Nidec

All for dreams

Installation and maintenance

LSRPM - PLSRPM

Permanent magnet synchronous motors

Reference: 4155 en - 2017.06 / j

LEROY-SOMER™

GENERAL WARNING

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

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

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

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

The 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.)**

⚠ **Even when not supplied with power, there is voltage at the terminals of a rotating synchronous motor with magnets.**
Accordingly, before carrying out any work check carefully that the motor is not rotating.

⚠ ⊘ **For dismantling the permanent magnet motor only**

Assembly or maintenance of the rotor must not be carried out by people with pacemakers or any other implanted medical electronic device.
The motor rotor contains a powerful magnetic field. When the rotor is separated from the motor, its field can affect pacemakers or disturb digital devices such as watches, mobile phones, 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 technologies – automation, specially selected materials and rigorous quality control. As a result, the regulatory authorities have awarded our motor factories ***ISO 9001, Edition 2008 international certification from the DNV****. Similarly, our environmental approach has enabled us to obtain* ***ISO 14001: 2004****.*

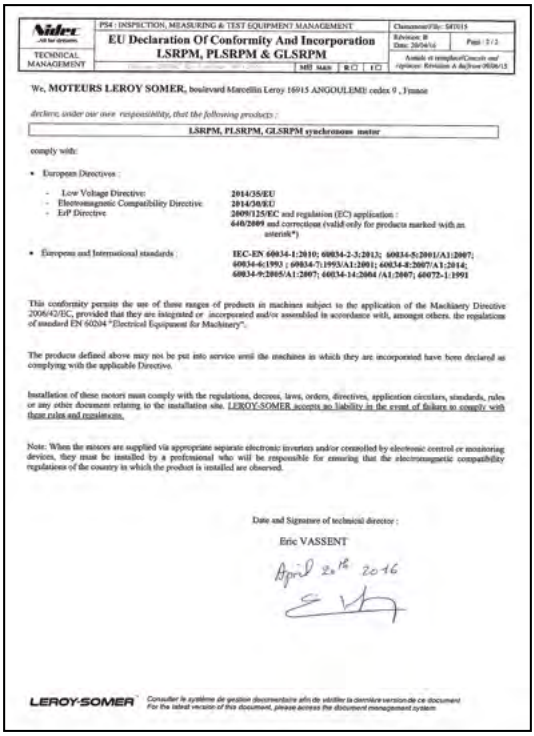
Products for particular applications or those designed to operate in specific environments are also approved or certified by the following organizations: CETIM, LCIE, DNV, ISSEP, INERIS, CTICM, UL, BSRIA, TUV, CCC, GOST, which check their technical performance against the various standards or recommendations.

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

CE conformity



PS4 : INSPECTION, MEASURING & TEST EQUIPMENT MANAGEMENT

Vidéo ...not for division.

TECHNICAL MANAGEMENT

EU Declaration Of Conformity And Incorporation
LSRPM, PLSRPM & GLSRPM

Classement/File: SH015

Révision: B
Date: 28/04/16

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Annule et remplace/Cancels and replaces: Révision A du/from 29/06/15

MH MAN R ☐ FD

We, **MOTEURS LEROY SOMER,** boulevard Marcellin Leroy 16915 ANGOULEME cedex 9 , France

declares, under our own responsibility, that the following products :

LSRPM, PLSRPM, GLSRPM synchronous motor

comply with:

- European Directives :
  - Low Voltage Directive: **2014/35/EU**
  - Electromagnetic Compatibility Directive: **2014/30/EU**
  - ErP Directive: **2009/125/EC** and regulation (EC) application : **640/2009** and corrections (valid only for products marked with an asterisk*)
- European and International standards : **IEC-EN 60034-1:2010; 60034-2-3:2013; 60034-5:2001/A1:2007; 60034-6:1993 ; 60034-7:1993/A1:2001; 60034-8:2007/A1:2014; 60034-9:2005/A1:2007; 60034-14:2004 /A1:2007; 60072-1:1991**

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

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

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

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

Date and Signature of technical director :

Eric VASSENT

April 2nd 2016

LEROY-SOMER

Consulter le système de gestion documentaire afin de vérifier la dernière version de ce document
For the latest version of this document, please access the document management system

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.

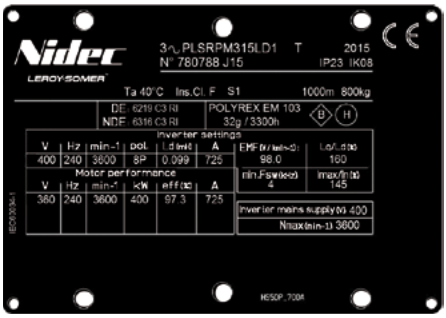
CONTENTS

1 - RECEIPT

On receipt of your motor, check that it has not suffered any damage in transit.
If there are obvious signs of damage, contact the carrier (you may be able to claim on their insurance) and after a visual check, turn the motor 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 marking of conformity of equipment to the requirements of European Directives.

3 ~ : Three-phase A.C. motor
LSRPM : Series
200 : Frame size
L : Housing designation and manufacturer index
TC : Impregnation index

Motor

772333 : Motor serial number
B : Month of production
15 : Year of production
001 : Batch number
IP55 IK08 : Protection index
Ins. cl. F : Insulation class F
Ta 40°C : Contractual ambient operating temperature
S : Duty
% : Operating factor
1000m : Maximum altitude without derating
kg : Weight

RI: Insulated bearing
DE: Drive end bearing
NDE: Non drive end bearings
12 g: Quantity of grease at each regreasing
2200 h : Regreasing interval (in hours) for the ambient temperature (Ta)
QUIET BQ 72-72: Type of grease

(A) : Vibration level
(H) : Balancing mode

Inverter settings : Setting to enter into the drive
EMF (v / kmin^{-1}): Electromotive force
Lq/Ld % : Cogging ratio
min.Fsw (kHz) : Minimum quench frequency
Imax/In % : Ratio of maximum current / Rated current
V : Voltage
Hz : Supply frequency
min^{-1} : Revolutions per minute
pol. : Number of poles
Ld (mH) : Transient inductance
A : Rated intensity

Motor performance: Motor characteristics
V : Voltage
Hz : Supply frequency
min^{-1} : Revolutions per minute
kW : Rated power
Eff % : Efficiency
A : Rated intensity

Inverter mains supply (v): Drive mains supply voltage
Nmax (min^{-1}): Maximum speed

1.2 - Storage

Prior to commissioning, machines must be stored:
- Protected 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 prolonged storage longer than 3 months, place the machine in a sealed waterproof covering (for example heat-shrunk plastic) containing sachets of desiccant corresponding to the volume and the degree of humidity of the location:
- 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 (provided at the lowest point, depending on the operating position).

This location must be dry and protected from harsh weather conditions, cold (temperature between – 15°C and + 80°C), free from vibration, dust and corrosive gases.
- 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).

Turn the rotor a fraction of a turn once a fortnight to prevent the bearing rings from becoming marked.
- Do not remove the rotor locking device (where there are roller bearings).

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

Greasing

Bearings which cannot be regreased

Maximum storage: 3 years. After this time, replace the bearings.

Bearings which can be regreased

	Grade 2 grease	Grade 3 grease	
Storage period	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 5.2
	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

Greases used by Leroy-Somer: refer to the nameplate or chapter 5.2.2.

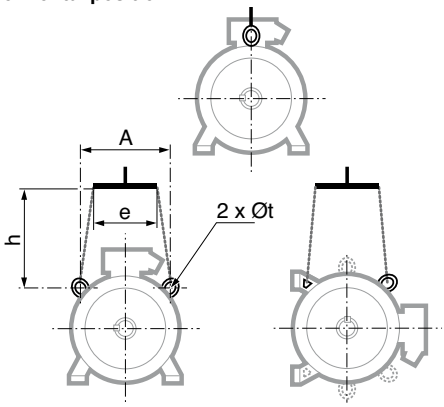
2 - POSITION OF LIFTING RINGS

⚠ Position of lifting rings for lifting the motor only (not connected to the machine).

