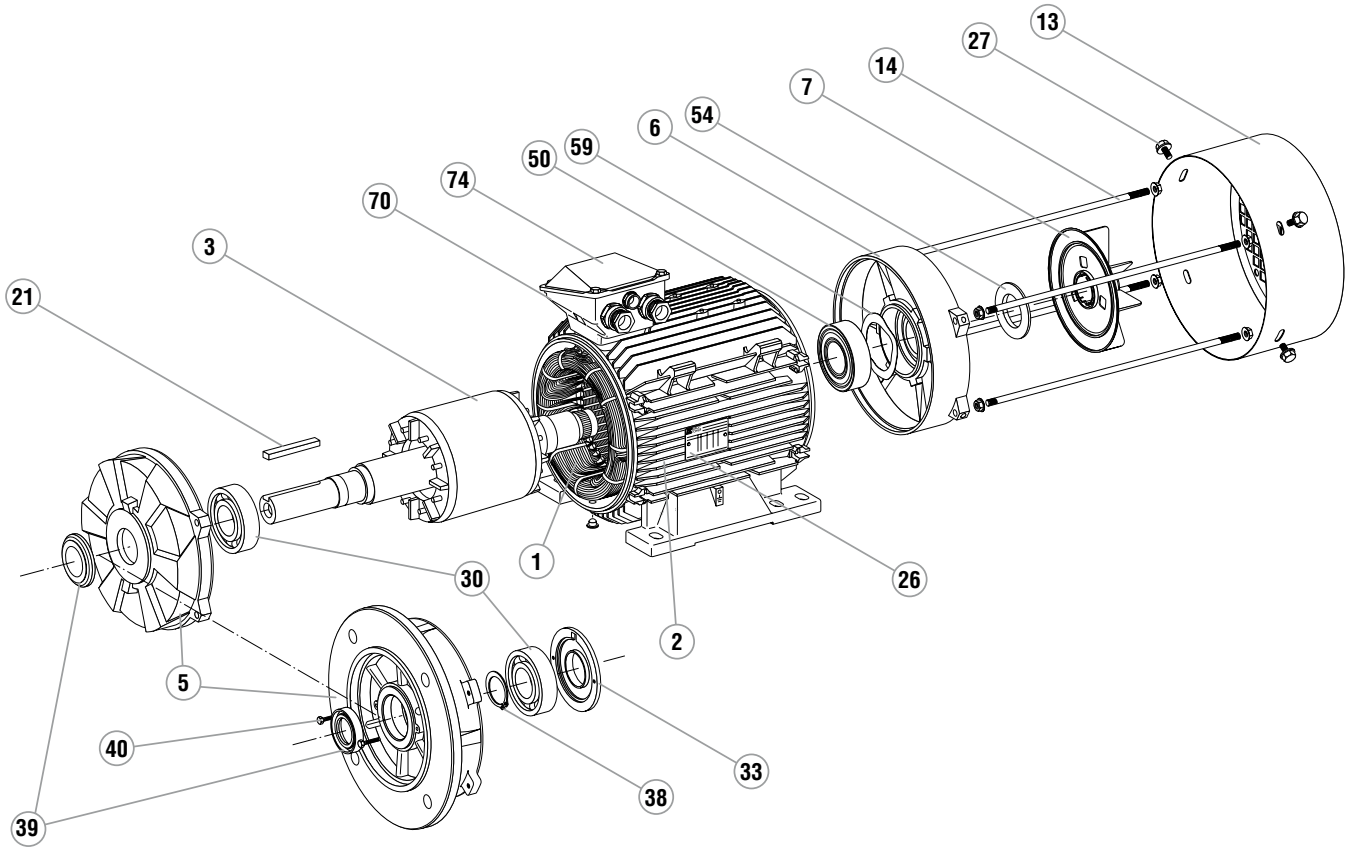


NDE DE

LSE - FLSE

THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

LSE 160 M/L, LSE 180 MT/LR



LSE 160 M/L, LSE 180 MT/LR					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**14**	Tie rods	**39**	Drive end seal
2	Housing	**21**	Key	**40**	Cover fixing screw
3	Rotor	**26**	Nameplate	**50**	Non drive end bearing
5	DE shield	**27**	Fan cover screw	**54**	NDE seal
6	NDE shield	**30**	DE bearing	**59**	Preloading (wavy) washer
7	Fan	**33**	Inner DE bearing retainer	**70**	Terminal box
13	Fan cover	**38**	Drive end bearing circlip	**74**	Terminal box cover

