Nidec

All for dreams

Installation and maintenance

CPLS

Drip-proof 3-phase induction motors

Part number: 4240 en - 2017.08 / c

LEROY-SOMER™

IMPORTANT

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

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

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

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

Abide by the safety instructions: before touching the motor, you must read the UTE C18-510 standard with regard to operator protection as well as any current laws and regulations affecting the safety of personnel.

LEROY-SOMER cannot be held responsible for any problems arising from failure to comply with the instructions in this manual.

⚠ **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)

Dear Customer,

You have just acquired a LEROY-SOMER motor.

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

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

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

LEROY-SOMER

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.

CONTENTS

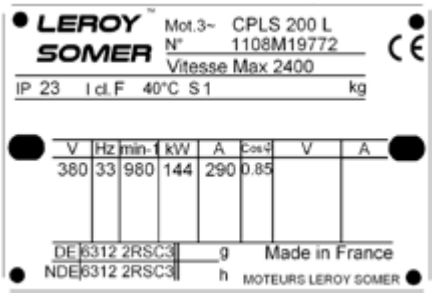
1 – RECEIPT

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 - Marking

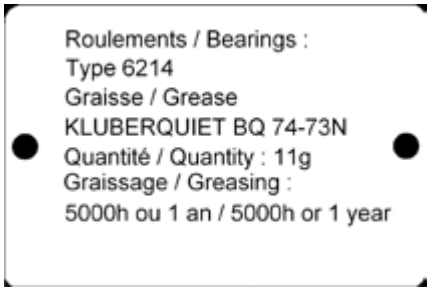
As soon as you receive the motor, check that the nameplate on the machine conforms to your order.

Examples of nameplates:



Standard nameplate permanently greased bearings

Nameplate for brake motors



Additional nameplate for regreasable bearings

Definition of symbols used on nameplates:

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

1108M19772: Motor serial number →

11 : Year of production
08 : Week of production
M19772 : Manufacturing order

Mot.3~ : Three-phase A.C. motor
CPLS : Series
112 : Frame size
L : Housing symbol
kg : Weight
IP23 : Index of protection
Icl. F : Insulation class F
40°C : Maximum ambient temperature for operation (EN 60034-1)
S : Motor duty
V : Motor supply voltage
Hz : Supply frequency
min-1 : Revolutions per minute (rpm)
kW : Rated output power
cos φ : Power factor
A : Rated current
Vmax : Maximum mechanical speed (in rpm)
Echt : Temperature rise (°K)

Bearings

If the bearings are regreasable, information about the bearings and their lubrication is indicated on a secondary nameplate placed next to the main nameplate.

DE : Drive end bearing
NDE : Non drive end bearing
g : Left blank
h : Left blank

Brake

FCPL60H : Brake type
IP44 : Brake protection index
400 Nm : Static braking torque
A : Brake current
V~ : Voltage if A.C. brake
V= : Voltage if D.C. brake

1.2 - Storage

Prior to commissioning, machines should be stored:

- Away from humidity: at relative humidity levels above 90%, the machine insulation can drop very quickly and become virtually non-existent at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.

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

- Protected from frequent significant temperature variations to prevent any condensation during storage.

- 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.

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

Greasing

Sealed bearings (cannot be regreased)

Maximum storage: 3 years. After this time, replace the bearings (see section 6.1).

Bearings which can be regreased

Greases used by LEROY-SOMER

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

CPLS motors are lubricated with EXXON UNIREX N3 grease as standard (grade 3).

2 - ASSEMBLY

2.1 - Checking the insulation

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

This check is essential if the motor has been stored for longer than 6 months or if it has been kept in a damp atmosphere.
This measurement must be carried out using a megohmmeter at 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° 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° difference.
While it is drying, all the motor orifices must be open (terminal box).

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).

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.

Before testing at no load and without coupling, secure the shaft extension key!

2.2 - Location

Motors in the CPLS range are IP23 motors. They must therefore be installed under shelter so they are not to exposed to bad weather.

The standard cooling mode for these motors is IC06 in accordance with standard EN 60034-6. In other words, the coolant is taken from and expelled into the surrounding medium, and this fluid circulates thanks to a system independent of the motor speed.

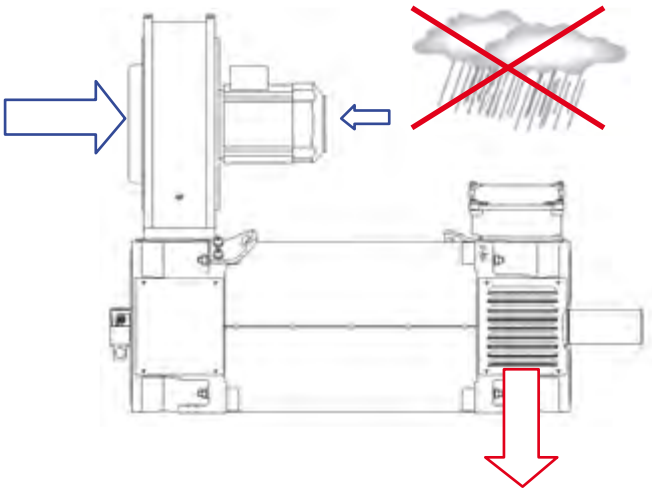
The following recommendations must therefore be observed:

The motor must be installed in a ventilated place, with clearance for the air inlet and outlet.
Obstruction (clogging) - even accidental - of the ventilation circuit has an adverse effect on motor operation.

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

Unless otherwise stated at the time of ordering, the motor is sized for a standard environment in accordance with EN 60034-1, in other words:

- Altitude 1000 m or less
- Temperature between +5 and +40°C



For ease of servicing, ensure access to the motor terminal boxes and inspection doors is unobstructed.

The motor must be fixed on a flat surface which is rigid enough to prevent distortion and vibration.
The seals should be able to withstand the forces engaged during normal motor operation, as well as a possible overtorque of at least twice the machine's rated torque.

For the CPLS motor range, the standard mounting positions are B3 and B35. Mounting position B5 is prohibited. Contact Leroy-Somer for any other mounting position.

The motor is fitted with lifting rings mounted diagonally on each end shield.

They are designed to lift **the motor only** and must not be used to lift the whole machine after the motor has been fitted to it.

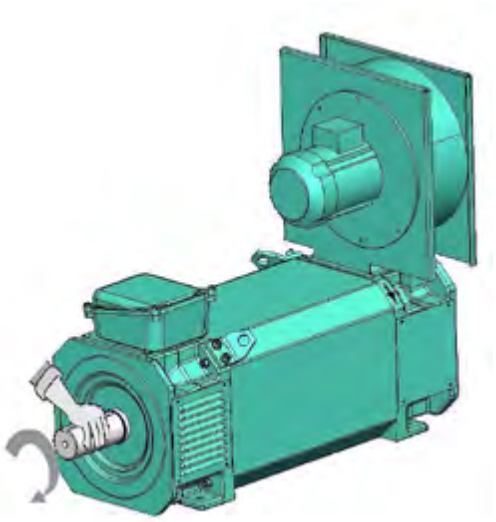
If necessary, use a lifting bar system to avoid damaging the forced ventilation unit and its accessories.

Note: Never stand on the motor.

2.3 - Coupling

Preparation

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



Moving the motor

For made-to-order motors with roller bearings, if the motor has to be moved after the coupling device has been fitted, the rotor must be immobilised.