Labour regulations stipulate that all loads over 25 kg must be fitted with lifting devices to facilitate handling.
The positions of the lifting rings and the minimum dimensions of the loading bars are given below in order to help with preparation for handling the motors. If these precautions are not followed, there is a risk of warping or crushing some equipment such as the terminal box, cover or drip cover.

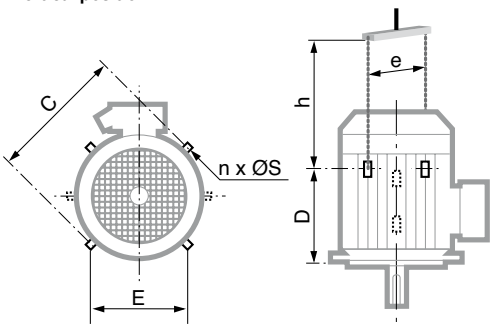
⚠ Motors intended for use in the vertical position may be delivered on a pallet in the horizontal position. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings may be irreparably damaged. Moreover, additional special precautions must be taken,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

• Horizontal position



Type	Horizontal position (mm)			
	A	e min	h min	Øt
100 L	165	165	150	9
132 M	200	180	150	14
160 MP/LR	200	180	110	14
200 L/L1/L2	270	260	150	14
200 LU/LU2	270	260	150	14
225 ST1/ST2/MR1/SR2	270	260	150	14
225 SG	360	380	200	30
250 MY	270	260	150	14
250 SE/SE1/ME/ME1	400	400	500	30
280SC/SC1/SD/SD1/SCM/MD	400	400	500	30
280 MK	360	380	500	17
315 SN	400	400	500	30
315 SP1/MP1/MR1	360	380	500	17
315 LD1	385	380	500	30

• Vertical position



View from above Side view

Type	Vertical position (mm)						
	C	E	D	n**	ØS	e min*	Min h
200 L/L1/L2	410	300	295	2	14	410	450
200 LU/LU2	410	300	295	2	14	410	450
225 ST1/ST2/ MR1/SR2	480	360	405	4	30	540	350
225 SG	480	360	405	4	30	500	500
250 MY	480	360	405	4	30	590	550
250 SE/SE1/ ME/ME1	480	360	405	4	30	500	500
280SC/SC1/ SD/SD1/SCM/ MD	480	360	405	4	30	500	500
280 MK	630	-	570	2	30	630	550
315 SN	480	360	405	4	30	500	500
315 SP1/MP1/ MR1	630	-	570	2	30	630	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.*

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

3- ASSEMBLY AND COMMISSIONING RECOMMENDATIONS

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

Electric motors are industrial products. In this respect, their installation must be ensured by qualified, skilled and authorized personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards).

3.1 - Checking the insulation

Before starting the motor, check the insulation between the phases and earth.
Do not make the phase/phase measurement as it is not relevant for motors of the Dyneo® range.

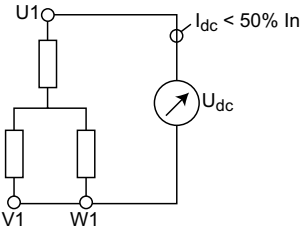
This check is essential if the motor has been stored for longer than 6 months or if it has been kept in a damp atmosphere.
This measurement must be carried out using a megohmmeter at 500 V DC (do not use a magnetoelectric system). It is better to carry out an initial test at 30 or 50 volts and if the insulation is greater than 1 megohm, carry out a second test at 500 volts for 60 seconds, between the winding and earth (use any motor terminal). The insulation value must be at least 10 megohms in cold state.
If this value cannot be achieved, or if the motor has routinely 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, the motor should be dried using the optional space heaters if the motor has them (see section 3.4.3) or follow the methods described below.

Do not apply the megohmmeter to the terminals of the thermal sensors as this can damage them.

Drying using external heating
- Place the motor in an oven at 70°C for at least 24 hours until the correct insulation is obtained (100 MΩ).
- Take care to increase the temperature gradually to clear the condensation.
- After drying at ambient temperature during the cooling phase, check the insulation value regularly, as it will initially tend to fall then rise.

Drying using internal heating

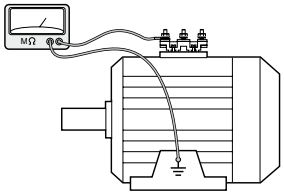
Winding connections for drying using internal reheating



- Connect motor windings V1 and W1 in parallel in relation to U1.
- Read off the resistance between U1 and V1/W1.
- Apply a low voltage DC current to them (to obtain 10% of the rated current calculated using the winding resistances), then increase the voltage until 50% of the rated current is reached.
- Maintain the power for 4 hours. The temperature of the motor should increase slightly.

- NB: The DC current must be monitored using a shunt ammeter. This current must not exceed 60% of the rated current. It is advisable to place a thermometer on the motor housing:

If the temperature exceeds 70°C, reduce the indicated voltage or current by 5% of the original value for every 10° difference. While it is drying, all the motor orifices must be open (terminal box, drain holes).



Warning: If the high voltage test which was carried out at the factory before shipping needs to be repeated, it should be performed at the voltage: 0.8 x (2U + 1000 V). Check that the capacitive effect resulting from the high voltage test is eliminated before connecting the terminals to earth.

The heating solution by A.C. injection must not be used.

3.2 - Location - ventilation

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. With drip-proof motors, do not obstruct the air inlet with a coupling guard, provide a perforated plate.

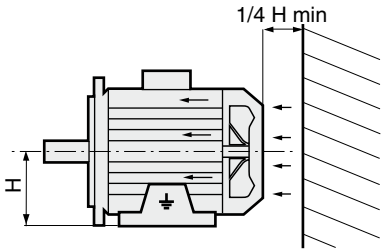
It is also necessary to check that the hot air is not being recycled. If it is, pipes must be provided for the intake of cold air and expulsion of hot air, in order to prevent abnormal motor temperature rise.

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.

3.2.1 - TEFV motors

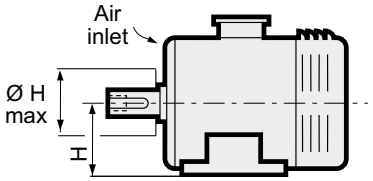
Our motors are cooled in accordance with method IC 411 (standard IEC 60034-6) i.e. “machine cooled by its surface, using the ambient fluid (air) flowing along the machine”.

The fan at the non-drive end cools the motor. Air is sucked in through the grille of a fan cover (which provides protection against the risk of direct contact with the fan in accordance with standard IEC 34-5) and blown along the housing fins to ensure thermal equilibrium of the motor whatever the direction of rotation.



3.2.2 - Drip-proof motors

Our motors are cooled in accordance with method IC 01 (standard IEC 60034-6), i.e. “machine cooled by means of the ambient fluid (air) circulating inside the machine”. A fan at the non-drive end cools the motor. Air is sucked in at the motor drive end and blown along the fan cover to ensure thermal equilibrium of the motor whatever the direction of rotation.

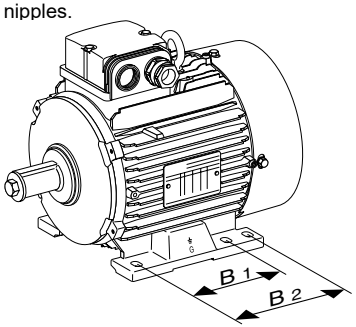


3.2.3 - Positioning

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 motors technical catalogue) or, should this not be the case, to those shown at B2.