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

11.3.1 - Dismantling

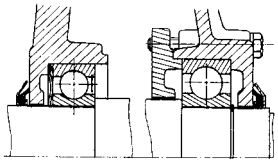
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposite one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors, 54 for flange mounted motors).
- Unscrew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

11.3.2 - Reassembly

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

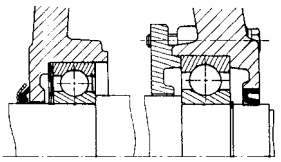
The shields must be fitted with a DE inner bearing retainer.

LSE 180 L - LSE 200
foot mounted
standard bearings



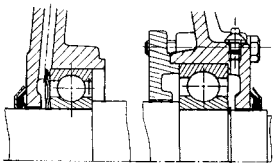
NDE DE

LSE 180 L - LSE 200
flange mounted (or foot and flange)
standard bearings



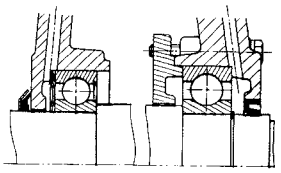
NDE DE

LSE 225 ST/MT/MR
LSE 250 MZ
foot mounted
standard bearings



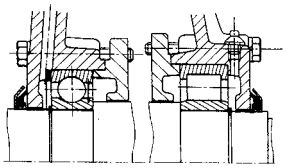
NDE DE

LSE 225 ST/MT/MR
LSE 250 MZ
flange mounted (or foot and flange)
standard bearings



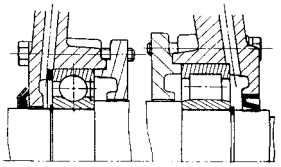
NDE DE

LSE 180 L - LSE 200
LSE 225 ST/MT/MR
LSE 250 MZ
foot mounted
drive end roller bearings



NDE DE

LSE 180 L - LSE 200
LSE 225 ST/MT/MR
LSE 250 MZ
flange mounted (or foot and flange)
drive end roller bearings