Balancing

Rotating machines are balanced in accordance with standard ISO 8821:
- Half-key when the shaft extension is marked H: standard
- No key when the shaft extension is marked N
- Full key when the shaft extension is marked F, thus any coupling element (pulley, coupling sleeve, slip-ring, etc) must be balanced accordingly.

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

Precautions

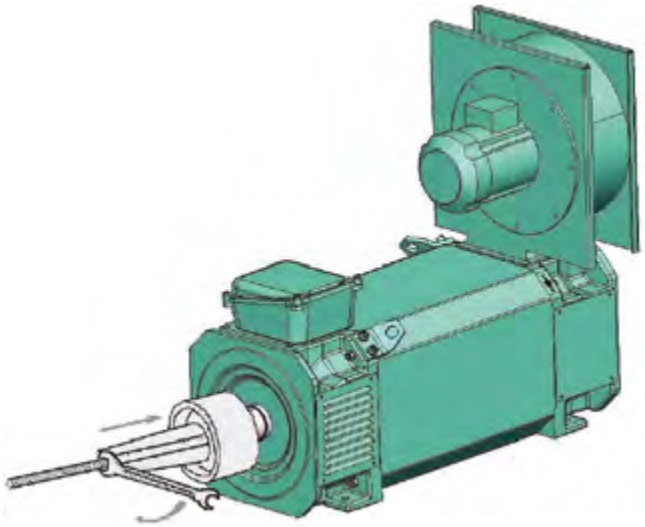
All measures must be taken to ensure protection against the risks which arise when there are rotating parts (coupling sleeve, pulley, belt, etc).

⚠ Beware of backdriving when the motor is switched off. The appropriate precautions must be taken:
- On pumps: install a non-return valve
- On 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 standard EN 60072-1.
When fitting the coupling:
- Users must adhere strictly to the instructions provided by the transmission device supplier.
- Avoid impacts which could damage the bearings.

To do this, use a spanner and grease 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.
- Longer than the shaft extension (2 to 3 mm) so that it can be tightened using a screw and washer. If it is not, a spacer ring must be inserted without cutting the key (if this ring is large, it must be balanced).

If there is a second shaft extension, it must only be used for direct coupling and the same recommendations must be followed.
Inertia flywheels must not be mounted directly onto the shaft extension, but installed between end shields and connected by a coupling sleeve.
End shields fitted with flanges are designed to ensure good-quality positioning, but cannot support the weight of excessively heavy equipment.

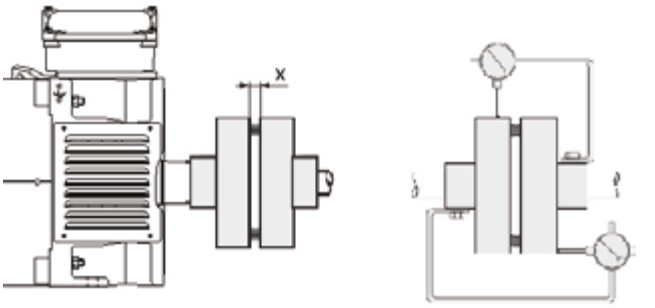
⚠ To access the flange drill holes on the CPLS 250, the DE shield ventilation grilles need to be removed.
Make sure that the winding power is off during this operation.
Take all the necessary precautions to avoid damaging the winding while mounting the driven equipment.

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 CPLS catalogue for maintaining the bearings.

Direct connection using a flexible coupling

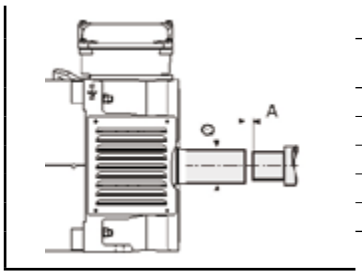
Selection of the coupling sleeve should take account of the rated torque to be transmitted and the safety factor dependent on the starting conditions for the electric motor.
The machines must be carefully aligned, so that any lack of concentricity and parallelism in the two coupling halves is compatible with the recommendations of the coupling sleeve manufacturer.
Both coupling halves should be provisionally assembled to assist moving them in relation to one another.
Adjust the parallel plane of both shafts using a gauge. Measure the distance between the two coupling surfaces at one point on the circumference. Rotate them 90°, 180° and 270° in relation to this initial position, and measure each time. The difference between the two extreme values of dimension “x” must not exceed 0.05 mm for standard couplings.
To perfect this adjustment and at the same time check the concentricity of the two shafts, fit 2 gauges as shown in the diagram and slowly turn both shafts.



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

Direct connection using a rigid coupling

Both shafts must be aligned so as to adhere to the tolerances of the coupling sleeve manufacturer.
Maintain the minimum distance between the shaft extensions to allow for expansion of the motor shaft.



Ø (mm)	A (mm)
< 55	1
60	1.5
65	1.5
75	2
80	2

If this is not possible, consult LEROY-SOMER.

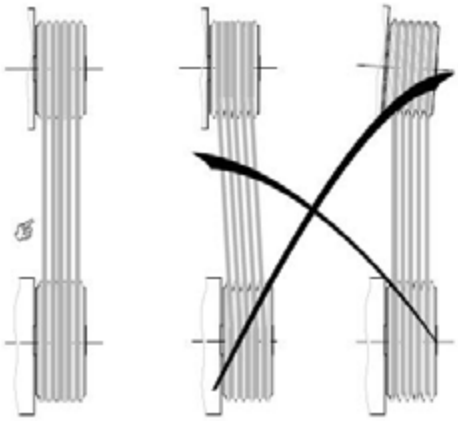
Transmission via belt pulleys

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

Positioning the belts

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

Check that the motor shaft is completely parallel and aligned with that of the receiving pulley.



The belt tension must be adjusted very carefully in line with the recommendations of the belt supplier.
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).

For any radial force value not in the technical catalogue, contact Leroy-Somer.
CPLS HV3 motors can withstand barely any radial force. Transmission via belt pulleys prohibited for these versions!

2.4 - Electrical connection

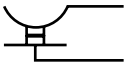
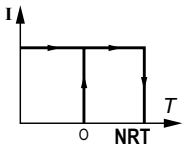
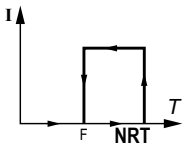
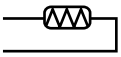
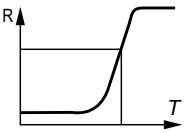
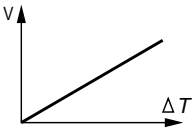
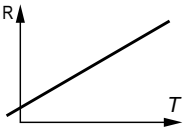
Electric motors are industrial products.
They must therefore be installed by qualified, experienced personnel.
The safety of people, animals and property must be ensured when fitting or building the motors into a machine (please refer to current standards).

The CPLS range of motors is designed for use with a frequency inverter.
For optimum operation without compromising safety, follow the commissioning and protection procedures described in the user manuals for these drives.

Earthing

It is essential to earth the motor in order to protect workers and ensure correct operation of the installation.
Conform to the current standards and legislation.

Built-in indirect thermal protection

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number of devices*
Normally closed thermal protection **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	2 or 3 in series
Normally open thermal protection **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	2 or 3 in parallel
Positive temperature coefficient thermistor **PTC**	Non-linear variable resistor, indirectly heated 		0	General surveillance for transient overloads	3 in series
Thermocouples **T** (T<150°C) Copper Constantan **K** (T<1000°C) Copper-nickel	Peltier effect		0	Continuous surveil-lance of hot spots at regular intervals	1 per hot spot
Platinum resistance thermometer **PT 100**	Linear variable resistor, indirectly heated		0	High accuracy continuous surveil-lance of key hot spots	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.

