LEROY SOMER®

3713 en - 12.2003 / b

NAVY

This manual is to be given to the end user

Induction motors for the navy

MNI - MNIHS

Installation and maintenance

Induction motors for the navy

MNI - MNIHS

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

Induction motors for the navy
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Dear Customer,

You have just acquired a LEROY-SOMER motor, developed for DCN, for use on fighting ships.

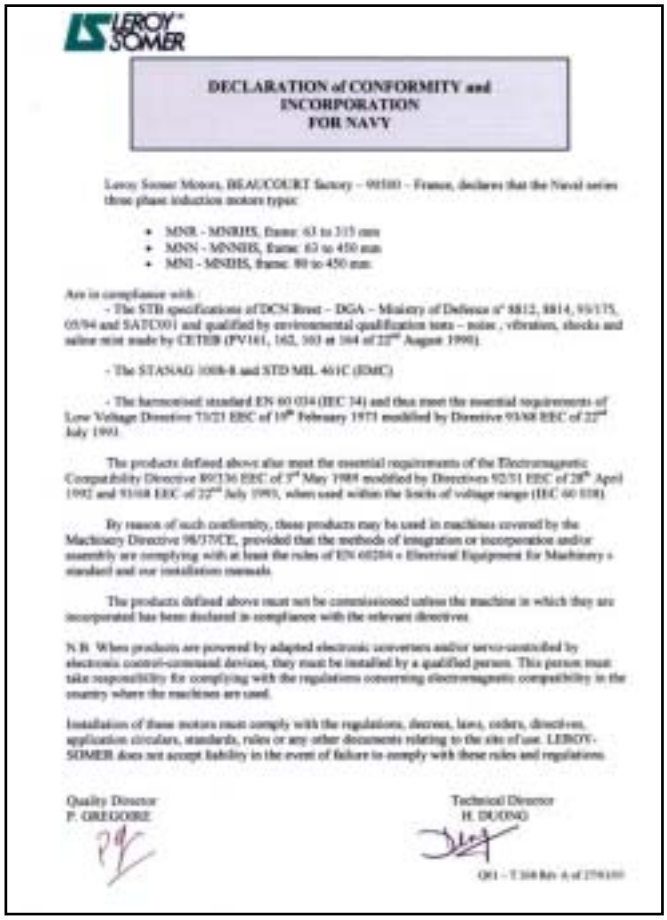
This motor has been defined in accordance with STB 05.94 for MNI motors, and SATC 001 for MNI HS motors.
It benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technology in automation, specially selected materials and rigorous quality control. As a result, the certification bodies have awarded our motor factories ISO 9001 - Edition 2000 certification.

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 MOTORS

CE CONFORMITY:
Our motors conform to standard EN 60034, 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



LEROY SOMER

DECLARATION of CONFORMITY and INCORPORATION FOR NAVY

Leroy Somer Motors, BEAUCOURT factory – 90500 – France, declares that the Naval series three phase induction motors types:

- MNR - MNRHS, frame: 63 to 315 mm
- MNN - MNNHS, frame: 63 to 450 mm
- MNI - MNIHS, frame: 80 to 450 mm

Are in compliance with :

- The STB specifications of DCN Brest – DGA – Ministry of Defence n° 8812, 8814, 93/175, 05/94 and SATC001 and qualified by environmental qualification tests – noise , vibration, shocks and saline mist made by CETEB (PV161, 162, 163 et 164 of 22nd August 1998).

- The STANAG 1008-8 and STD MIL 461C (EMC)

- The harmonised standard EN 60 034 (IEC 34) and thus meet the essential requirements of Low Voltage Directive 73/23 EEC of 19th February 1973 modified by Directive 93/68 EEC of 22nd July 1993

The products defined above also meet the essential requirements of the Electromagnetic Compatibility Directive 89/336 EEC of 3rd May 1989 modified by Directives 92/31 EEC of 28th April 1992 and 93/68 EEC of 22nd July 1993, when used within the limits of voltage range (IEC 60 038).

By reason of such conformity, these products may be used in machines covered by the Machinery Directive 98/37/CE, provided that the methods of integration or incorporation and/or assembly are complying with at least the rules of EN 60204 « Electrical Equipment for Machinery » standard and our installation manuals.

The products defined above must not be commissioned unless the machine in which they are incorporated has been declared in compliance with the relevant directives.

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

Installation of these motors must comply with the regulations, decrees, laws, orders, directives, application circulars, standards, rules or any other documents relating to the site of use. LEROY-SOMER does not accept liability in the event of failure to comply with these rules and regulations.

Quality Director
P. GREGOIRE

Technical Director
H. DUONG

QS1 – T 316 Rév. A of 27/9/1999

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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CONTENTS

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MNI motors range – Extracts from STB 05/94

	rated output power in kw	frame size
2-pole motors	1.1	80
	2.2	90
	4	112
	7.5	132
	18.5	160
	37	200
4-pole motors	0.75	80
	0.75	80 S (1)
	1.5	90
	2.2	100
	2.2	100 S (1)
	4	112
	7.5	132
	11	160
	15	160
	22	180
	30	200
	45	225
	55	250
4/8-pole motors	0.63/0.125	80
	0.63/0.125	80 S (1)
	2.2/0.55	100
	2.2/0.55	100 S (1)
	5.5/1.1	132
	11/2.2	160
6-pole motors	1.1	90
	3	132

(1) / Special with flying leads (for fans)

For all motors whose specification does not conform to definition STB 05/94 from DCN BREST, we have created Non-Standard (HS) motors - STB - SATC001.

- Power > 55 kW with 4 poles
- Power > 37 kW with 2 poles
- Power > 11/2.2 kW with 4/8 poles
- Power > 3kW with 6 poles
- Different number of poles (2/4P)
- Different construction (B35 for frame size 132)
- Switchgear equipment (drip cover - PTC - heating tapes - PTO - PTF)
- Cable glands differing from drawing 17-060-550

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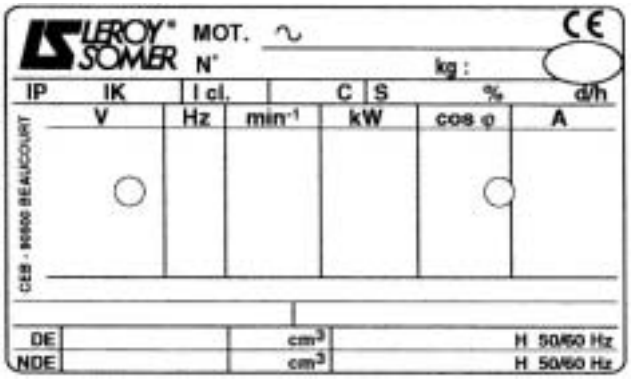
RECEIPT

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.



Definition of symbols used on nameplates:

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

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

MNI : Range

160 : Frame size

L : Housing symbol

TR : Impregnation index

Motor number

N° : Serial number

for motor types 80 to 355:

H* : Year of production

A** : Month of production

002 : Batch number

* **L** = 2001 ** **A** = January
M = 2002 **B** = February

IP55 IK08 : Protection index

(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

Bearings

DE : Drive end bearing

NDE : Non drive end bearing

60 cm^3 : Amount of grease at each regreasing (in cm^3)

4500 H : Lubrication interval (in hours) for stated θ amb at 50 Hz frequency

3000 H : Lubrication interval (in hours) for stated θ amb at 60 Hz frequency

ESSO BEACON EP3 :Type of grease

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RECOMMENDATIONS FOR ASSEMBLY

1.2 - Storage

Prior to commissioning, machines should be stored:
- Away from humidity: in conditions of relative humidity of more than 90%, the machine insulation can drop very rapidly, to just above zero at around 100% ; monitor the state of the anti-rust protection on unpainted parts.