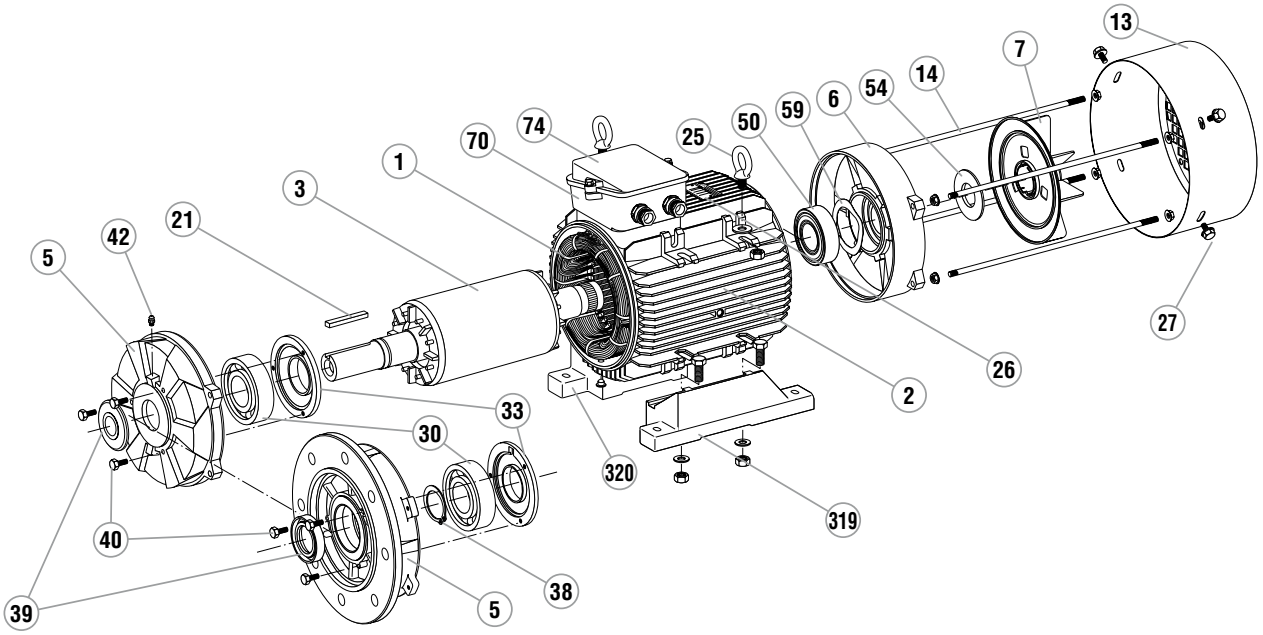


NDE DE

LSE - FLSE

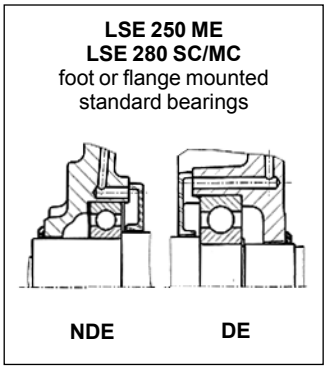
THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

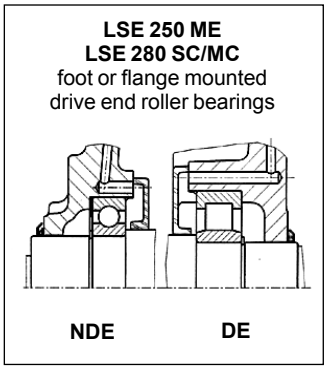
LSE 180 L, LSE 200, LSE 225 ST/MT/MR, LSE 250 MZ



LSE 180 L, LSE 200, LSE 225 ST/MT/MR, LSE 250 MZ					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**25**	Lifting ring	**50**	Non drive end bearing
2	Housing	**26**	Nameplate	**54**	NDE seal
3	Rotor	**27**	Fan cover screw	**59**	Preloading (wavy) washer
5	DE shield	**30**	DE bearing	**70**	Terminal box
6	NDE shield	**33**	Inner DE bearing retainer	**74**	Terminal box cover
7	Fan	**38**	Drive end bearing circlip	**319**	Right foot
13	Fan cover	**39**	Drive end seal	**320**	Left foot
14	Tie rods	**40**	Cover fixing screw		
21	Key	**42**	Grease nipples (optional for LSE 180 L, LSE 200)		