Built-in thermal protection (standard)

CPLS motors are fitted with 3 PTC sensors in the winding as standard (one per phase). These sensors can be used to monitor temperature rises at “hot spots” in order to detect an overload or faulty cooling.
It must be emphasized that under no circumstances can these sensors be used to carry out direct regulation of the motor operating cycles.

Thermal protection (optional)

- PTO or PTF, in the control circuit

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.
- PT100 or Thermocouples, with reading equipment (or recorder) for continuous surveillance.

Alarm and safety

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

Space heaters (optional)

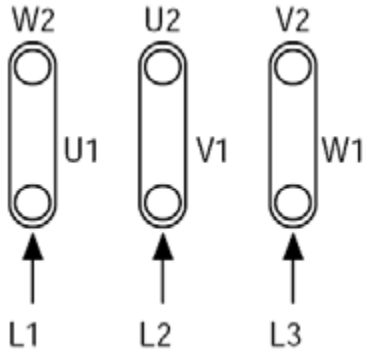
A glass fibre flexible resistor is fixed on 1 or 2 coil end turns. This resistor heats the machines when stopped and thus prevents condensation inside the machines.
Power supply: 230 V single-phase, 50 or 60 Hz, unless otherwise specified by the customer.

Bearing protection

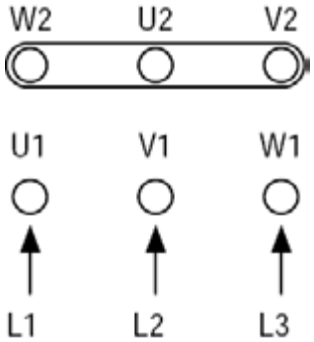
CPLS HV3 motors are fitted (as standard) with PTO sensors (NC bimetallic strip) in the end shields, in order to cut the power in the event of abnormally high bearing temperatures.
These sensors can be fitted on the whole range (as an option), or replaced by PT100s for continuous surveillance.

3-phase forced ventilation wiring

Δ connection: 220 - 240 V



Y connection: 380 - 415 V



The forced ventilation motor must be earthed. An earth terminal is inside the ventilation motor terminal box. It is indicated by the symbol: ⏚

Encoder wiring

CODEUR / *ENCODER*

12 BROCHES / *12 PINS*	1	2	3	4	5	6	7	8	9	10	11	12
CONNECTEUR / *CONNECTOR*	–	+	A	B	O	$\overline{A}$	$\overline{B}$	$\overline{O}$		⏚	⏚	⏚
CABLE BLINDE *CABLE COLOUR*	Blanc *White*	Brun *Brown*	Vert *Green*	Jaune *Yellow*	Gris *Grey*	Rose *Pink*	Bleu *Blue*	Rouge *Red*		Tresse *Braided*	Tresse *Braided*	Tresse *Braided*

SIGNAUX : B avant A vu côté "DAC" dans le sens horaire / ***SIGNAL*** *: B before A view from the "DAC" side, clockwise rotation*

The use of incremental encoders in industrial environments comprising high-current installations, or electronic drive control systems, requires industry-standard, well-known basic rules to be followed. Equipment must be connected by qualified personnel.

Basic rules

Use shielded cables. For connections longer than 10 metres, use cables with several shielded twisted pairs, reinforced with external shielding. We recommend the use of conductors with a minimum standard cross-section of 0.14 mm² (recommended cable type: LIYCY 0.14 mm²).

Keep the encoder connection cables as far away as possible from the power cables and avoid parallel routing.

Distribute and connect the 0 V and the shielding in a “star” arrangement.

Earth the shielding using cables with a minimum cross-section of 4 mm².

Never connect the shielding to earth at both ends. Ideally, a shielded cable should be earthed at the “User” side for the encoder signals (cabinet, PLC, meter).

Check the continuity of the shielding when using connectors or connection boxes.

Precautions during connection

Switch off the power supply before performing any connection operation (connection or disconnection, with or without connectors) at the encoder or cabinet end.

For reasons of synchronisation, power up and power down the encoders and any associated electronic devices simultaneously.

On the first power-up, check that the “supply +” terminal is supplying the required voltage before connection.

For the supply, use stabilised power supplies.

Power supplies via transformers providing 5 V (or 24 V) rms, followed by rectifiers and smoothing capacitors, MUST NOT BE USED, as in reality the resulting D.C. voltages obtained are:

For 5 V: $5 \times \sqrt{2} = 7.07$ V

For 24 V: $24 \times \sqrt{2} = 33.94$ V

2.5 - Optional brake

As an option, motors in the CPLS range can be fitted with a failsafe brake from the FCPL range.

These brakes are fitted with:
- accessories: SO7 power supply device or CDF7/CDF10 doping device
- options: brake disk wear sensors, brake release sensors, space heaters, temperature sensor(s) for brake coil

Electrical connection of the brake and its accessories can be made either in a special brake terminal box (standard), or in the motor main terminal box (on request).

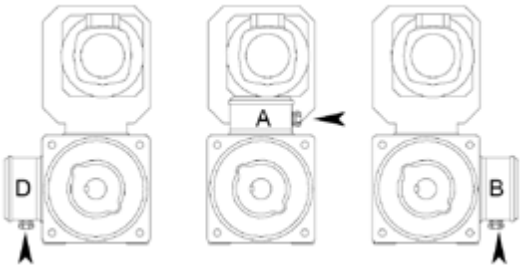
For more information about the brake electrical wiring and maintenance, see the manual specific to the brake installed on your motor.

2.6 - Mains/drive connection

⚠ This section only applies to CPLS motors **without** the CPS system (optional).
For motors equipped with this system, refer to the CPS system documentation.

Terminal box

This is made up of IP 55 components and is fitted with a cable gland in accordance with the tables below.
If required, the terminal box may be fitted in a different position (on the left or right as seen from the drive end).



Terminal box positions

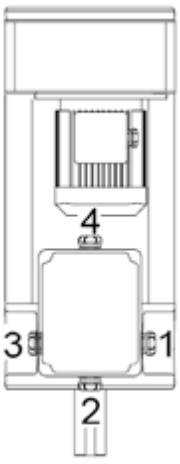
Cable gland

The position of the cable gland is on the right, seen from the drive end, unless otherwise specified at the time of ordering.

Check that the cable radius of curvature is large enough to prevent water entering through the cable gland.

The cable glands are plastic as standard. On request, they can be brass, or marine type.

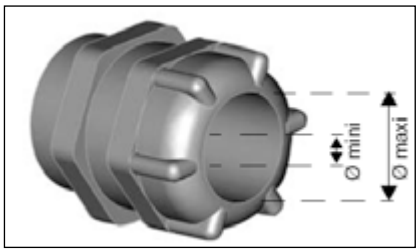
Cable gland positions:



⚠ Adapt the cable gland and its reducer if present to the diameter of the cable being used.
In order to maintain the terminal box's original IP55 protection, it is essential to tighten the cable gland seal correctly (so that it cannot be unscrewed by hand).
If some cable glands are not being used, ensure that they are always covered and tighten them so that they also cannot be unscrewed by hand.