For very long storage periods the motor can be placed in a sealed covering (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

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

Greases used by LEROY-SOMER
(see nameplate):
grade 3: ESSO BEACON EP3

2 - RECOMMENDATIONS FOR ASSEMBLY

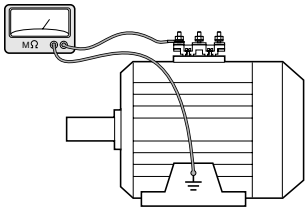
Electric motors are industrial products. They must therefore be installed by qualified, experienced and authorised personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards).

2.1 - Checking the insulation

Before starting up the motor, it is advisable to check the phase-earth and phase-phase insulation.

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 in 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).



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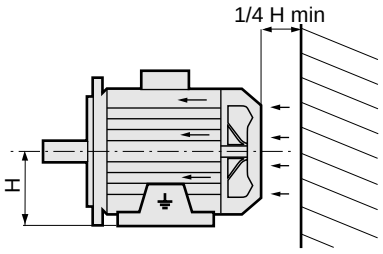
Warning: As the high voltage test has been performed in the factory before despatch, if it needs be repeated, it should be performed at half the standard voltage, ie: 1/2 (2U+1000V). Check that the capacitive effect resulting from the high voltage test is eliminated before connecting the terminals to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

Prior to commissioning for all motors:
Rotate the motor at no load (no mechanical load) for 2 to 5 minutes, checking that there is no abnormal noise. If there is any abnormal noise, see section 5.

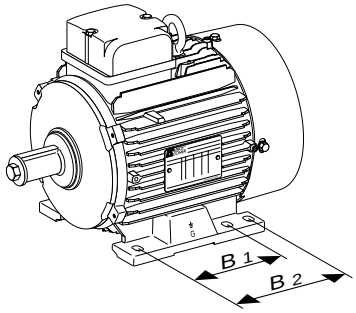
2.2 - Location - ventilation

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.



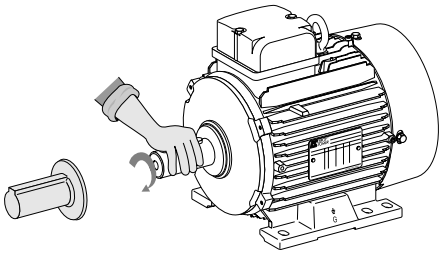
Ensure there is easy access to the terminal box, the condensation drain plugs and, if appropriate, to the grease nipples.

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.

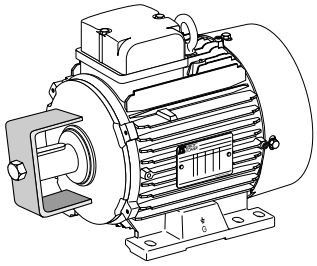
2.3 - Coupling

Preparation
Turn the motor by hand before coupling to detect any fault caused by handling operations.
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.



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RECOMMENDATIONS FOR ASSEMBLY

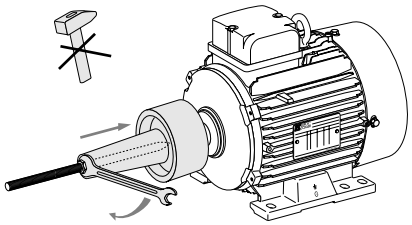
Balancing
Rotating machines are balanced in accordance with standard ISO 8821:
- Half-key when the shaft extension is marked H
- Full key when the shaft extension is marked F (FAPMO)
and any coupling element (pulley, coupling sleeve, slip-ring, etc) must therefore be balanced accordingly.

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

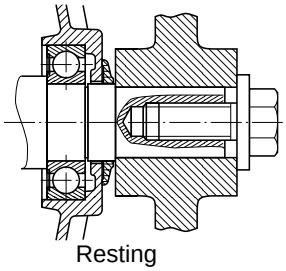
⚠ **If a motor is started up without a coupling device having been fitted, carefully immobilise the key in its location.**

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.

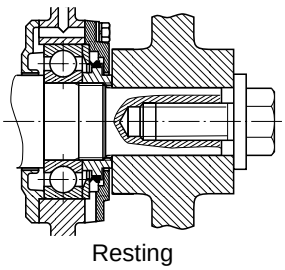
Tolerances and adjustments
The standard tolerances are applicable to the mechanical characteristics given in our catalogues. They comply fully with the requirements of IEC standard 72-1.
- Users must adhere strictly to the instructions provided by the transmission device supplier.
- Avoid impacts which could damage the bearings.
Use a spanner and the tapped hole of the shaft extension with a special lubricant (eg. 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 the shoulder of the shaft



Resting on the stop ring

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

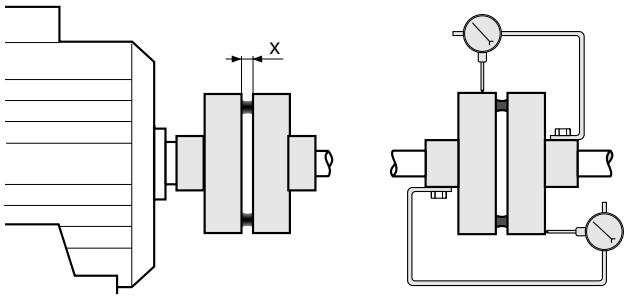
Direct connection onto the machine
When the mobile device (pump or fan turbine) is mounted directly on the motor shaft extension, check that this device is perfectly balanced and that the radial force and the axial thrust are within the limits indicated in the catalogue for the bearing withstand.

Direct connection using a flexible coupling
The coupling must be chosen taking into account the rated torque to be transmitted and the safety factor according to 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 is compatible with the recommendations of the coupling manufacturer.

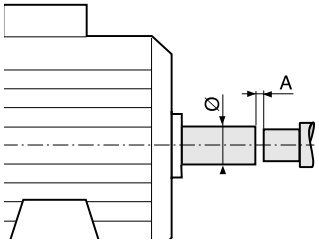
Both parts of the coupling should be provisionally assembled to make it easier to alter their relative position.

Adjust the parallelism 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 in order to keep to the tolerances given by 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

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RECOMMENDATIONS FOR 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}.

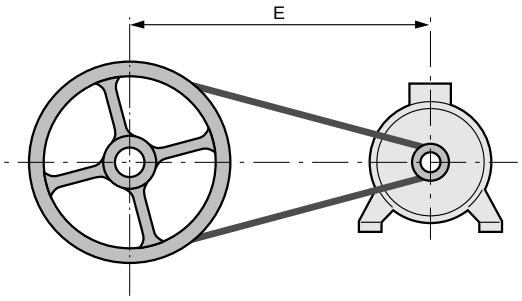
Flat belts cannot be used for rotation speeds of 3000 min^{-1} or more.

Positioning the belts

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

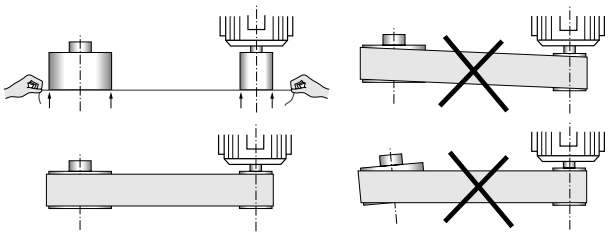
Force must never be used when fitting the belts.

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:

- 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:

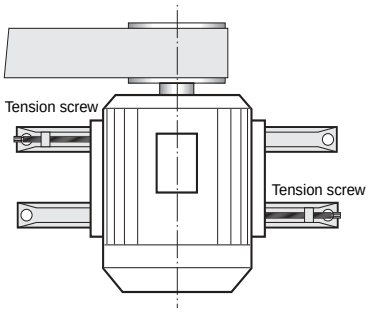
The motor is generally mounted on slide rails, which enables optimum adjustment of the pulley alignment and the belt tension.