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

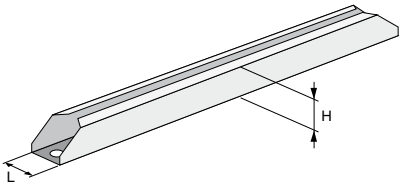


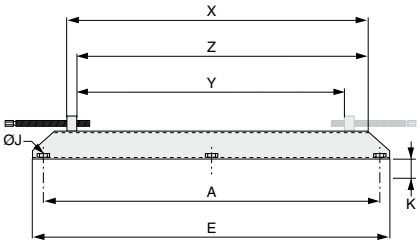
Use lifting equipment which is compatible with the weight of the motor (indicated on the nameplate).

⚠ When the motor is fitted with lifting rings, these are for lifting the motor on its own. They 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.

3.2.4 - Standard slide rail option (conforming to standard NFC 51-105)

These steel slide rails are supplied with tension screws and 4 bolts and nuts for fixing the motor onto the slide rails, but the fixing bolts for the slide rails are not supplied.





Motor frame size	Slide rail type	Footprint									Slide rails pair weight (kg)
		A	E	H	K	L	X	Y	Z	Ø J	
90	G 90/8 PM	355	395	40	2.5	50	324	264	294	13	3
100 and 132	G 132/10 PM	420	530	49.5	7	60	442	368	405	15	6
160	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	G 355/24 PF	1250	1330	125	36	130	-	946	1064	30	60

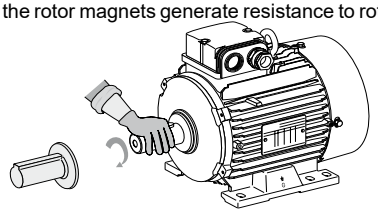
3.3 - Coupling

Preparation

Rotate the motor before coupling to detect any possible fault due to handling.

Remove any protection from the shaft extension.

Note: the rotor magnets generate resistance to rotation.

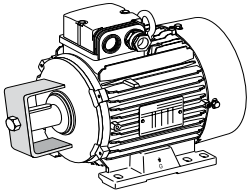


Drain off any condensation water that has formed inside the motor be by removing the plugs from the drain holes.

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 re-immobilized.



Balancing

Rotating machines are balanced in accordance with standard ISO 8821:

- Half-key when the shaft extension is marked H
- No key when the shaft extension is marked N
- Full key when the shaft extension is marked F

Any coupling element (pulley, coupling sleeve, slip-ring, etc.) must therefore be balanced accordingly. To find out the motor balancing, refer to its nameplate.

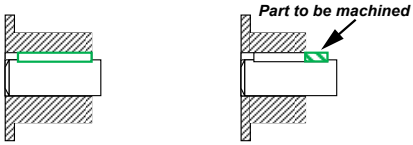
The motors are balanced with ½ key as standard unless otherwise indicated. The coupling balancing therefore needs to be adapted to the motor balancing, and the coupling needs to be adapted to the length of the key or the visible parts protruding from the key need to be machined. A customized key can be used.

⚠ Failure to adhere to these recommendations can lead to premature wear of the bearings and invalidate the statutory warranty.

CONFORMING MOUNTINGS

Coupling adapted to the length of the key

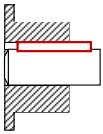
Machining of visible parts protruding from the key



NON-CONFORMING MOUNTINGS

Non-machined open keyway.

Coupling not adapted to the length of the key



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

Beware of backdriving when the motor is switched off. The appropriate precautions must be taken:

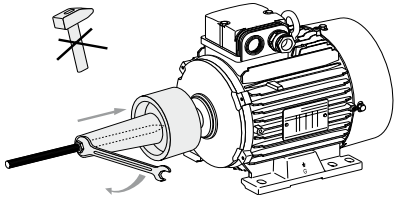
- For pumps, a non-return valve must be installed.
- For mechanical devices, install a backstop or a holding brake.
- Etc.

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.

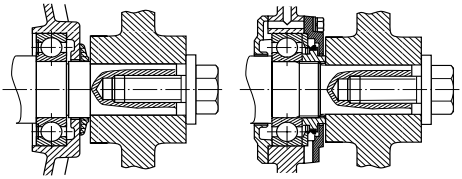
Use a spanner and the tapped hole of the shaft extension with a special lubricant (e.g. molykote grease) to make it easier to fit the coupling.



The hub of the transmission device must be:

- Fully in contact with the shaft shoulder or, if this is missing, against the metal stop ring which forms a labyrinth seal and thus locks the bearing in place (do not

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



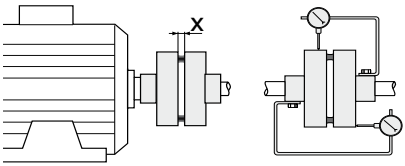
Applied to shaft shoulder

Applied to stop ring

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

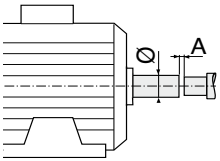
Direct coupling onto the machine
When mounted directly on the motor shaft extension of the moving device (pump or fan turbine), check that this device is perfectly balanced and that the radial force and the axial thrust are within the limits indicated in the catalogue for bearing performance.

Direct coupling using a flexible coupling sleeve
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.
The two parts of the coupling sleeve should be provisionally assembled to make it easier to alter their relative position.
Adjust the parallel plane of both shafts using a gauge. Measure the distance between the two coupling surfaces at one point on the circumference. Rotate them 90°, 180° and 270° in relation to this initial position, and measure each time. The difference between the two 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.

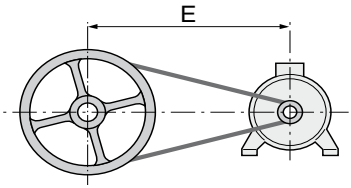
Direct coupling using a rigid coupling sleeve
Both shafts must be aligned so as to adhere to the tolerances of the coupling sleeve manufacturer.
Maintain the minimum distance between the shaft extensions to allow for expansion of the motor shaft and the load shaft.



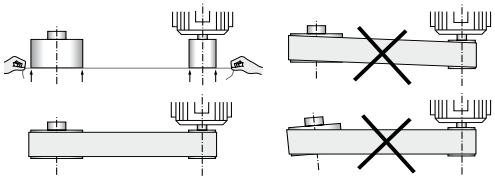
Ø (mm)	A (mm) min
28 to 55	1
60	1.5
65	1.5
75 to 85	2
95	2

Transmission via belt pulleys (up to Series 2400)
The user can choose the diameter of the pulleys.

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



Pulley alignment
Check that the motor shaft is completely parallel with that of the receiving pulley.



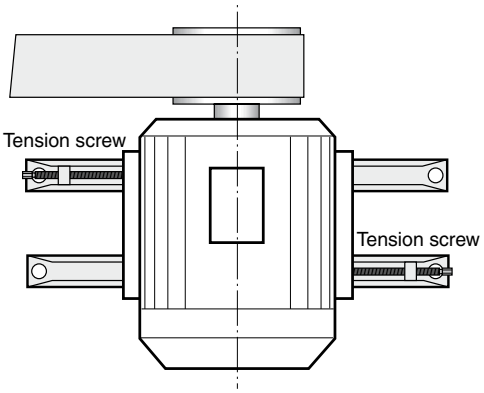
Protect all rotating devices before power-up.

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

Reminder:
- Tension too great = unnecessary force on the end shields which could lead to premature wear of the mechanism of rotation (end shield-bearings) and eventually break the shaft.
- Too little tension = vibration (wearing of the mechanism of rotation).

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

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



3.4 - Motor protection

3.4.1 - Recommendations for variable speed

Special precautions must be taken when using synchronous motors powered via a frequency inverter:
During prolonged operation at low speed, cooling efficiency is greatly reduced. A forced ventilation unit should therefore be installed that will produce a constant flow of air independently of the motor speed.