Cable gland tables for the CPLS range of motors:

Cable gland type	Cable size	
	min. cable Ø (mm)	max. cable Ø (mm)
ISO 16 (for accessories)	5	10
ISO 20	9.5	15
ISO 25	13	19
ISO 32	15	25
ISO 40	21	32
ISO 50	26	38
ISO 63	31	44

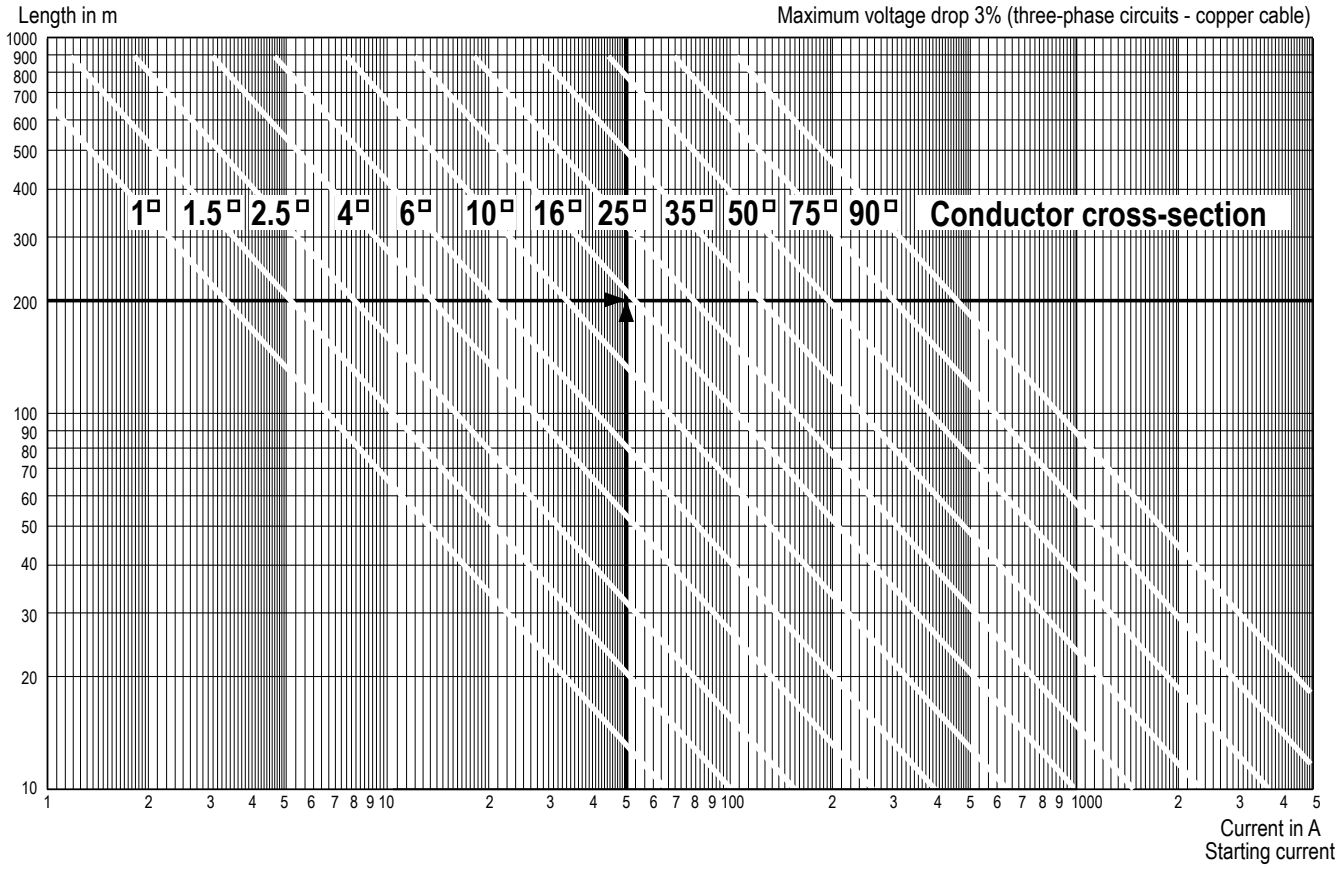


Power supply cable cross-sections

The higher the current, the greater the voltage drop along the cables will be (NFC 15.100 standard). The voltage drop should therefore be calculated **for the maximum current absorbed by the motor** to see if this is suitable for the application.

The chart below can be used to select the conductors according to the length of the supply cables and the starting current, in order to limit the voltage drop to 3% maximum.

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

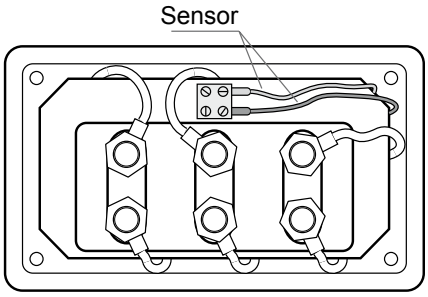


Terminal block wiring diagram

The motors are fitted with a block of 6 terminals complying with standard NFC 51 120, with the terminal markings complying with EN 60034-8 (or NFC 51 118).

Direction of rotation

When the motor is powered by U1, V1, W1 or 1U, 1V, 1W from a direct mains supply L1, L2, L3, it turns clockwise when seen from the drive end.
If any two of the phases are changed over, the motor will run in an anti-clockwise direction.
If the motor is fitted with accessories (thermal protection and/or space heater), these should be connected on screw dominos or terminal blocks with labelled wires (see section 2.4).



Earth terminal

In the terminal box:

- Frame size ≤132 mm
This consists of a pin inside the terminal box.

- Frame size ≥160 mm
This is situated on a boss inside the terminal box.

It is indicated by the symbol: ⏚

On the end shield at the terminal box end:

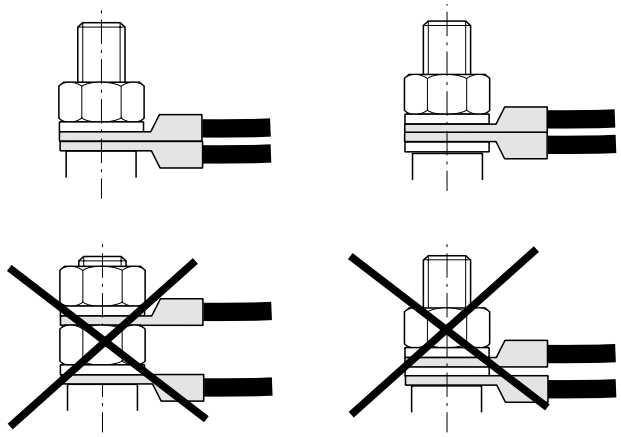
This consists of a tapped hole on the end shield, marked with a label.

The motor must be earthed, and conform to current regulations (protection of people).

Mains connection

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 diagrams below):



Tightening torque (Nm) on the terminal block nuts:

Terminal	M6	M8	M10	M12	M14	M16
Steel	5	10	20	35	50	70

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

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

2.7 - Commissioning

The motor is designed to operate at the speeds indicated on the nameplate:

- Do not exceed the maximum mechanical speed on the motor nameplate.

- Comply with the voltage and frequency indicated on the nameplate. Do not deviate by more than ±5% from the voltage extremes on the nameplate and by more than ±1% from the frequencies.

3 - ROUTINE MAINTENANCE

Checks after start-up

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

Ventilation

To ensure the motor operates correctly, remove any dust or foreign bodies which might clog the grilles in the forced ventilation unit and end shield.
For forced ventilation units equipped with standard or vinyl filters (optional in both cases), it is advisable to clean the filter periodically (having disassembled it) with compressed air, depending on how polluted the surrounding environment is. If the filter is too clogged, replace it.