Place the slide rails on a totally 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.

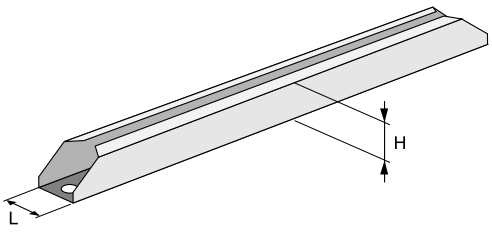
Mount the slide rails firmly with the tension screws in the direction shown in the diagram (the slide rail screw on the belt side between the motor and the machine being driven).

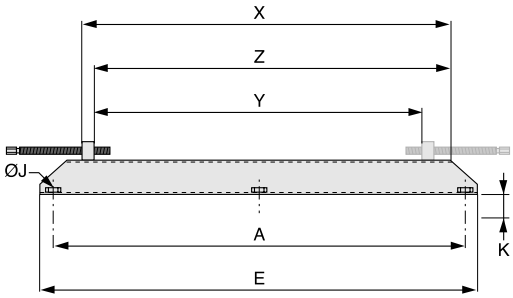
Fix the slide rails onto the baseplate and adjust the belt tension as before.



Option: 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	SLIDE RAIL	DIMENSIONS									WEIGHT OF PAIR
FRAME SIZE	TYPE	A	E	H	K	L	X	Y	Z	Ø J	SLIDE RAILS (kg)
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

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RECOMMENDATIONS FOR ASSEMBLY

2.4 - Electrical guidelines

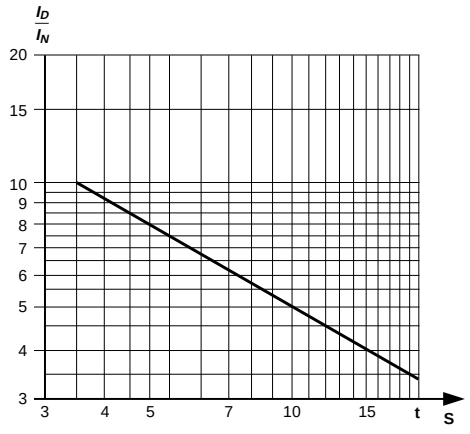
2.4.1 - Minimizing motor starting problems

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 increased service life 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 is possible to adapt the torque and the current to the machine starting time and to the possibilities of the mains power supply.

2.4.2 - Starting times and permissible 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 times as a function of the ratio

2.4.3 - Earthing (see section 2.5.4)

2.4.4 - Motor protection devices

2.4.4.1 - 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 - MNIHS
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.

2.4.4.2 - Built-in indirect thermal protection - MNIHS

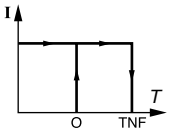
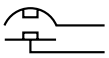
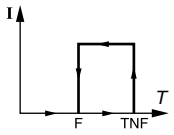
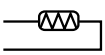
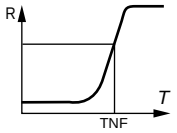
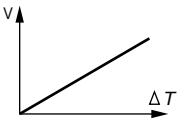
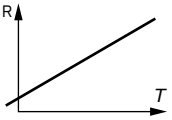
The motors can be equipped with optional heat sensors. These sensors can be used to monitor temperature changes at “hot spots”:
- overload detection
- cooling check
- monitoring strategic points for maintenance of the installation

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

Induction motors for the navy

MNI - MNIHS

RECOMMENDATIONS FOR ASSEMBLY

Type	Operating principle	Operating curve	Cut-off (A)	Protection provided	Mounting Number of devices*
Normally closed thermostat **PTO**	bimetallic strip, indirectly heated, with normally closed (NC) contact 		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounting in control circuit 2 or 3 in series
Normally open thermostat **PTF**	bimetallic strip, indirectly heated, with normally open (NO) contact 		2.5 at 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounting in control circuit 2 or 3 in parallel
Positive temperature coefficient thermistor **PTC**	Variable non-linear resistor with indirect heating 		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	Mounting in switchboards with associated reader (or recorder) 1 per hot spot
Platinum resistance thermometer **PT 100**	Variable linear resistor indirect heating		0	high accuracy continuous surveillance at key hot spots	Mounting in switchboards with associated reader (or recorder) 1 per hot spot

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

* The number of devices affects the protection of the windings.

Alarm and early warning

All protective equipment may 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 switched off before any work is carried out in the terminal box or in the cabinet.

Induction motors for the navy

MNI - MNIHS

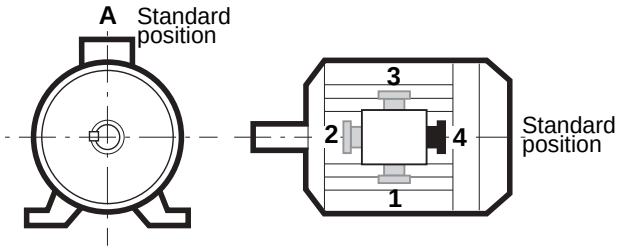
RECOMMENDATIONS FOR ASSEMBLY

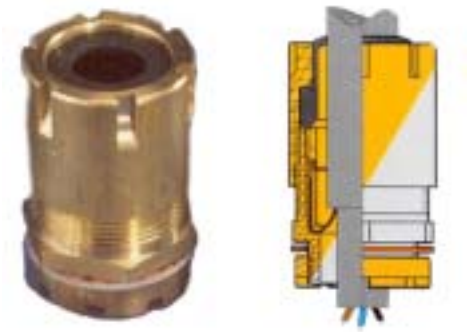
2.5 - Mains connection

2.5.1 - Terminal box

Placed as standard on the top of the motor near the drive end, the terminal box has IP 55 protection and is fitted with a cable gland.
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.

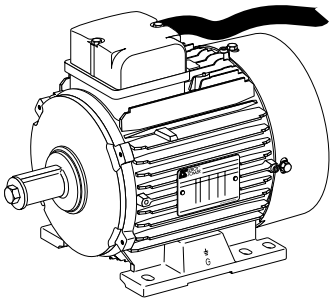
BVLE cable gland
The standard position of the cable gland is at the back, seen from the drive end.





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.



Type of BVLE	Min. cable Ø (mm)	Max. cable Ø (mm)
1	8	13.5
2	10	16.5
3	13	20.5
4	19.5	25
5	23	29
6	30	38
7	38	44.5
9	46	53

2.5.2 - Wiring diagram

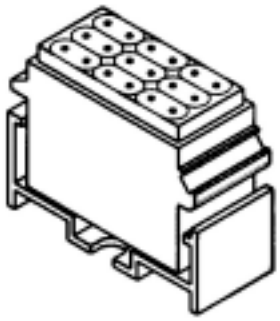
All motors are supplied with a wiring diagram in the terminal box*.
The connections are made with MAF terminals.

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

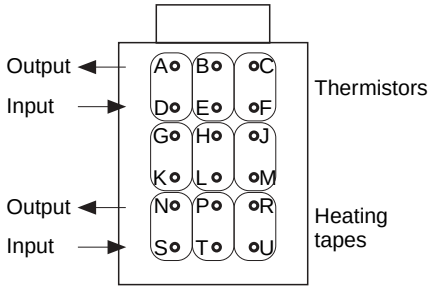
2.5.3 - Direction of rotation

When the motor is running in 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 for 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 a terminal block.

Terminal block



HL 105 modules



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

2.5.4 - Earth terminal

This is situated inside the terminal box and on the housing.