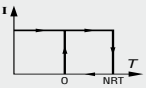
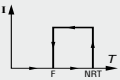
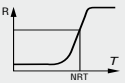
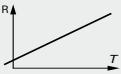
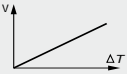
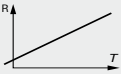
3.4.2 - Thermal protection

The motors are protected by the variable speed drive, placed between the isolating switch and the motor.
Connect the probes as indicated in the manual of the drive used.

Adjusting the thermal protection
It must be set to the value of the current shown on the motor nameplate for the voltage and frequency.
The drive provides total protection of the motor against mechanical overloads.

Built-in indirect thermal protection
The motors are fitted with PTC sensors as standard. As an option specific sensors (see table overleaf) can be fitted on the motor to monitor temperature changes at “hot spots”:
- overload detection,
- cooling check,
- monitoring strategic points for maintenance of the installation.

⚠ **It must be emphasized that under no circumstances can these sensors be used to carry out direct regulation of the motor operating cycles.**
Motor PTC sensors must be connected in order to maintain optimum protection.

Type	Operating principle	Operating curve	Interrupting capacity (A)	Protection provided	Mounting Number of devices*
Normally closed thermal protection **PTO**	Dual blade with indirect heating with contact with opening (O) 		2.5 A under 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounting in control circuit 2 or 3 in series
Normally open thermal protection **PTF**	Dual blade with indirect heating with contact with closing (F) 		2.5 A under 250 V with cos φ 0.4	general surveillance for non-transient overloads	Mounting in control circuit 2 or 3 in parallel
Thermistance with positive temperature coefficient **PTC**	Non-linear variable resistor with indirect heating 		0	general surveillance for transient overloads	Mounted with associated relay in control circuit 3 in series
Temperature sensor **KT** Y	Linear variable resistor with indirect heating		0	continuous monitoring with high precision of key hot spots	Mounted in control boards with associated reading equipment (or recorder) 1/point to monitor
Thermocouples ***T*** (*T* < 150°C) Copper Constantan **K** (*T* < 1000°C) Copper cupro-nickel	Peltier effect		0	continuous monitoring punctual of hot spots	Mounted in control boards with associated reading equipment (or recorder) 1/point to monitor
Platinum temperature sensor **PT 100**	Linear variable resistor with indirect heating		0	continuous monitoring with high precision of key hot spots	Mounted in control boards with associated reading equipment (or recorder) 1/point to monitor

- NRT: nominal running temperature
- The NRTs are chosen according to the position of the sensor in the motor and the temperature rise class.
- KTY standard = 84 / 130

* The number of devices relates to the winding protection.

Alarm and early warning

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

Warning: The motor can remain powered-up, depending on the type of protection. Ensure that the power supply is disconnected before any work is carried out in the terminal box or in the drive cabinet.

3.4.3 - Protection against condensation: space heaters option

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

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

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

3.4.4 - Reinforced insulation

Standard motors are compatible with power supplies with the following characteristics:
• U rms = 480 V max.
• Value of voltage peaks generated at the terminals: 1500 V max.
However, they can be supplied under more severe conditions if additional protection is provided.

Reinforced winding insulation
The main effect associated with supplying power via an electronic drive is overheating of the motor due to the non-sinusoidal shape of the signal. In addition, this can result in accelerated ageing of the winding through the voltage peaks generated at each pulse in the power supply signal. For peak values greater than 1500 V, a super-insulation option for the winding is available over the entire range.

Mains voltage	Cable length	Frame size	Winding protection
≤ 480 V	< 20 m	All frame sizes	Standard*
	> 20 m and < 100 m	< 315	Standard*
		≥ 315	RIS or drive filter**
> 480 V and ≤ 690 V	≤ 20 m	< 250	Standard*
		≥ 250	RIS or drive filter**
	> 20 m and < 100 m	< 250	RIS or drive filter**
		≥ 250	RIS or drive filter**

*Standard insulation = 1500 V peak and 3500 V/ms
** RIS: Reinforced insulation system. Do not use a drive filter in Sensorless mode.

Reinforced insulation of the mechanical parts
Supplying power via a drive can affect the mechanical parts and can lead to premature wear of the bearings. This is because, in any motor, a shaft voltage exists with respect to earth. This voltage, due to electro-mechanical dissymmetries, creates a potential difference between the rotor and the stator. This effect can generate electrical discharges between balls and slip-rings and lead to a reduction in bearing life.

If power is supplied via a PWM drive, a second effect is added: high-frequency currents generated by the IGBT output bridges of the drives. These currents “attempt” to spread towards the drive and therefore flow through the stator and via earth where the link between the casing, machine frame and earth is correctly made. Some motors are equipped with insulated bearings as standard, see section 5.2.1.

If the earth connection cannot be relied on, an insulated bearing option is available over the entire range from frame size 200. For instructions on connecting the motor to earth, refer to section 3.5.1.2.
For more information, refer to the IEC 60034-25 technical specification

3.5 - Connections

3.5.1 - Good wiring practice

3.5.1.1 - General

It is the responsibility of the user and/or the installer to connect the variable speed drive system in accordance with the current legislation and regulations in the country of use. This is particularly important as concerns cable size and connection of earths and grounds.
The information provided below shall never substitute to currently enforced standards nor the installer's liability.

3.5.1.2 - Earth links and connection

Grounding the components and equipment of an industrial facility primarily aims at ensuring the protection of persons and limit the risks of damage in case of major fault on the power supply or consecutive to a lightning strike.
A second purpose for earth connection is the creation of a low impedance voltage reference common to all equipment which reduces:
- the risks of interferences between equipments in facilities integrating sensitive and interconnected electronic and electrical systems,
- the risk of equipment breakage in case of fault currents,
- the risk of current flowing in the bearings of electrical machines supplied by frequency inverter,
- the level of conducted or radiated electromagnetic emissions.

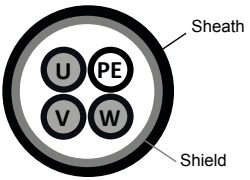
It is essential that the earth network is designed and implemented by the installation supervisor so that its impedance is as low as possible, so as to distribute the fault currents and high-frequency currents without them passing through electrical equipment. The basic philosophy of any earth connection facility is to maximize the meshing of ground links between the metallic parts (machine frames, building structure, piping, etc.) and connect this meshing to earth in multiple points. Metal grounds must notably be mechanically connected to each other with the largest possible electrical contact area or by grounding braids. The motor housings must be connected to the equipment's frame by means of high frequency flat braids.

Under no circumstances can earth connections designed to protect people, by linking metal grounds to earth via a cable, serve as a substitute for ground connections (see IEC 61000-5-2). More particularly, the motor earth terminal (PE) must be connected directly to the drive earth terminal. One or several separate PE protective conductors are mandatory if the conductivity of the cable shielding is less than 50% of the conductivity of the phase conductor.

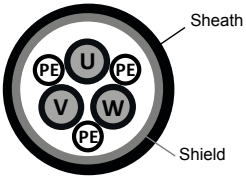
3.5.1.3 - Power connections

Drive supply cables
These cables do not necessarily need shielding. Refer to the drive documentation.

Shielded motor cables
For compliance with standard EN 61800-3, the power conductors between drive and motor must be shielded. Shielded cables must be low leak capacity symmetrical multicore cables. Cables with a single equipotent conductor can be used up to cross-sections of about 10 mm^2.
For larger cross-sections, use only cables with 3 equipotent conductors. The shielding must be connected at both ends: drive side and motor side over 360°. The non-shielded part of the cable shall be as short as possible: metallic cable glands must be used on the motor side. For the shielding link on the drive side, refer to the drive installation manuals.