Cleaning

Dry cleaning (vacuuming or compressed air) is recommended. Cleaning must always be carried out at low pressure to avoid dust and particles getting under the seals.
Necessary precaution: check that the motor is totally sealed (terminal box, etc) before carrying out any cleaning operation.

⚠ **Wet cleaning (using a hose or pressure washer) is prohibited.**

3.1 - 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 when it is correctly greased, the state 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. When 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 drive end (DE) bearing must be freely mounted to allow for expansion of the rotor shaft.

3.2 - Greasing

As standard, bearings on the CPLS 112, 132, 160 and 200 range of motors are permanently greased. (The end shields do not therefore have grease nipples).
For CPLS 250 motors, or for specific applications such as high speeds or heavy loads, motors can be equipped with regreasable open ball bearings, or roller bearings. (The end shields are then fitted with a grease nipple).
In this case the end shields are fitted with Tecalemit-Hydraulic M8 x 125 grease nipples.

The bearings are lubricated in the factory with the grease shown on the nameplate. When regreasing, always use the same type of grease.

The interval between successive regreasings can depend on additional parameters such as the ambient temperature (see next page) and type of grease used.

⚠ **The regreasing intervals, quantity and quality of grease, are indicated on the motor nameplate.**

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

Regreasing

Always begin by cleaning the waste grease channel.

Remove the covers and clean the grease nipple heads.
Efficient greasing only really occurs with the motor running, which ensures that the new grease is well distributed in the bearing.

If greasing cannot be carried out with the motor running (mainly for safety reasons):
- Stop the motor.
- Inject only half the amount of grease shown on the nameplate.
- Turn the motor for a few minutes.
- Add more grease until the quantity indicated is reached.

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

⚠ **The new grease must be recently manufactured and must not contain any impurities (dust, water, etc).**

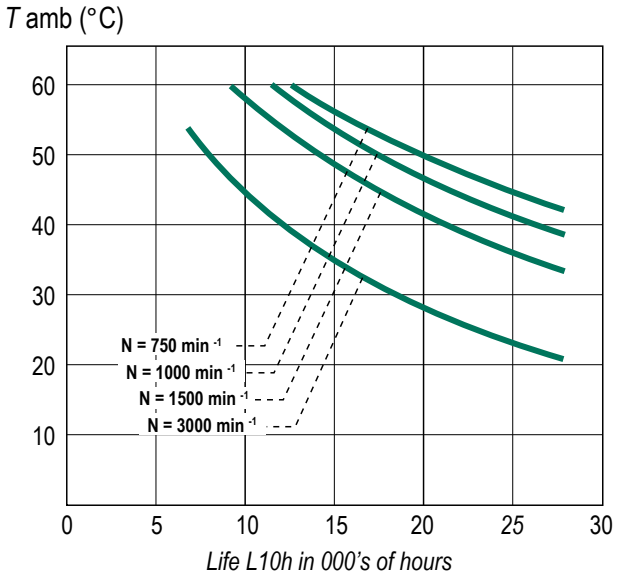
Permanently greased bearings

As standard, motors with frame size ≤ 200 mm.

The life of a grease depends on:
- its characteristics (soap, base oil, etc)
- operating conditions (speed of rotation, operating temperature)
- contamination

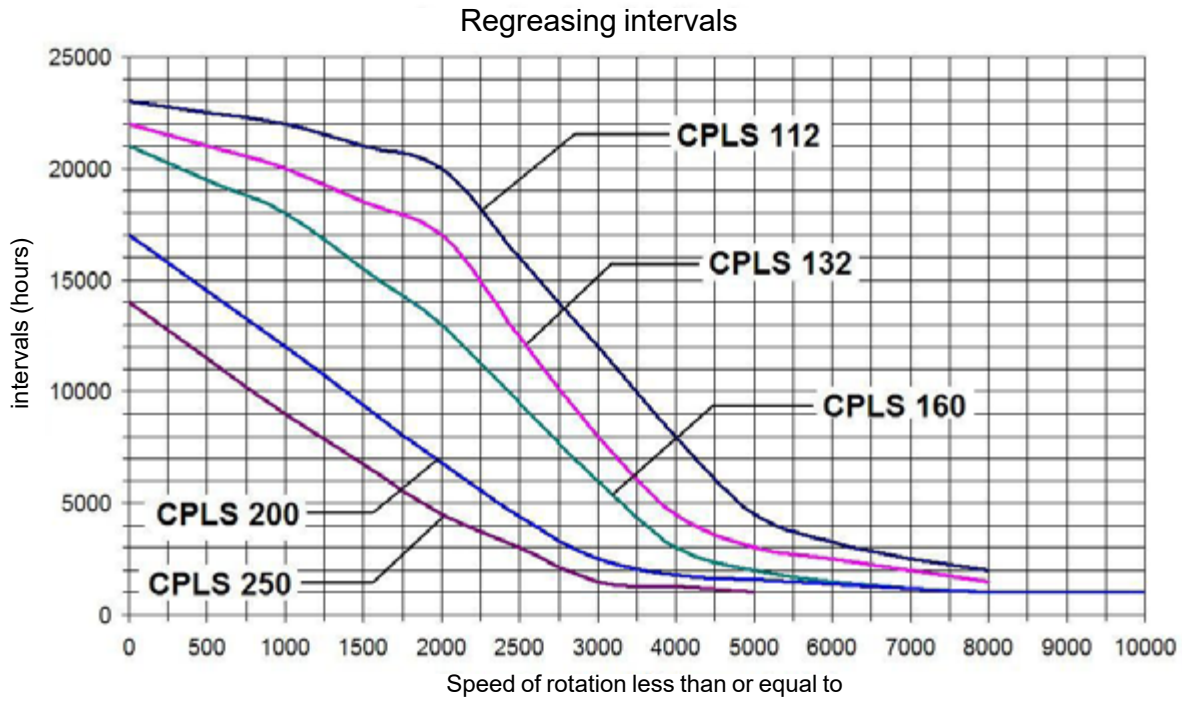
The configuration and size of these bearings ensure a long grease life and therefore greasing lasts the lifetime of the machines.

The curves opposite show the grease life as a function of the motor speed of rotation and the ambient temperature.



Bearings with grease nipples

Greasing intervals – Ball bearings*:



*For roller bearings, halve these values.

Quantity of grease

As the bearings are pre-lubricated in the factory, no greasing is needed during commissioning, unless the motor has been stored for a long time (see section 1.2 - Storage).
During the **first greasing undertaken by the customer or if the grease inlet pipes have been cleaned**, a slighter larger quantity of grease should be added in order to ensure that the new grease reaches the bearing.

Motor	1st greasing	2nd greasing
CPLS 112	14 g	11 g
CPLS 132	18 g	15 g
CPLS 160 Std, HV1, HV2	25 g	20 g
CPLS 160 HV3	16 g	11 g
CPLS 200 Std, HV1, HV2	45 g	40 g
CPLS 200 HV3	19 g	11 g
CPLS 250 Std, HV1	65 g	50 g
CPLS 250 HV2	55 g	40 g

Specific greasing information for CPLS 160 HV3 and 200 HV3 (high-speed) motors

After 5 greasings, the DE and NDE grease traps must be dismantled, emptied and cleaned.
(See the “Cleaning the grease traps” section).