It is indicated by the symbol: ⏚

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

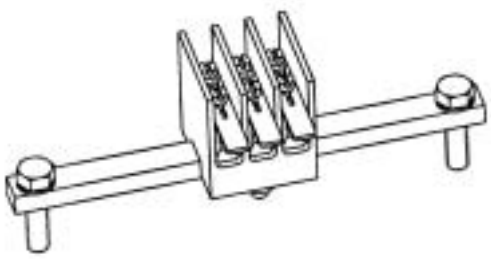
2.5.5 - MAF terminals

Type A43B2C 80 to 132 motors

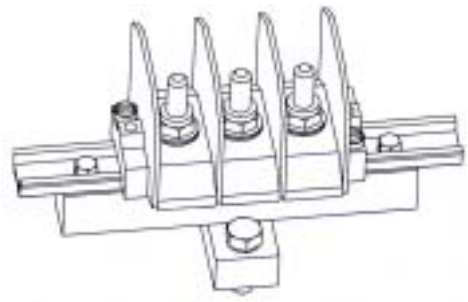
Type BJT 14-6 160 L 2P motors
160 M 4P motors
180 M 4P motors

Type BJT 12-5 160 L 4P motors
160 M 4/8P motors

Type BJT 23-8 200 to 250 motors
MNIHS 280 motors



MAF terminal for 80 - 132



MAF terminal for 200 to 280

When closing the box, ensure that the seal is correctly positioned.

⚠ **Make sure at all times that no nuts, washers, or other foreign bodies have fallen in and might be in contact with the winding.**

3 - ROUTINE MAINTENANCE

Checks after start-up
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 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.

⚠ **Cleaning should be always be done at reduced pressure from the centre of the motor outwards to avoid dust and particles getting 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.

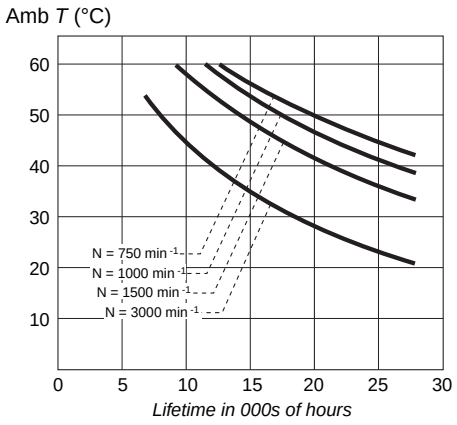
3.1 - Lubrication

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 BEACON EP3 and we recommend that it is used for subsequent lubrication.
Avoid mixing greases.

3.1.2 - Permanently greased bearings

For **80 to 132 motors**, the specified bearings make for 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 with grease nipples

The bearings are lubricated in the factory
For motors of type 160 or above, the end shields are fitted with bearings lubricated by greases such as Técalémit-Hydraulic M8 x 125.

⚠ **The frequency of lubrication, 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.**

3.2 - 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 pipe.
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 turn over the motor to distribute the grease.

Warning:
Too large an amount of grease causes excessive temperature rise in the bearing (statistically the number of bearings damaged by too much grease is higher than the number of bearings damaged by insufficient lubrication).

Important note:
The new grease should be recently manufactured, of equivalent performance and should not contain any impurities (dust, water, etc).

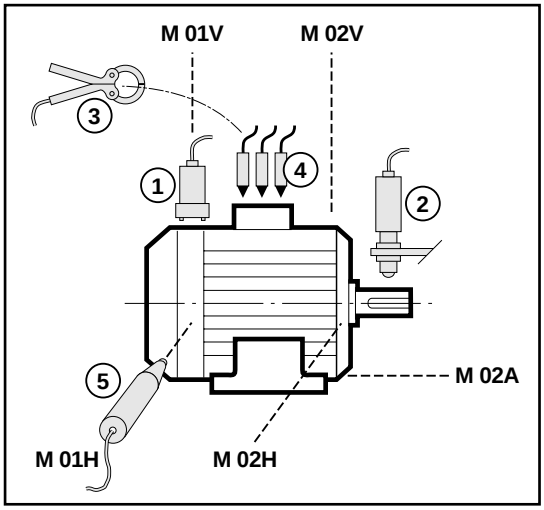
Induction motors for the navy

MNI - MNIHS

PREVENTIVE MAINTENANCE

4 - PREVENTIVE MAINTENANCE

Consult LEROY-SOMER, who in its continuous search for ways to help our customers, has evaluated numerous methods of preventive maintenance.
The diagram and table below give the recommended equipment to use and the ideal positions to take measurements of all parameters which can affect the operation of the machine, such as eccentricity, vibration, state of bearings, structural problems, electrical problems, etc.



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

5 - TROUBLESHOOTING GUIDE

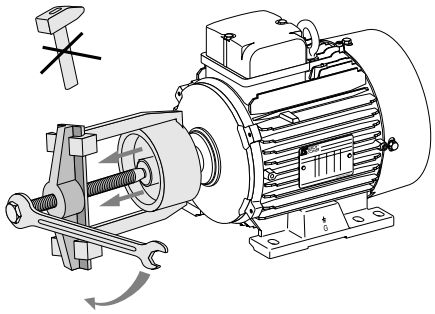
Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	**Mechanical cause**: if the noise persists after switching off the electrical power supply	
	- Vibration	- Check that 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
	- 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 nameplate of the motor
	- Partial short-circuit	- Check the electrical continuity of the windings and/or the installation
	- Phase imbalance	- Check the winding resistance
Motor does not start	**At no load** - Mechanical locking - Broken power supply line	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

6 - CORRECTIVE MAINTENANCE: GENERAL

Switch off and lock the power supply before any intervention

- 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.



6.1 - Dismantling the motor

Refer to the detailed instructions for the relevant motor range (see following pages).
It is advisable to identify the shields in relation to the stator and the direction of the fan on the rotor.

6.2 - Checks before reassembly

Stator:
- Remove all dust from the stator:

if the winding needs to be cleaned, an appropriate liquid must be used: dielectric and inert on the insulation 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 caps 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:

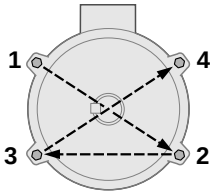
- Cold state: The bearings must be mounted without any impact, using a spanner (do not use a hammer). The force applied must not be transferred to the bearing track. You should therefore use the internal cage for support (taking care not to press on the seal shield for sealed bearings).
- Hot state: heat the bearing to between 80 and 100°C: in a 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.
See detailed instructions for the relevant motor ranges in the following pages.

6.4 - Reassembling the motor

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 below).



Tie rod tightening torque

Type	Rod/screw Ø	Tightening torque N. m ± 5%
80	M5	4
90	M5	4
100	M5 or M6	4
112	M5 or M6	4
132	M7	10
160	M8	18
180 L	M10	25
200	M10	25
225 M	M12	44
250	M12	44
280 MNIHS	M12	44
315 MNIHS	M12	44

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 nozzle (part no. 89 on the exploded views) or/and a cable gland support plate, ensure that the seal has been correctly positioned before closing. Check that the terminal box components are tightened correctly.

Note: It is advisable to test the motor at no load
- If necessary, repaint the motor.
- Mount the transmission device on the motor shaft extension and reinstall the motor on the machine to be driven.

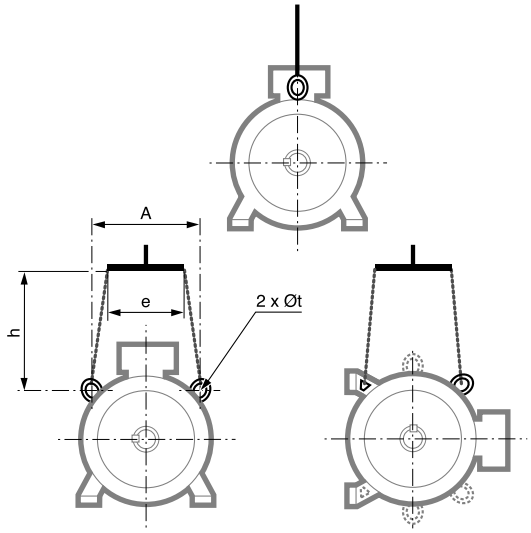
7 - POSITION OF THE LIFTING RINGS

⚠ **Position of the lifting rings for lifting the motor only (not coupled 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.