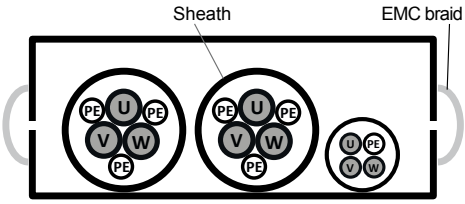
Cable cross-section ≤ 10 mm^2



Cable cross-section > 10 mm^2

Shielded single conductor cables must not be used

Unshielded motor cables
In a second industrial environment, unshielded cables can be used when the distance between motor and drive is short (< 10m) and there is no risk of electromagnetic interference with sensitive devices (measurement equipment, high precision probes, etc.). Only symmetrical multicore cables with one or three equipotent conductors must be used. The cables must be laid in a metallic conduit closed over 360° (e.g. metallic raceway). This metal conduit must be mechanically connected to the electrical cabinet and the structure supporting the motor.
If the conduit consists of several pieces, these should be interconnected by braids to ensure earth continuity.



Unshielded cables in metallic conduit

Sizing of power cables
Sizing the power cables: The drive and motor power supply cables must be sized according to the applicable standard, and according to the design current stated in the drive documentation. The different factors to be taken into account are:
- The installation method: in a conduit, a cable tray, suspended, etc.
- The type of conductor: copper or aluminium.

Once the cable cross-section has been determined, check the voltage drop at the motor terminals. A significant voltage drop results in increased current and additional losses in the motor (temperature rise). An example of motor cable sizing is detailed in §3.5.4.

3.5.1.4 - Checking connection

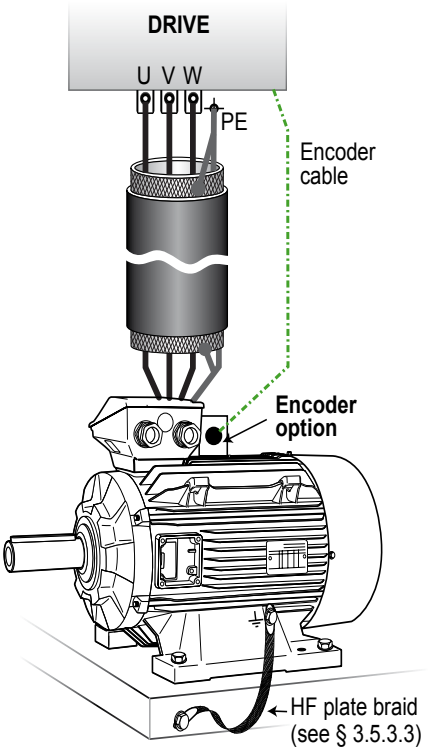
Refer to the manual of the drive used. Also refer to § 3.5.7 for the encoder cable.

3.5.1.5 - Motor-drive type connection

The following information is given for guidance only, and should never be used as a substitute for the current standards, nor does it relieve the installation company of their responsibility.

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

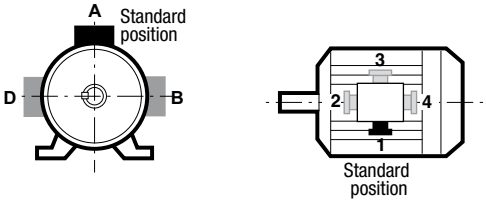
An equipotential binding between the frame, motor, drive, transformer and ground implemented in the rules of the art will highly contribute to attenuating the voltage between the motor's frame and casing, will reduce the flow of high frequency currents via the shaft and, therefore, will prevent the risk of early failure of the bearings or encoders.



3.5.2 - Position of the terminal box and cable gland

Located as standard on the top of the motor near the drive end, for mounting IM B3 and B5, the terminal box is IP55 protected.

The positions B and D are not authorized for the PLSRPM with inclined feed.



Position of the cable glands	1	2*	3	4
LSRPM	●	♦	♦	♦
PLSRPM	●	–	▼	▼

* not recommended (not possible on motor with smooth hole flange)

● standard

♦ possible merely by turning the terminal box

▼ Upon viewing (not authorized in certain cases)

WARNING:

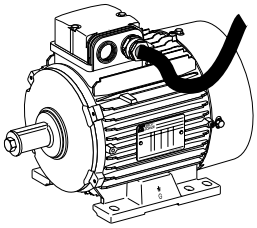
The position of the terminal box cannot be easily modified, even with flange mounted motors, as the condensation drain holes must be at the bottom.

Using a cable gland
(NFC 68 311 and 312 standards)

If the position of the cable gland has not been correctly specified on the order, or is no longer suitable, the symmetrical construction of the LSRPM terminal box enables it to be turned round other positions (refer to table opposite page).

A cable gland must never open upwards.

Check that the incoming cable bend radius prevents water entering via the cable gland.



3- ASSEMBLY AND COMMISSIONING RECOMMENDATIONS

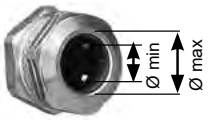
Motors are supplied as standard with terminal boxes pre-drilled and threaded without cable glands or removable undrilled cable gland support plate depending on the types of motor.

Boreholes in the terminal boxes for cable glands

Motor type	Power + auxiliaries	
	Number of boreholes	Borehole diameter
LSRPM 160 LR/MP	2	ISO M50 x 1.5 + 1 x M16 for speed ≤ 2400 min^{-1}: ISO M40 x 1.5 + 1 x M16
LSRPM 200 L/LU	3	2 x M40 + 1 x M16
LSRPM 200 L1		2 x M50 + 1 x M16
LSRPM 200 L2/LU2		2 x M63 + 1 x M16
LSRPM 225 ST1/MR1, LSRPM 250 MY		2 x M50 + 1 x M16
LSRPM 225 SG/ST2/SR2		2 x M63 + 1 x M16
LSRPM 250 SE/ME		2 x M63 + 1 x M16
LSRPM 250 SE1/ME1		Non-drilled removable plate holder
LSRPM 280 SD/MD/SC/SCM		2 x M63 + 1 x M16
LSRPM 280 SD1/MK1	0	Non-drilled removable plate holder
LSRPM 315 SP1/MR1/SN/MP1/SR1		
PLSRPM 315 LD1		

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

⚠ Adapt the cable gland and its reducer, if fitted, to the diameter of the cable being used.
In order to maintain the motor's original IP55 protection, it is essential to ensure the cable gland provides a total seal by tightening it correctly (so that it cannot be unscrewed by hand). When there are several cable glands and some are not being used, ensure that they are always covered and tighten them so that they also cannot be unscrewed by hand.



Type and cable size of cable glands

Type of cable gland	Cable size	
	Min. cable Ø (mm)	Max. cable Ø (mm)
ISO 16	6	11
ISO 20	7.5	13
ISO 25	12.5	18
ISO 32	17.5	25
ISO 40	24.5	33.5
ISO 50	33	43
ISO 63	42.5	55

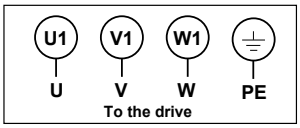
To guarantee the facility's protection complies with the EMC 2004/108/EC directive, ground continuity must be ensured between the cable and the motor's ground. Therefore, a cable gland option with anchoring on reinforced cable is available for pre-bored terminal boxes.

3.5.3- Motor connections

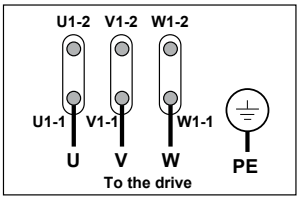
WARNING: for motors with backstop: starting in the wrong direction destroys the backstop (see arrow on motor casing).