After regreasing, do not start the motor immediately at very high speed.

Proceed in stages:
- Run the motor up to 3000 min^{-1} and wait for the bearing temperature to stabilise (10-15 min approximately).
- Increase the motor speed by another 3000 min^{-1} and wait for the bearing temperature to re-stabilise (another 10-15 minutes approximately).

The motor can then be used normally
As a rule, abrupt, frequent changes of motor speed should be avoided, so as to “smooth out” temperature variations in the end shields as much as possible. The grease will then work optimally, and the bearing and grease life will be maximised.

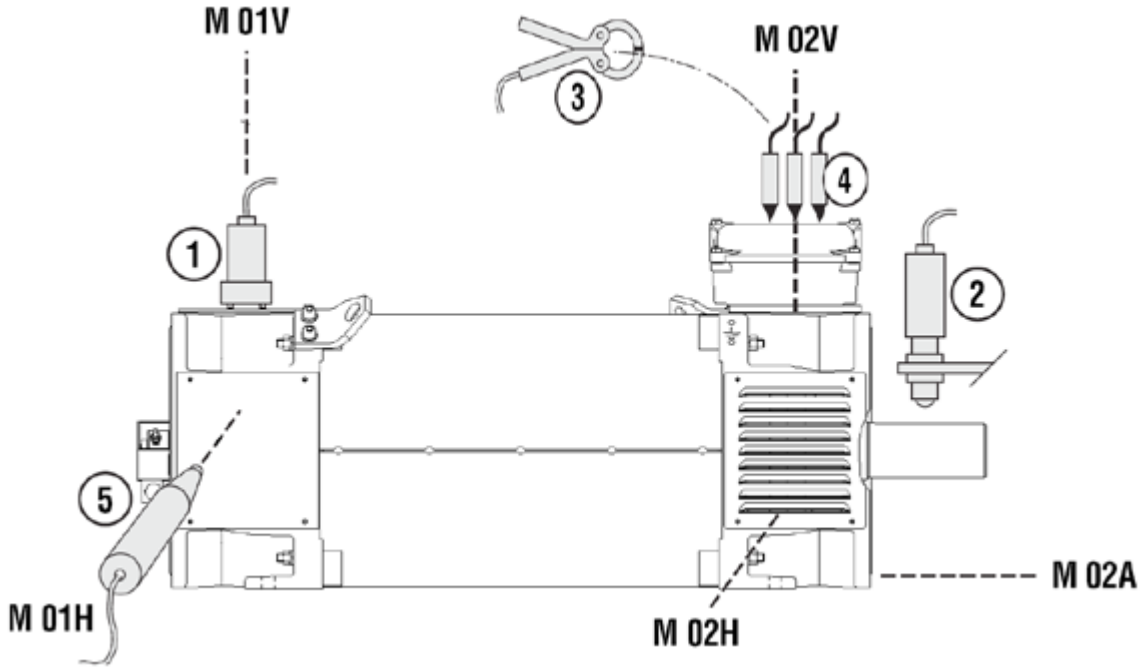
Cleaning the grease traps

On the DE shield:
- Take off the coupling and the shaft extension key.
- Undo the CHC screws holding the trap, and release it.
- Empty out the waste grease, clean the trap, and the grease valve.
- Refit the trap, the CHC screws, the shaft extension key and the coupling.

On the NDE shield:
- Remove the 3 CHC screws from the encoder protective cover, the encoder support is also released.
- Loosen the encoder driving ring screw (at the encoder drive end).
- Remove the encoder from the motor shaft with its support.
- Undo the CHC screws holding the trap, and release it.
- Empty out the waste grease, clean the trap, and the grease valve.
- Refit the trap and CHC screws.
- Refit the encoder on the shaft, with its support.
- Tighten the encoder driving ring screw.
- Refit the encoder protective cover and the 3 CHC screws. When tightening its screws, be sure not to force the encoder feet: it must remain centred on the shaft. Forcing it could cause high-speed vibrations, with damaging effects on the encoder .

4 – PREVENTIVE MAINTENANCE

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

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 power supply	
	- Vibration	Check that the key conforms to the type of balancing
	- Damaged bearings	Change the bearings
	- Mechanical friction	Check the coupling and ventilation
	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 terminal plate connection and that the connectors are tight
	- Abnormal voltage	See drive documentation
	- Phase imbalance	Check the winding resistance
Motor heats up abnormally	- Faulty ventilation	Check the environment Clean the ventilation grilles (or filters) Check the forced ventilation motor electrical connection If necessary, check the temperature sensors are working correctly (optional)
	- Faulty supply voltage	Check
	- Overload	Check the current consumption against 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	**At no load:** - Mechanical locking - Broken power supply line	**When switched off:** Check by hand that the shaft rotates freely Check the fuses, starting device, electrical and thermal protection (optional).
	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

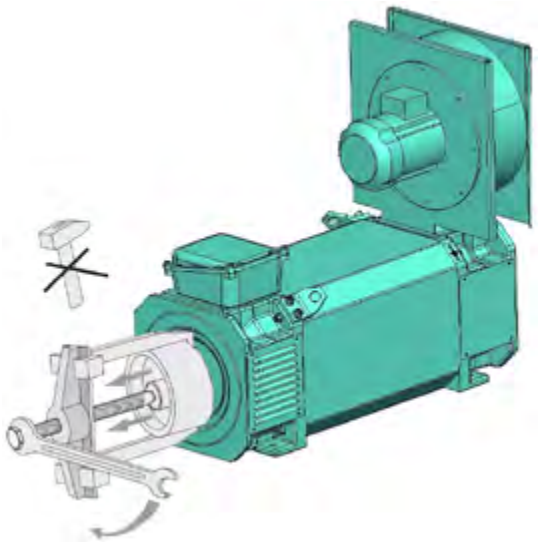
6 - CORRECTIVE MAINTENANCE:

6.1 - General information

First switch off and lock the power supply.

Open the terminal box, identify the wires and their position.
- 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.



6.2 - HV1, HV2 and CPLS 132 HV3 standard motors

6.2.1 - Dismantling the motor

It is advisable to identify the shields in relation to the stator.
- Remove the encoder: disconnect its connection and loosen the encoder driving ring. Slide the encoder and its anti-rotation foot over the shaft and pull it out fully.
- Remove the forced ventilation unit (11) by undoing the 4 screws on the base.
- Open the terminal box (10).
- **Mark the position of the stator connection cables in the terminal box.**
- Disconnect the stator connection cables by unscrewing the nuts.
- Remove the terminal plate (7).
- Remove the terminal box (8) by undoing all 4 screws, then the terminal box support plate (6), by undoing all 4 countersunk head screws (this will make reassembly easier).
- Remove the key, taking care not to damage the keyway.
- Unscrew the nuts holding the end shields (5) and (13).
- Undo the DE and/or NDE inner bearing retainer fixing screws (if necessary).
- Using a bronze drift, remove the shields (5) and (13) by tapping gently on the inside of the flange (above and below the shutters – inspection doors). During this operation, support the shields with a lifting system, taking care not to damage the winding.
- Recover the preloading washer and/or spacer washers from the bearings. Caution, they are in different positions at the drive end and the non-drive end.

Note their position.
- Remove the circlip and/or the bush ring from the bearings (3) and (15) if necessary (flanged motor).
- Remove the rotor from the stator (1), taking care not to touch the winding.
- Pull out the bearings (3) and (15) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.