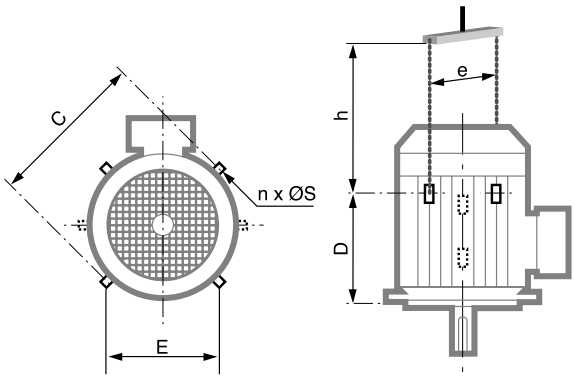
⚠ **Motors designed for use in a vertical position may be delivered on a pallet in the horizontal position. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings may be irreparably damaged. Moreover, additional special precautions must be taken,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

• 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

** 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.*

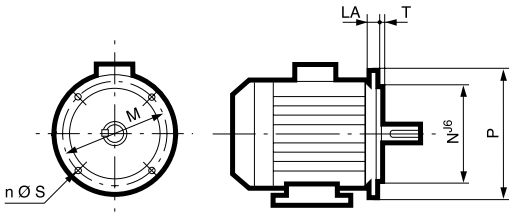
8 - SPARE PARTS

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

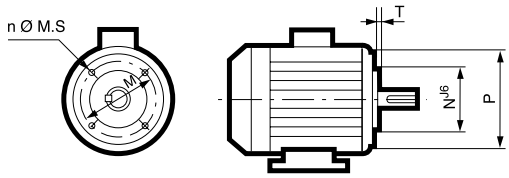
Part numbers can be found on the exploded views and their descriptions in the parts list (see section 9).

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

IM 3001 (IM B35)



IM 3601 (IM B34)



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.

Induction motors for the navy

MNI - MNIHS

SPARE PARTS

9 - PROCEDURE FOR DISMANTLING AND REASSEMBLY

9.1 - MNI - MNIHS 80 to 132 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).
- 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.

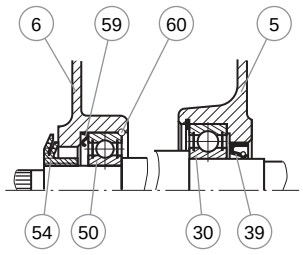
9.1.2 - Reassembling motors without circlip

- 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).
- 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 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 table opposite).
- 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).

MNI - MNIHS 80 to 132
foot and flange

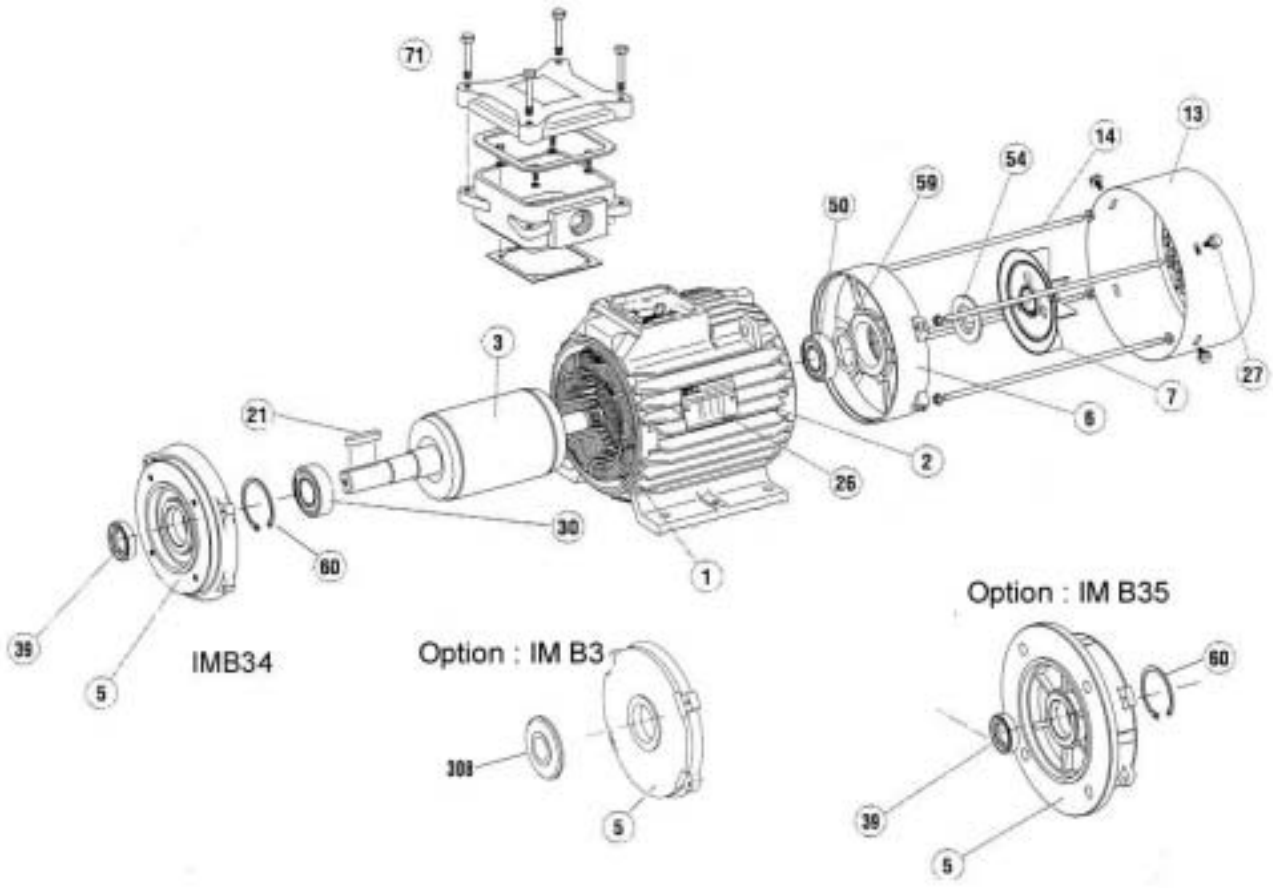


Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

MNI - MNIHS 80 to 132



MNI - MNIHS 80 to 132					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**14**	Tie rods	**54**	Non drive end seal
2	Housing	**21**	Shaft extension key	**59**	Preloading (wavy) washer
3	Rotor	**26**	Nameplate	**60**	Circlip
5	DE shield	**27**	Fan cover screw	**71**	Terminal box
6	NDE shield	**30**	Drive end bearing	**308**	Labyrinth seal
7	Fan	**39**	Drive end seal		
13	Fan cover	**50**	Non drive end bearing		

Cable gland - Terminal block (see page 13-14)

Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

9.2 - MNI - MNIHS 160 and 180 motors

9.2.1 - 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.

9.2.2 - 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 DE internal cover (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.

9.2.3 - 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 section **"CHECKS BEFORE REASSEMBLY"**.