3.5.3.1 - LSRPM motors

Frame size ≤ 160



Frame size > 160

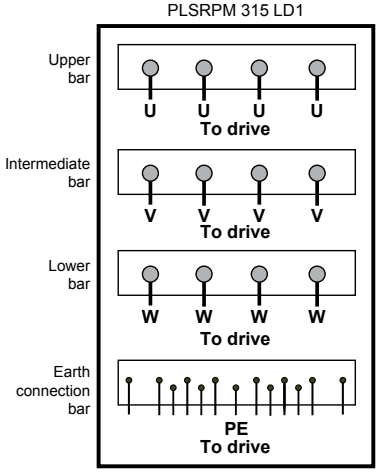


Do not change the positioning bars, they are not coupling links.
To reverse the direction of rotation, refer to the manual for the corresponding drive.

3.5.3.2 - PLSRPM motors

In standard, PLSRPM motors feature a terminal box allowing connection stepped copper bars (3 levels).
From 400 kW (400 V power supply), they have a standard inclined extension feed to facilitate wiring. A straight or inclined extension feed in option for all PLSRPMs.

PLSRPM 315 LD1



3.5.3.3 - Earth terminal

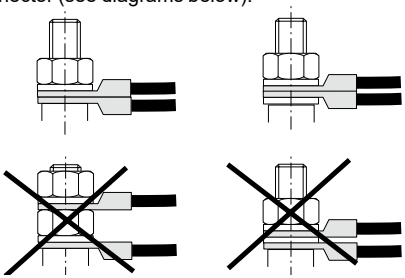
For LSRPM motors, the earth terminal is situated on an embossing inside the terminal box. PLSRPM motors feature an earth terminal in standard, situated in the lower section of the terminal box. A location for a second earth terminal is also planned on a foot or fin (round motors). The earth terminals are marked with the acronym: ⏚

The motor housing must be connected to the frame earth via a high-frequency flat braid.

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

3.5.3.4 - Connecting the power supply cables to the terminal block

The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter.
They must be crimped in accordance with the connector supplier's instructions.
They must be connected with connector resting on connector (see diagrams below):



Size of terminal block nuts:

• LSRPM motors with frame size ≤ 160

Frame Size	Speed (rpm)	Terminals
90	all	M5
100 and 132	all	M6
160	N ≤ 2400	M6
	N > 2400	M8

• LSRPM motors with frame size ≥ 200

Motor current (A)	Terminals
≤ 63	M6
63 < I ≤ 125	M10
200 < I ≤ 320	M12
I > 320	M16

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

Terminal	M5	M6	M8	M10	M12	M14	M16
Steel	3.2	5	10	20	35	50	65
Brass	2	3	6	12	20	-	50

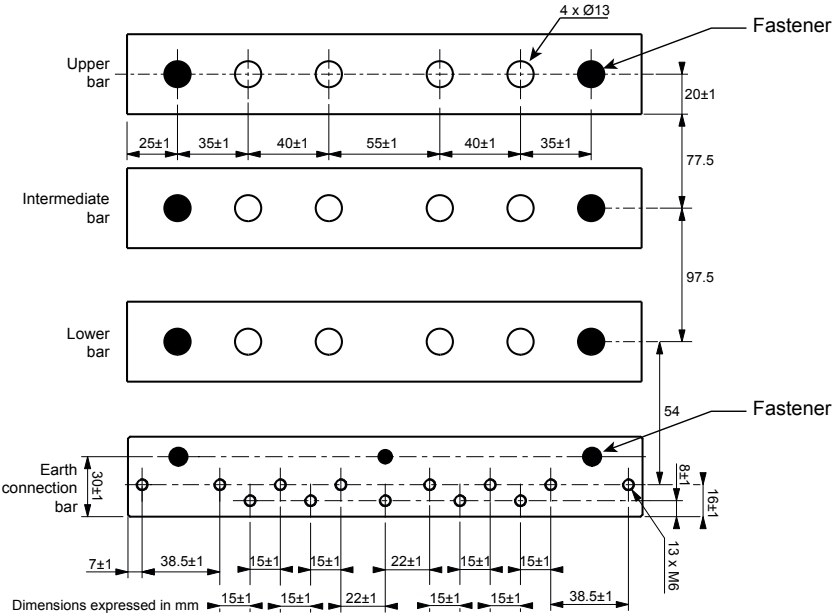
If using cables without connectors, attach some callipers.
If any nuts on the brass terminal block are lost, they must be replaced by brass nuts, not steel ones.

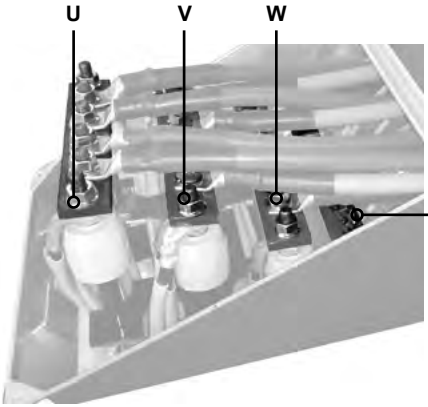
When closing the box, ensure that the seal is correctly positioned.

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

• PLSRPM motors

The stepped power connection bars are drilled (smooth holes) and are supplied without screw or nut, allowing the user to adapt the connection to the cross-section of its lugs.





PLSRPM terminal box

3.5.4 - Example of motor power supply cable sizing

(power above or equal to 250 kW)

The higher the current, the greater the voltage drop in the cables (standard NFC15.100 or end user's national standard). The voltage drop must therefore be calculated **for the motor rated current indicated on the nameplate** and acceptance will depend on the application and the type of cable.

Example of intensities permissible for copper multi-conductor shielded cables

Conditions of use:

- Maximum fundamental frequency: 100 Hz
- Ambient temperature: 40°C
- Maximum length of motor cables: 50 m
- Single layer installation on perforated raceways, ladders, brackets.

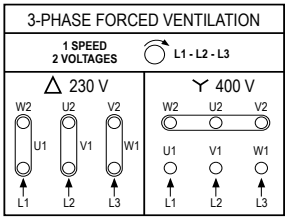
Number of cables x conductor cross-section (mm^2)	Intensity permissible (A)	
	70°C (1)	90°C (1)
2 x (3x95 + PE)	360	475
2 x (3x120 + PE)	420	550
2 x (3x150 + PE)	485	630
2 x (3x185 + PE)	555	720
2 x (3x240 + PE)	655	860
4 x (3x50 + PE)	415	545
4 x (3x70 + PE)	530	695
4 x (3x95 + PE)	645	845
4 x (3x120 + PE)	745	980
4 x (3x150 + PE)	865	1120
4 x (3x185 + PE)	985	1275

(1) maximum temperature permissible of the cable (for 70°C max, Ölflex SERVO 2YSLCY-JB type and 90°C max, TOXFREE ROZ1-K type).

Example: 2 x (3 x 95 + PE) corresponds to two cables each comprising 3 phase conductors with a cross-section of 95 mm^2 and 3 earth conductors (PE).

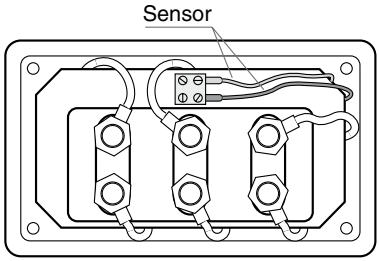
It is the responsibility of the user to connect and protect the variable speed drive system in accordance with the current legislation and regulations in the country of use. This table is given for information only and does not substitute to current standards.

3.5.5 - Forced ventilation option



3.5.6- Protection connections

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 in the main terminal box (see section 3.4).

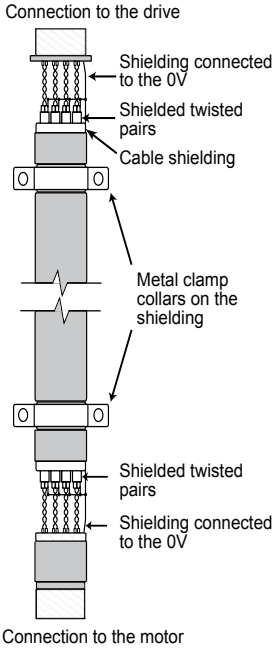


3.5.7- Encoder connections

3.5.7.1 – Connection of the shielding

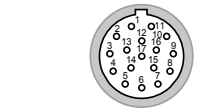
The sensor cable shielding is indispensable due to interference with the power cables. This cable must be laid at least 30 cm away from any power cables.