6.2.2 - Before reassembling

Stator:
- Remove all dust from the stator: if the winding needs to be cleaned, a suitable liquid must be used: dielectric and inert on the insulating components and the external finish.
- Check the insulation (see section 2.1) and if necessary, dry the stator in a drying cabinet.
- Clean the spigots, and remove all traces of impact 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 inside the shields.
- Clean the bearing retainers and the grease valves carefully.

Mounting the bearings on the shaft

The reference numbers for the bearings to be used are indicated on the motor nameplate.

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.

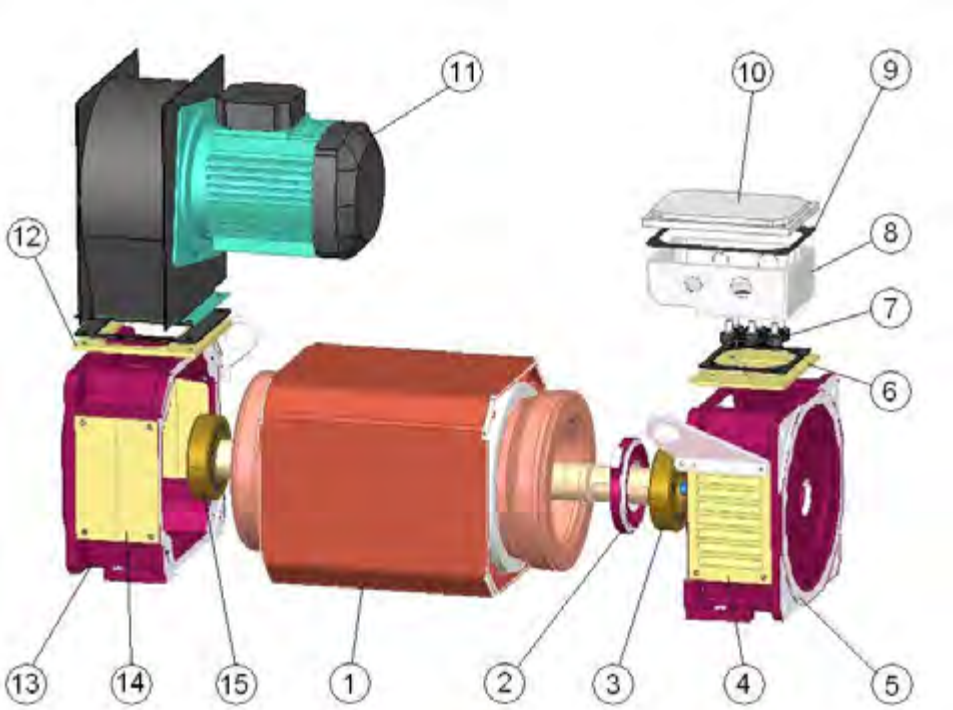
There are several ways of mounting the bearings correctly:
- Cold state: the bearings must be mounted without any impact, using a spanner **(do not use a hammer)**. The force applied must not be transferred to the bearing track. You should therefore use the internal cage for support (taking care not 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 must never be used for heating, just as an oil bath must never be used for heating permanently greased bearings).

6.2.3 - 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, and the rotor and stator are aligned correctly.
During reassembly, always check that the various seals are in the correct position, and replace them if they are in poor condition.
- See section 6.2.2 before reassembly.
- If necessary, insert the inner bearing retainers and bearing spacer rings on the shaft.
- Screw a threaded rod with the same diameter as the screws into one of the tapped holes of each bearing retainer to maintain its angular position when refitting the shield.
- Mount the new bearings on the shaft, see section 6.2.2 on mounting bearings.
- Fit the circlip(s).
- Insert the rotor in the stator (1), taking care not to knock the winding.
- If the motor has tie rods, pass them into the stator.
- Position the preloading washer with a small amount of grease at the back of the bearing cage of the DE shield (5). Don't forget the bearing spacer rings, if any, and run all the connection cables through (stator and any accessories), then refit the shield, positioning it on the stator (1) with a lifting system.
- Position the NDE shield (13) on its rods/pins, not forgetting the bearing spacer rings, if any, before pushing it up against the stator.
- Semi-tighten the shield fixing screws to hold the assembly in position.
- Check the alignment of each end shield with the housing. (An angular defect could prevent the rotor rotating freely once mounted on its base).
- Tighten the shield fixing nuts diagonally to the recommended torque (see section 6.4). The lifting device can then be removed.
- If necessary, fix the DE and/or NDE bearing retainer with its screws.
- Fix the DE (6) and NDE (7) bearing retainer.
- Screw in the DE (8) and NDE (9) valves.
- Tighten the valve grub screws.
- Check that the rotor turns freely by hand and that there is no axial play.
- Refit the DE (10) and NDE (11) grease traps.
- Fix the terminal box support plate (6).
- Refit the terminal box (8).
- Fix the terminal plate (7)
- Wire up the terminal plate, complying with the tightening torques indicated in section 2.5.
- Refit the forced ventilation unit (11).
- Refit the encoder, and check how much the shaft driving the encoder is out-of-round: 0.03 mm max. (A defect could quickly damage the encoder).
- Replace the shaft extension key.

6.2.4 - Parts list



No.	Part
01	Stator
02	Inner bearing retainer (depending on mounting type)
03	DE bearing
04	Ventilation grille
05	DE shield
06	Terminal box support
07	Terminal plate
08	Terminal box
09	Terminal box seal
10	Terminal box lid
11	Forced ventilation unit
12	Forced ventilation unit baseplate
13	NDE shield
14	Inspection door
15	NDE bearing

6.3 - CPLS 160 and 200 HV3 motors

6.3.1 - Dismantling the motor

It is advisable to identify the shields in relation to the stator. **The bearing retainers, valves and trap are different at the non drive end and the drive end.**

- Remove the 3 CHC screws from the encoder protective cover (13), the encoder support (12) is also released.
- Loosen the encoder driving ring screw (at the encoder drive end).
- Remove the encoder (14) from the motor shaft with its support (12).
- Undo the CHC screws holding the NDE trap (11), and remove it.
- Remove the forced ventilation unit (17) by undoing the 4 screws on the base.
- Open the terminal box (15).
- **Mark the position of the stator connection cables in the terminal box.**
- Disconnect the accessories (sensors, space heaters, etc).
- Disconnect the stator connection cables by unscrewing the nuts.
- Remove the terminal plate (16).
- Remove the terminal box (15) by undoing all 4 screws, then the terminal box support plate, by undoing all 4 countersunk head screws (this will make reassembly easier).
- Remove the key, taking care not to damage the keyway.
- Undo the CHC screws holding the DE trap (10), and remove it.
- Loosen the grub set screws on the DE (8) and NDE (9) valves.
- Unscrew the DE (8) and NDE (9) valves. (The smooth radial drill holes allow a tool to be inserted in order to loosen the valves).
- Unscrew the 4 nuts holding the end shields (2) and (3).
- Undo the DE (6) and/or NDE (7) inner bearing retainer fixing screws (if necessary). **Take care with the sensors during this operation!**
- Using a bronze drift, remove the shields (2) and (3) by tapping gently on the inside of the flange (above and below the shutters – inspection doors). During this operation, support the shields with a lifting system.

Once again, take care with the sensors!

- Remove the rotor from the stator (1), taking care not to touch the winding.
- If necessary (1), take out the bearings (4) and (5) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.