9.2.4 - Reassembly

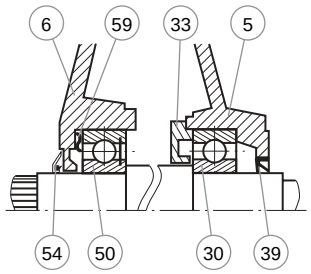
- Mount the bearings on the rotor shaft (not forgetting the DE internal cover (33).
- Slide the DE shield (5) onto the bearing (30).
- Replace the fixing screws (40) on the internal cover (33).
- Insert the rotor + shield assembly in the stator without knocking the winding.
- Present the shields, grease 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 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

MNI - MNIHS 160 to 160
foot and flange
standard bearings

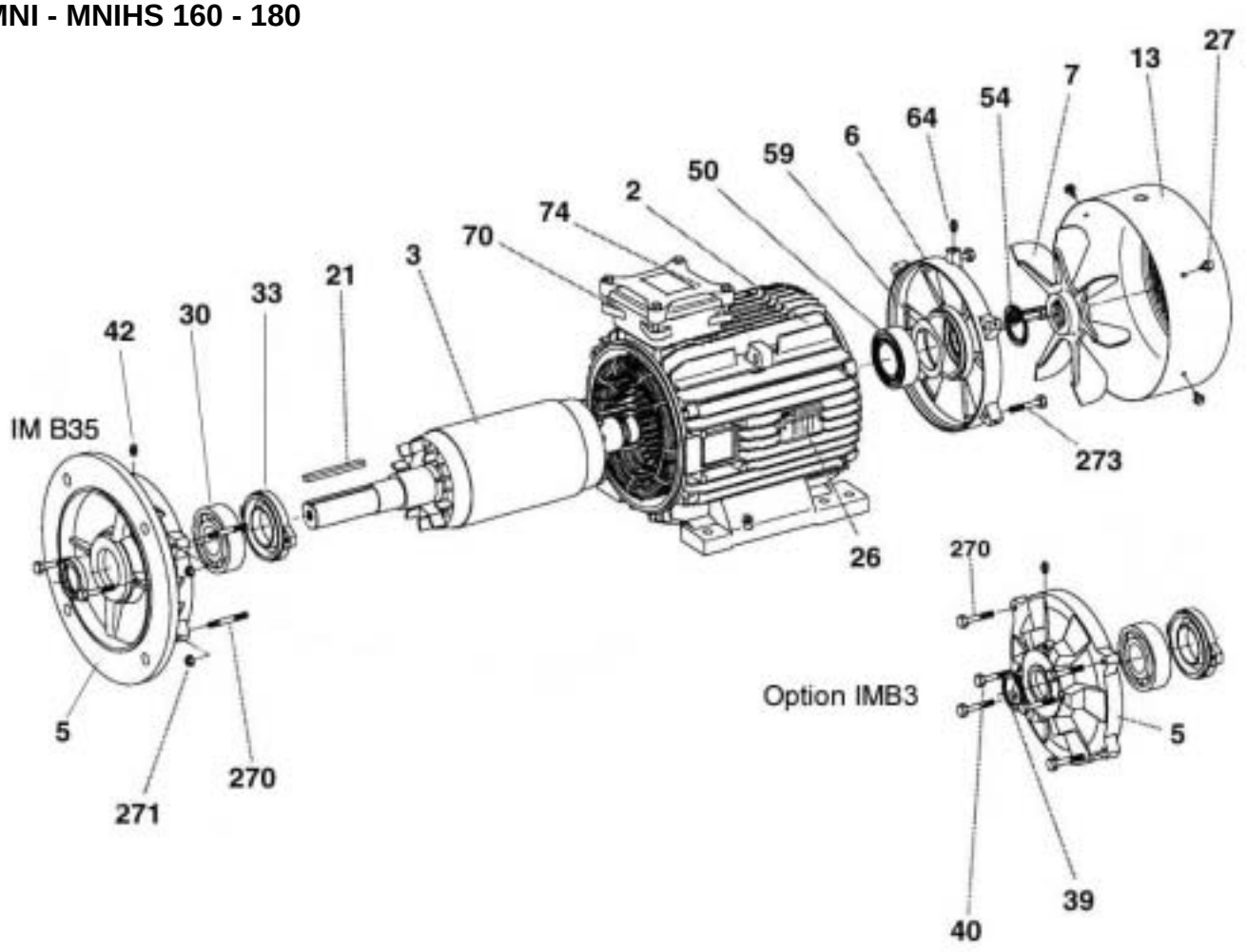


Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

MNI - MNIHS 160 - 180



MNI - MNIHS 160 and 180

No.	Description	No.	Description	No.	Description
1	Wound stator	**26**	Nameplate	**54**	NDE seal
2	Housing	**27**	Fan cover screw	**59**	NDE preloading (wavy) washer
3	Rotor	**30**	Drive end bearing	**64**	NDE grease nipple
5	DE shield	**33**	DE internal cover	**70**	Stator terminal box
6	NDE shield	**39**	DE seal	**74**	Terminal box lid
7	Fan	**40**	Cover fixing screw	**270**	DE shield fixing screw
13	Fan cover	**42**	DE grease nipple	**271**	DE shield fixing nut
21	Shaft extension key	**50**	Non drive end bearing	**273**	NDE shield fixing screw

Cable gland - Terminal block (see page 13-14)

Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

9.3 - MNI - MNIHS 200 motors

9.3.1 - 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 NDE internal cover (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.

9.3.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
- Remove the fixing screws (40) from the DE internal cover (33).
- Remove the fixing screws (270) from the DE shield (5).
- Remove the fixing screws 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. The seal (39) follows behind and is no longer usable.

9.3.3 - 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) 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 section **"CHECKS BEFORE REASSEMBLY"**.

9.3.4 - Reassembly

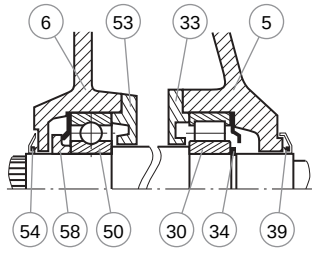
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the internal cover (33), and also the NDE bearing (50) if and only if the lower Ø of the stator allows the NDE internal cover (53) to pass through.
- Install the fixed part of the grease valves (no. (55) for the non-drive end and (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 bearing internal 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 internal cover (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 internal cover (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 internal cover fixing screws (33) and (53).
- Use a drift to fit a new seal (54).
- Replace the fan (7).
- Use a drift to fit a new seal (39).
- Replace the cover (13) and reinsert the fixing screws (27).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.