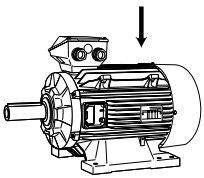
Strip back the shielding on the metal clamp collars in order to ensure 360° contact.



3.5.7.2 - Connecting with feedback via standard incremental encoder with commutation channels, controlled by a Powerdrive MD2 or Powerdrive FX drive

Encoder with commutation channels (1)

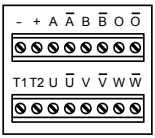




LSRPM

17-pin connector on encoder end (male plug)			MDX-Encoder terminal block (3)
No.	**Wire**	**Designation**	**Designation**
1	-	x	x
2	-	x	x
3	-	x	x
4	White/green	R	R
5	White/pink	U\	U\
6	White/yellow	V	V
7	White/blue	V\	V\
8	White/grey	W	W
9	White/brown	W\	W\
10	Green	A	A
11	Grey	C or O or Z	x
12	Red	C\ or O\ or Z\	x
13	Pink	A\	A\
14	Yellow	B	B
15	Blue	B\	B\
16	Brown	+5V or +15V	+
17	White	0V	—
	Shield (2)		⏚

MDX-ENCODER (3)



The thermal sensor located in the motor terminal box should be connected to terminals T1, T2 of the MDX-ENCODER option (refer to the drive manuals).

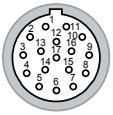
(1) Encoder references KH05 and KHK5S are fitted as standard on Dyneo® motors.

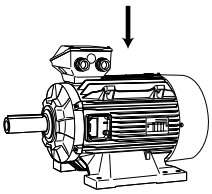
(2) Use shielded cable on each pair (U,U\), (V,V\), (W,W\) etc. Connect the shielding 360° round the connector.

(3) Powerdrive MD2 and FX option used to manage the motor speed feedback.

3.5.7.3 - Connecting with feedback via standard incremental encoder with commutation channels, controlled by a Unidrive M700/701/702 drive

Encoder with commutation channels (1)





LSRPM

17-pin connector on encoder end (male plug)			15-pin connector on drive end Pr 03.038 AB.Servo
No.	**Wire**	**Designation**	**No.**
1	-	x	x
2	-	x	x
3	-	x	x
4	White/green	R	7
5	White/pink	U\	8
6	White/yellow	V	9
7	White/blue	V\	10
8	White/grey	W	11
9	White/brown	W\	12
10	Green	A	1
11	Grey	C or O or Z	5
12	Red	C\ or O\ or Z\	6
13	Pink	A\	2
14	Yellow	B	3
15	Blue	B\	4
16	Brown	+5V or +15V	13
17	White	0V	14
	Shield (2)		(3)

The thermal sensor located in the motor terminal box should be connected to terminals 8 and 11 on the drive control terminal block. To modify sensor control, see parameter 7.15 (0.21).

(1) Encoder references KH05 and KHK5S are fitted as standard on Dyneo® motors.

(2) Use shielded cable on each pair (U,U\), (V,V\), (W,W\). Connect the shielding 360° round the connector.

(3) Connect the shielding 360° round the drive shielding holder.

4 - COMMISSIONING THE VARIABLE SPEED DRIVE

Caution: Make sure you comply with the supply voltages specified on the motor rating plate (± 10%). Outside this range, there is a risk of temperature rise.

For information on how to start up the motor-drive system, refer to the manual for the drive used. Quick commissioning is described according to the operating mode chosen (with speed sensor or sensorless).

5 - ROUTINE MAINTENANCE

5.1 - Checks

Running-in the bearings for series 4500 and 5500

When the motor is commissioned, and each time the bearings are replaced, the bearings must be run-in to obtain optimum service life.

Set the rotation speed to 4000 rpm, then each time the bearing temperature stabilizes, increase the speed by 500 rpm up to maximum speed. During this period, check that the bearing temperature remains below 110°C.

Checks during start-up

Check:
- noise,
- vibration,
- operation of the buttons/switches,
- also check the current and voltage on the machine while it is operating with the rated load.

Checks after approximately 50 hours' operation

Check:
- that the screws fixing the motor and the coupling device are correctly tightened
- in the case of chain or belt transmission, check that the tension is correctly adjusted

Annual checks

Check:
- that the screws fixing the motor are correctly tightened,
- the electrical connections,
- vibration.

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 totally sealed (terminal box, drain holes, etc.).

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

Always clean at reduced pressure from the centre of the motor outwards to avoid introducing dust and particles under the seals.

Draining 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 holes and plugs before reassembly.

Note: In conditions of high humidity and significant temperature variations, a shorter period is recommended.

As long as there is no risk for the motor protection, the condensation drain plugs can be removed.

5.2 - Bearings and lubrication

5.2.1 - Types of bearing

The bearings are defined in accordance with the table below:

Voltage	Speed (rpm)	Power (kW)	NDE bearing	DE bearing
< 460 V	N ≤ 900	All	Standard	Standard
	900 < N ≤ 2400	< 160	Standard	
		≥ 160	Insulated 1000 V	
	2400 < N ≤ 3600	< 145	Standard	Standard
		145 ≤ P < 325	Insulated 1000 V	
		≥ 325		Insulated 1000 V
	3600 < N ≤ 4500	< 55	Standard	Standard
		≥ 55	Insulated 1000 V	Insulated 1000 V
	N > 4500	< 55	Standard	Standard
		≥ 55	Insulated ceramic balls	Insulated ceramic balls
≥ 460 V	N ≤ 900	All	Standard	Standard
	N > 900	≤ 55	Standard	Standard
		> 55	Insulated ceramic balls	Standard + earth ring

5.2.2 - Type of grease

When the bearings are not greased for life, the type of grease is indicated on the nameplate.
Avoid mixing greases.

FS	Speed (rpm)	Greasing type	Grease
< 225	All	Permanently greased bearings	ENS, WT or BQ 72-72
≥ 225	N ≤ 3600	Bearings with grease nipples	Polyrex EM 103
	N > 3600	Bearings with grease nipples	BQ 72-72

5.2.3 - Permanently greased bearings

Under normal operating conditions, the service life (L10h) of the lubricant is 25,000 hours for a machine installed horizontally and for temperatures less than 25°C.

5.2.4 - Bearings with grease nipples

The bearings are lubricated in the factory

The end shields are fitted with bearings lubricated by Técalémit grease nipples.