11.4 - LSE 250 ME, LSE 280 SC/MC motors





11.4.1 - Dismantling

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

11.4.2 - Reassembly

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

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

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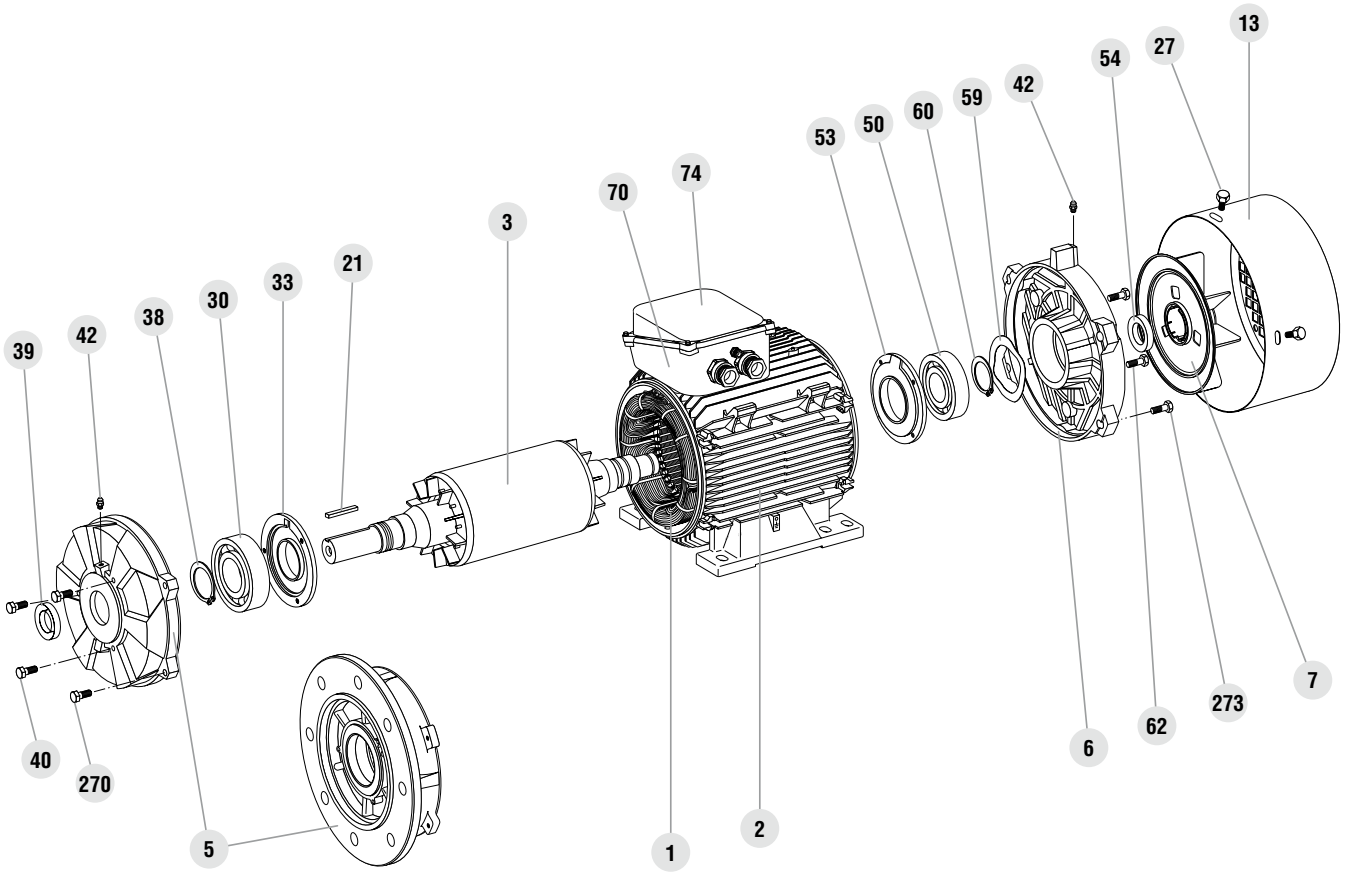
LSE 250 ME, LSE 280 SC/MC



LSE 250 ME, LSE 280 SC/MC					
Ref.	**Description**	**Ref.**	**Description**	**Ref.**	**Description**
1	Wound stator	**30**	DE bearing	**59**	Preloading (wavy) washer
2	Housing	**33**	Inner DE bearing retainer	**60**	Non drive end bearing circlip
3	Rotor	**38**	Drive end bearing circlip	**62**	Cover fixing screw
5	DE shield	**39**	Drive end seal	**70**	Terminal box
6	NDE shield	**40**	Cover fixing screw	**74**	Terminal box cover
7	Fan	**42**	Grease nipples	**270**	DE shield fixing screw
13	Fan cover	**50**	Non drive end bearing	**273**	NDE shield fixing screw
21	Shaft extension key	**53**	Inner NDE bearing retainer		
27	Fan cover screw	**54**	NDE seal		

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