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

MNI - MNIHS 200
standard bearings

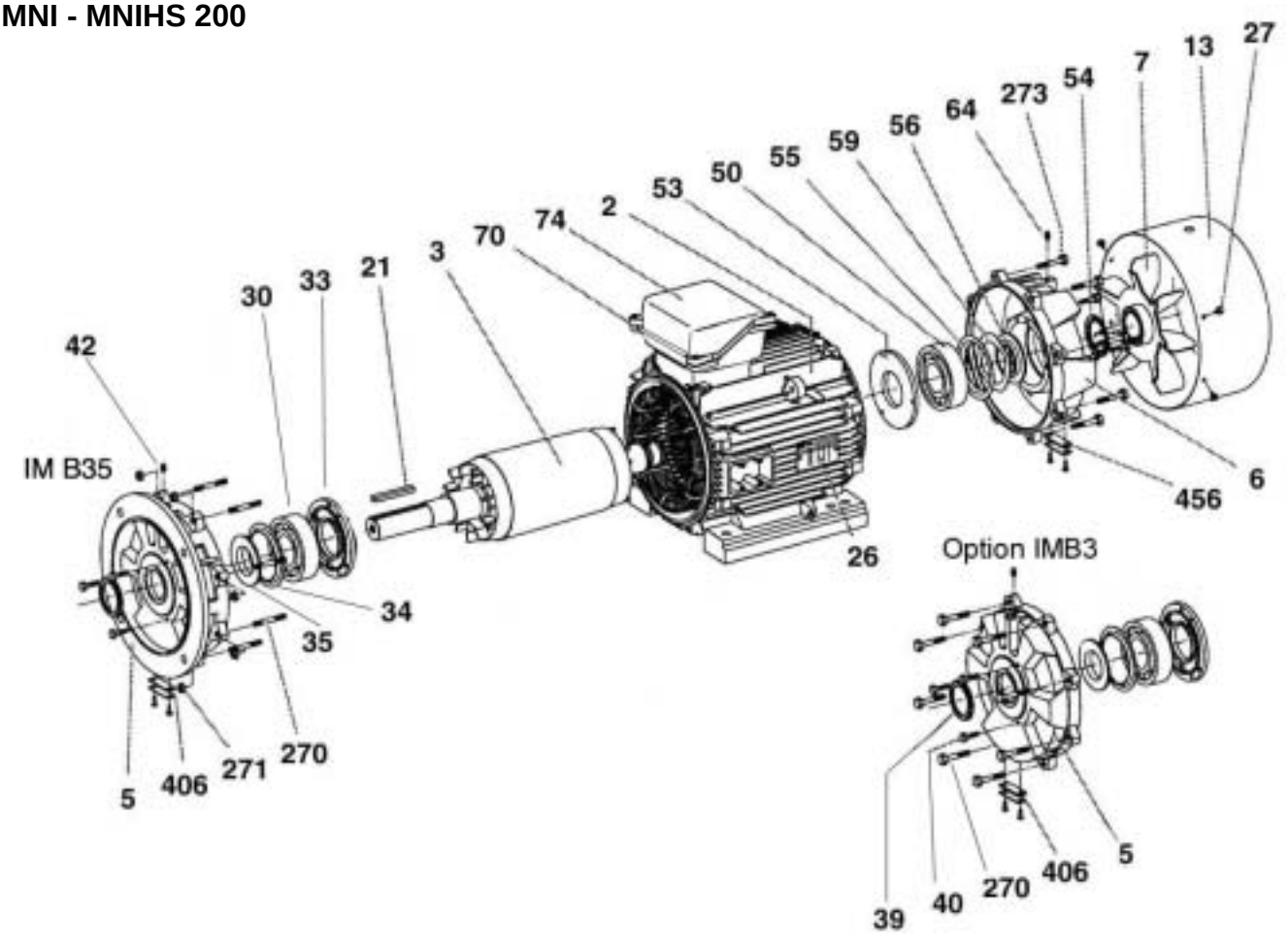


Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

MNI - MNIHS 200



MNI - MNIHS 200					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**33**	DE internal cover	**59**	NDE preloading (wavy) washer
2	Housing	**34**	Fixed part of DE grease valve	**64**	NDE grease nipple
3	Rotor	**35**	Moving part of DE grease valve	**70**	Stator terminal box
5	DE shield	**39**	DE seal	**74**	Stator terminal box lid
6	NDE shield	**40**	Cover fixing screw	**270**	DE shield fixing screw
7	Fan	**42**	DE grease nipple	**271**	DE shield fixing nut
13	Fan cover	**50**	Non drive end bearing	**273**	NDE shield fixing screw
21	Shaft extension key	**53**	NDE internal cover	**406**	DE Grease valve cover plate
26	Nameplate	**54**	NDE seal	**456**	NDE Grease valve cover plate
27	Fan cover screw	**55**	Fixed part of NDE grease valve		
30	Drive end bearing	**56**	Moving part of NDE grease valve		

Cable gland - Terminal block (see page 13-14)

Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

9.4 - MNI - MNIHS 225 M to 280 motors

9.4.1 - 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 NDE internal cover (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.

9.4.2 - 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.

9.4.3 - 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 section **"CHECKS BEFORE REASSEMBLY"**.

9.4.4 - Reassembly

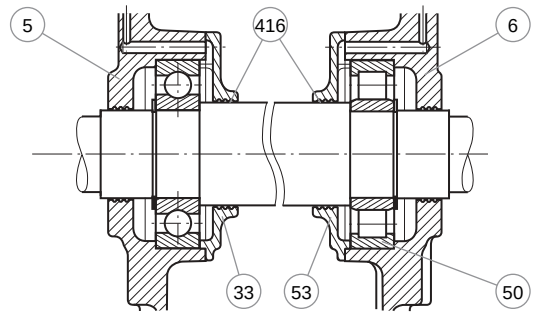
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the internal cover (33) and the circlip (38), and also the NDE bearing (50) if and only if the lower Ø of the stator allows the NDE internal cover (53) to pass through.
- Insert the rotor into the stator taking care not to knock 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 internal cover (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 internal cover (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 internal cover fixing screws (33) and (53). Replace the AZ washers to ensure a perfect seal.
- Replace the fan key if appropriate.
- Replace the fan (7).
- Replace the shaft extension screw if necessary.
- Replace the cover (13) and reinsert the fixing screws (27).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.