⚠ **The frequency of lubrication and the quantity and quality of grease are given on the nameplates. Refer to these to ensure correct bearing greasing.**

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

Greasing intervals

Series	Type	Types of bearings		Regreasing intervals in hours											
				1500 rpm			1800 rpm			2400 rpm			3000 rpm		
		N.D.E.	D.E.	**25°C**	40°C	55°C	**25°C**	40°C	55°C	**25°C**	40°C	55°C	**25°C**	40°C	55°C
LSRPM	**200 L**	6214 C3	6312 C3	26200	13100	6550	22200	11100	5550	16000	8000	4000	14600	7300	3650
	200 L1			-	-	-	-	-	-	16000	8000	4000	11400	5700	2850
	200 LU	6312 C3	6312 C3	26800	13400	6700	-	-	-	-	-	-	-	-	-
	225 ST1	6214 C3	6313 C3	25200	12600	6300	21200	10600	5300	-	-	-	-	-	-
	225 ST2			-	-	-	-	-	-	-	-	-	10600	5300	2650
	225 MR1	6312 C3	6313 C3	25200	12600	6300	21200	10600	5300	15000	7500	3750	-	-	-
	250 SE	6216 C3	6314 C3	-	-	-	-	-	-	13600	6800	3400	9200	4600	2300
	250 ME			23600	11800	5900	19600	9800	4900	13600	6800	3400	-	-	-
	250 ME1			-	-	-	-	-	-	-	-	-	9200	4600	2300
	250 MY	6214 C3	6313 C3	25200	12600	6300	-	-	-	-	-	-	-	-	-
	280 SC	6216 C3	6316 C3	20800	10400	5200	16800	8400	4200	-	-	-	-	-	-
	280 SCM			20800	10400	5200	-	-	-	-	-	-	-	-	-
	280 SD	6218 C3	6316 C3	20800	10400	5200	16800	8400	4200	-	-	-	-	-	-
	280 SD1			-	-	-	-	-	-	11000	5500	2750	7200	3600	1800
	280 MK1	6317 C3	6317 C3	19600	9800	4900	15600	7800	3900	10000	5000	2500	6400	3200	1600
	315 SN	6218 C3	6317 C3	19600	9800	4900	-	-	-	-	-	-	-	-	-
	315 SP1	6317 C3	6317 C3	19600	9800	4900	15600	7800	3900	10000	5000	2500	6400	3200	1600
	315 MP1	6317 C3	6320 C3	15800	7900	3950	-	-	-	-	-	-	-	-	-
	315 SR1			-	-	-	-	-	-	7000	3500	1750	-	-	-
	315 MR1			15800	7900	3950	12000	6000	3000	7000	3500	1750	-	-	-
PLSRPM	**315 LD1**	6316 C3	6224 C3	14600	7300	3650	11000	5500	2750	-	-	-	-	-	-
	315 LD1	6316 C3	6219 C3	-	-	-	-	-	-	-	-	-	6400	3200	1600

Series	Type	Types of bearings		Regreasing intervals in hours								
				3600 rpm			4500 rpm			5500 rpm		
		N.D.E.	D.E.	**25°C**	40°C	55°C	**25°C**	40°C	55°C	**25°C**	40°C	55°C
LSRPM	**200 L**	6214 C3	6312 C3	10400	5200	2600	-	-	-	-	-	-
	200 L1			8200	4100	2050	8000	4000	2000	-	-	-
	200 L2			-	-	-	8000	4000	2000	-	-	-
	200 L1	6212 C3	6212 C3	-	-	-	-	-	-	6800	3400	1700
	200 L2			-	-	-	-	-	-	5400	2700	1350
	200 LU2	6312 C3	6312 C3	8600	4300	2150	8600	4300	2150	-	-	-
	225 SR2			-	-	-	7000	3500	1750	-	-	-
	225 SG	6216 C3	6314 C3	8000	4000	2000	-	-	-	-	-	-
	250 SE1	6216 C3	6314 C3	6400	3200	1600	5800	2900	1450	-	-	-
	280 SD1			4600	2300	1150	-	-	-	-	-	-
	280 MK1	6317 C3	6317 C3	4000	2000	1000	-	-	-	-	-	-
PLSRPM	**315 LD1**	6316 C3	6219 C3	4000	2000	1000	-	-	-	-	-	-

5.3 - Bearing maintenance

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.

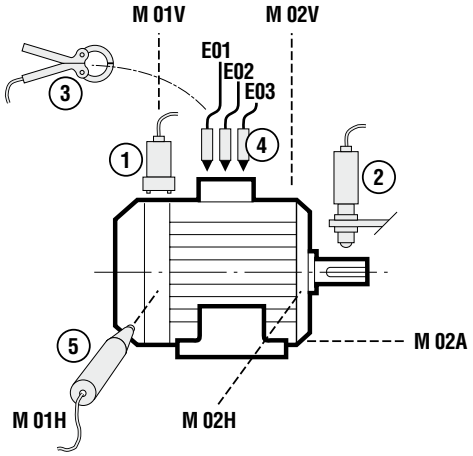
Damaged bearings must be replaced as soon as possible to prevent worse damage to the motor and the equipment being driven.

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 free bearing must allow the rotor shaft to expand (check its identification during dismantling).

6 - PREVENTIVE MAINTENANCE

Consult Leroy-Somer, who in its continuous search for ways to help our customers, has evaluated numerous methods of preventive maintenance.
This system allows data to be recorded on site for the different points and parameters described in the table below.
An analysis on IT media follows these measurements and reports the behaviour of the facility.
This summary also shows out of true, misalignments, the condition of the bearings, the structure issues, electrical problems, …



Detector	Measurement	Position of 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						•			
3 - Clamp ammeter	For measuring intensity (DC or 3-phase AC)							•	•	•
4 - Voltage probe	For measuring voltages							•	•	•
5 - Infra-red probe	For measuring temperature	•		•						

7 - TROUBLESHOOTING GUIDE

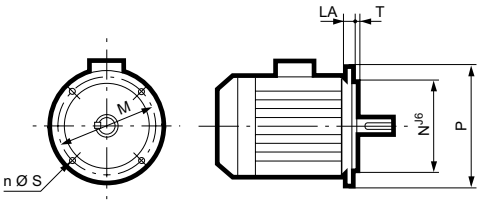
Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	**The cause is mechanical** if the noise persists after switching off the power supply, with the drive set to “freewheel” mode	
	- vibration	- Check that the key conforms to the type of balancing (see section 3.3)
	- damaged bearings	- change the bearings
	- mechanical friction: ventilation coupling	- check installation
	The cause is electrical if the noise stops after switching off the power supply	- check the power supply at the motor terminals - check the drive settings
	- normal voltage and 3 phases balanced	- check the connection of the terminal block and the tightening of the terminals
	- abnormal voltage	- check the power supply line
	- phase imbalance	- check the winding resistance
	Other possible causes: - incorrect settings - drive malfunction	- refer to the drive manual
Motor heats abnormally	- faulty ventilation	- check the environment - clean the fan cover and the cooling fins - check that the fan is correctly mounted on the shaft
	- unsuitable switching frequency	- comply with the minimum switching frequency indicated on the motor nameplate
	- faulty supply voltage	- check the voltage
	- bar connection fault	- check that the bars are correctly positioned, as described in section 3.5.3.1. These are not coupling bars
	- overload	- check the current consumption in relation to that indicated on the motor nameplate
	- partial short circuit	- check the electrical continuity of the windings and/or the installation
	- phase imbalance	- check the winding resistance
	Other possible causes: - incorrect settings - drive malfunction	- refer to the drive manual
Motor does not start	**at no load** - Mechanical seizing	When switched off: - check that rotation of the shaft is not locked (Note: the rotor magnets generate resistance to rotation)
	- broken power supply line	- check the fuses, electrical protection, starting device
	- position feedback (drive message)	- check the drive wiring and settings, operation of the position sensor
	- thermal protection	- check
	on load - phase imbalance	When switched off: - check the resistance and continuity of the windings - check the electrical protection
	- drive	- check the settings and sizing (max. current that can be delivered by the drive)
	- position feedback (drive message)	- check the drive wiring and settings, operation of the position sensor
	- thermal protection	- check

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).

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

IM 3001 (IM B5)



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.

Assembly or maintenance of the rotor must not be carried out by people with pacemakers or any other implanted medical devices.

The motor rotor contains a powerful magnetic field. When the rotor is separated from the motor, its field can affect pacemakers or disturb digital devices such as watches, mobile phones, etc.

Installation, servicing and maintenance must only be carried out by qualified personnel.
Failure to follow the instructions in this document, or to apply them correctly, releases the manufacturer from liability.

The product is covered by the warranty during the guarantee period as long as any partial or total dismantling has only been performed with the assistance of Leroy-Somer (or its approval).

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