(1) The special high-speed bearings must only be removed when they are replaced.

6.3.2 - Before reassembling

Stator:

- Remove all dust from the stator: if the winding needs to be cleaned, a suitable liquid must be used: dielectric and inert on the insulating components and the external finish.
- Check the insulation (see section 2.1) and if necessary, dry the stator in a drying cabinet.
- Clean the spigots thoroughly, and remove all traces of impact on the mating surfaces.

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 inside the shields.
- Clean the bearing retainers, the grease valves and the waste grease traps.

Mounting the bearings on the shaft

Please contact Leroy-Somer to obtain the exact reference number for the bearings to be used. 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 several 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 must never be used for heating, just as an oil bath must never be used for heating permanently greased bearings).

6.3.3 - Reassembling the motor

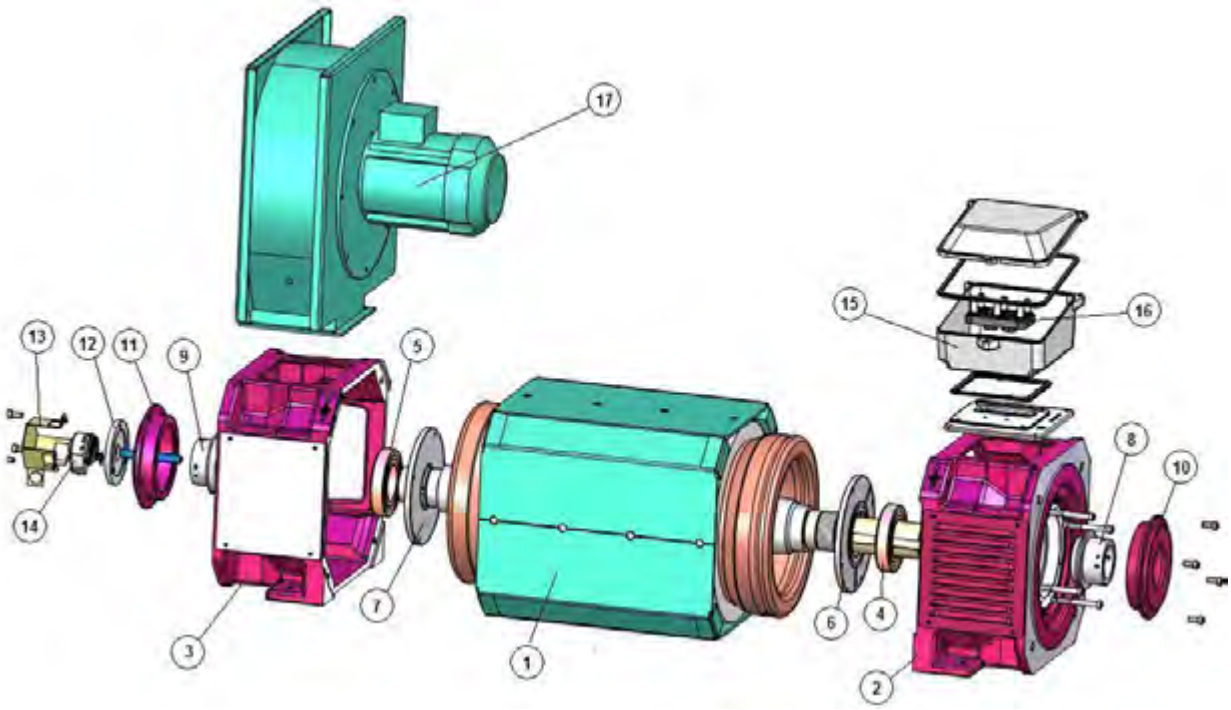
Care must be taken to ensure that the stator is replaced in its original position so that the stack of laminations is centred correctly, and the rotor and stator are aligned correctly.

During reassembly, always check that the various seals are in the correct position, and replace them if they are in poor condition.

- See section 6.3.2 before reassembly.
- If necessary, insert the inner bearing retainers and reattach the sensors if they have come undone.

- Screw a threaded rod with the same diameter as the screws into one of the tapped holes of each bearing retainer to maintain its angular position when refitting the shield. The lubrication line indicates the angular position of the bearing retainer.
- Mount the new bearings on the shaft, see section 6.3.2 on mounting bearings.
- Insert the rotor in the stator (1), taking care not to knock the winding.
- If the motor has tie rods, pass them into the stator.
- Position the preloading washer with a small amount of grease at the back of the bearing cage of the DE shield (2). Run all the connection cables through (stator and any accessories), then refit the shield, positioning it on the stator (1) with a lifting system.
- Position the NDE shield (13) on its rods/pins, before pushing it up against the stator.
- Semi-tighten the shield fixing screws to hold the assembly in position.
- Check the alignment of each end shield with the housing. (An angular defect could prevent the rotor rotating freely once mounted on its base).
- Tighten the shield fixing nuts diagonally to the recommended torque (see section 6.4). The lifting device can then be removed.
- Fix the DE (6) and NDE (7) bearing retainer.
- Screw in the DE (8) and NDE (9) valves.
- Tighten the valve grub screws.
- Check that the rotor turns freely by hand and that there is no axial play.
- Refit the DE (10) and NDE (11) grease traps.
- Fix the terminal box support plate.
- Refit the terminal box (15).
- Fix the terminal plate (16)
- Wire up the terminal plate, complying with the tightening torques indicated in section 2.5.
- Refit the forced ventilation unit (17).
- Check how much the shaft driving the encoder is out-of-round: 0.03 mm max. (A defect could quickly damage the encoder).
- Refit the encoder (14), with its support (12).
- Tighten the encoder driving ring screw.
- Refit the encoder protective cover (13) and the 3 CHC screws. When tightening its screws, be sure not to force the encoder feet: it must remain centred on the shaft. Forcing it could cause high-speed vibrations, with damaging effects on the encoder .
- Replace the shaft extension key.

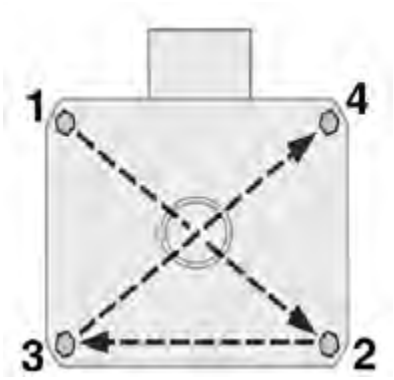
6.3.4 - Parts list



No.	Part
01	Stator
02	DE shield
03	NDE shield
04	DE bearing
05	NDE bearing
06	DE inner bearing retainer
07	NDE inner bearing retainer
08	DE grease valve (depending on mounting type)
09	NDE grease valve (depending on mounting type)
10	DE grease trap (depending on mounting type)
11	NDE grease trap (depending on mounting type)
12	Encoder support
13	Encoder protective cover
14	Encoder
15	Terminal box
16	Terminal plate
17	Forced ventilation unit

6.4 - Tightening pins/tie rods

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



	Φ	T_{min} (Nm)	T_{max} (Nm)
CPLS 112	M6	5	6
CPLS 132	M8	15	20
CPLS 160	M10	30	35
CPLS 200	M12	55	60
CPLS 250	M16	140	146

6.5 - Before recommissioning

- If necessary, grease the new bearings. **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 - 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 should be identified from the exploded views and their description from the parts list.

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.

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NOTES

Nidec

All for dreams

LEROY-SOMER™

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