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

MNI - MNIHS 225 M to 280
standard bearings

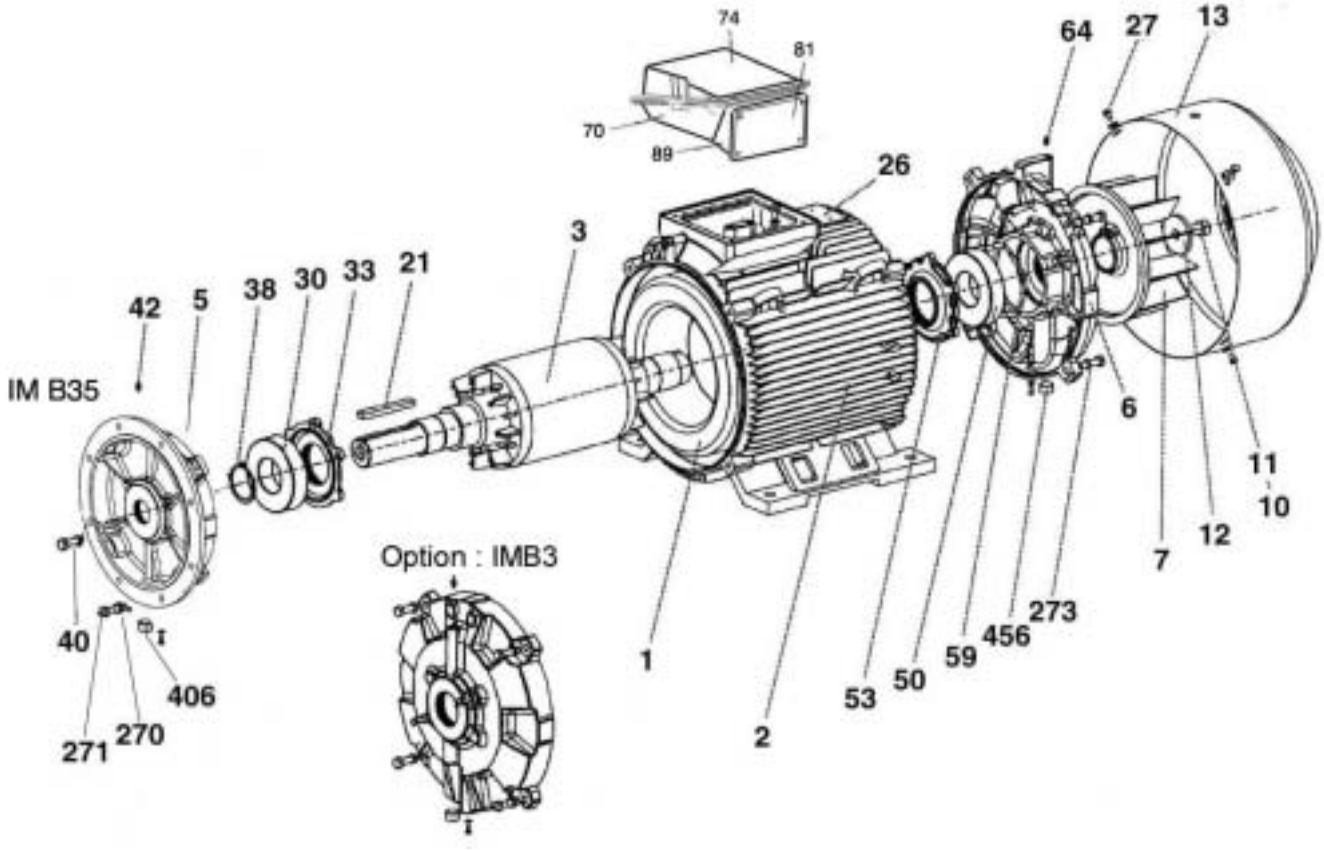


Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

MNI - MNIHS 225 M to 280



No.	Description	No.	Description	No.	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**	DE internal cover	**81**	Cable gland support plate
6	NDE shield	**38**	DE bearing circlip	**89**	Connection - Terminal box nozzle
7	Fan	**40**	Cover fixing screw	**270**	DE shield fixing screw
10	Turbine or fan screw (280 - 4p)	**42**	DE grease nipple	**271**	DE shield fixing nut
11	Brake washer (not shown) (280 - 4p)	**50**	Non drive end bearing	**273**	NDE shield fixing screw
12	Lock washer (280 - 4p)	**53**	NDE internal cover	**406**	Grease valve cover plate drive end - (plug)
13	Fan cover	**59**	NDE preloading (wavy) washer	**456**	Grease valve cover plate non-drive end - (plug)
21	Shaft extension key	**64**	NDE grease nipple		

Cable gland - Terminal block (see page 13-14)

Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

9.5 - MNI - MNIHS 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.

9.5.1 - 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 NDE internal cover (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).

9.5.2 - 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 DE internal cover (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).

9.5.3 - 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 section **"CHECKS BEFORE REASSEMBLY"**.

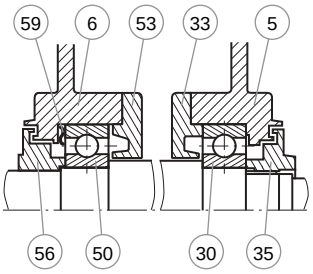
9.5.4 - Reassembly

- Mount the DE bearing (30) on the rotor shaft (take care not to forget the internal cover (33), and also the NDE bearing (50) and the NDE internal cover (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 internal cover tapped holes **so that the grease inlet pipes fully correspond**.
- End with the non-fixed bearing. Fix a dowel pin in one of the internal cover tapped holes **so that the grease inlet pipes fully correspond**.
- Lift the rotor slightly and fit the shields in place.

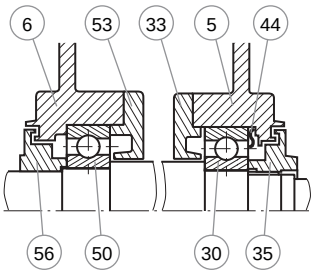
From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.
- Replace the shield fixing screws (270) and (273).
- Replace the internal cover fixing screws (33) and (53).
- Refit the moving part of the grease valve (56).
- Replace the 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

MNI - MNIHS 315 ST
standard bearings



MNI - MNIHS 315 M, L
355 LA, LB, LC, LD
standard bearings

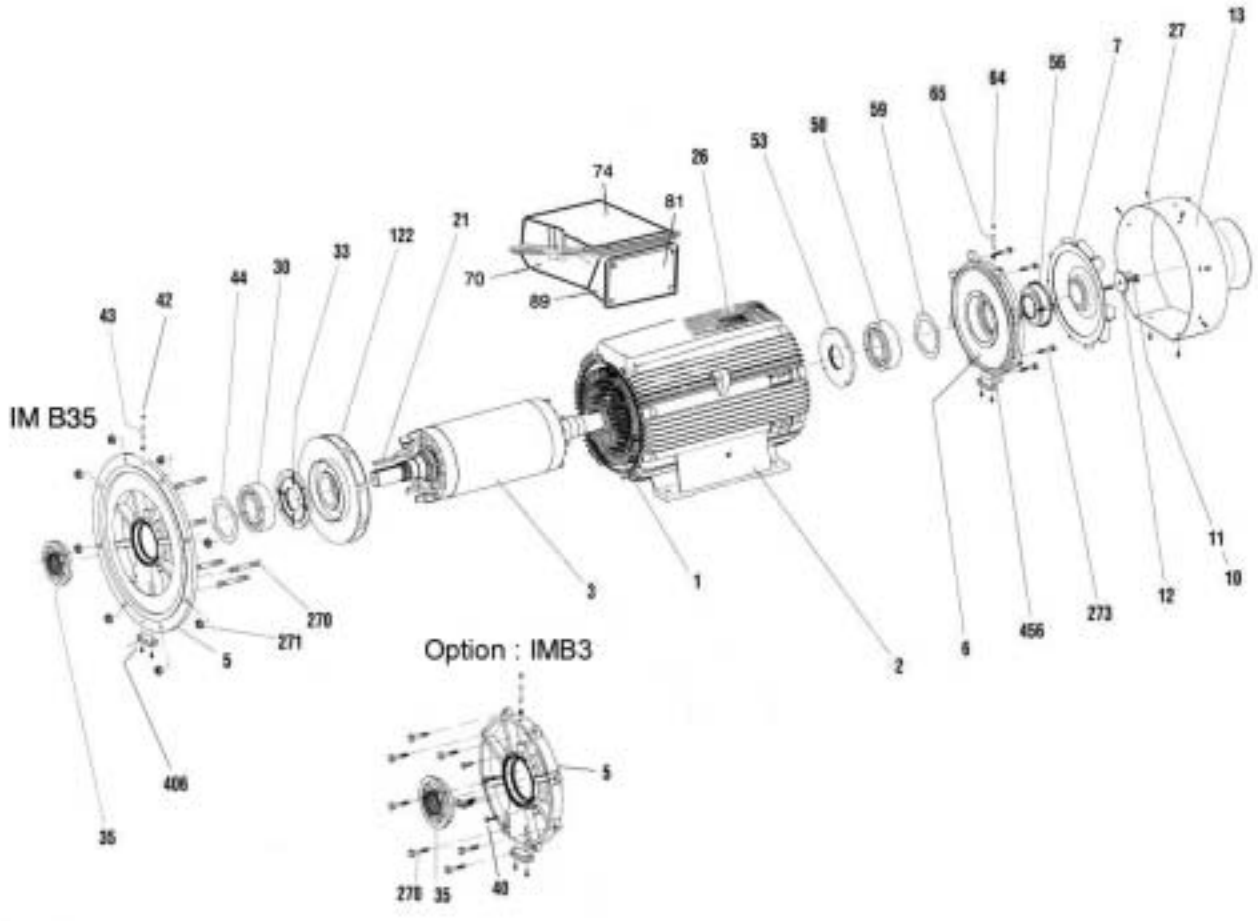


Induction motors for the navy

MNI - MNIHS

PROCEDURE FOR DISMANTLING AND REASSEMBLY

MNI - MNIHS 315 to 355 LD



MNI - MNIHS 315 to 355 LD					
No.	**Description**	**No.**	**Description**	**No.**	**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**	DE internal cover	**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 nozzle
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	Brake washer (not shown)	**50**	Non drive end bearing	**271**	DE shield fixing nut
12	Lock washer	**53**	NDE internal cover	**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		

Cable gland - Terminal block (see page 13-14)

LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE

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