ENGLISH

1. Introduction

The installation, operation and maintenance of the motor must be always performed by qualified and authorized personnel using proper tools and methods and following the instructions contained in the documents supplied with the motor.

The instructions presented in this document are valid for motors with the following characteristics:

- Three-phase and single-phase induction motors (squirrel cage rotor);
- Three-phase permanent magnet motors;
- Three-phase hybrid motors (squirrel cage rotor + permanent magnets);

These motors can be used in hazardous areas with the following types of protection:

- Increased Safety – "Ex eb";
- Flameproof – "Ex db" or "Ex db eb";
- Protection by Enclosure (combustible dust) - "Ex tb";
- Class I Division 1;
- Class I Division 2;
- Class II Division 1;
- Class II Division 2.

Details of motor marking may be found on nameplate and product certification, which is part of the motor documentation. For reference, this manual lists the certificate numbers for each type of protection and their nameplate markings. Furthermore, the applicable Standards may be found in the product certification and at the "Installation, Operation and Maintenance Manual of Electric Motors for Use in Explosive Atmospheres" – code 50034162.

The objective of this manual is to provide important information, which must be considered during the shipment, storage, installation, operation and maintenance of motors. Therefore, we advise to make a careful and detailed reading of the instructions contained herein before performing any intervention on the motor.

The noncompliance with the instructions informed in this manual and others mentioned in the website voids the product warranty and may compromise the type of protection of the motor and still result in serious personal injuries and material damages.



Any component added to the motor by the user, for example, cable glands, thread plug, encoder, etc., must meet the type of protection of the enclosure, the "equipment protection levels" (EPL) and the degree of protection of the motor, according to the Standards indicated in the product certification.

Special Conditions for Safe Use



The sign "X" added to the certificate number, informed on the nameplate of the motor, indicates that the equipment demands special conditions for installation, operation and/or maintenance, being those described in the certificate and the motor documentation.
For reference, the chapter 8 lists the certificate numbers for each type of protection and their nameplate markings.
The noncompliance with these requirements compromises the safety of the product and of the installation.

The correct classification of the installation area and ambient characteristics is user's responsibility.

Electric motors have energized circuits and exposed rotating parts which may cause injuries to people.

2. Shipment, storage and handling

Check the conditions of the motor right after receiving. When any damage is noticed, this must be reported in writing to the transportation company, and immediately communicated to the insurance company and to Larson Eleectronics. In this case, no installation job can be started before the detected problem has been solved.
Check if the nameplate data match the invoice data, the environment conditions where the motor will be installed, the type of protection and EPL of the motor. If the motor is not immediately installed, it must be

stored in a clean and dry room protected against dust, vibrations, gases and corrosive agents, with relative humidity not over 60%.
In order to prevent water condensation within the motor during the storage period, it is recommended to keep the space heater ON (if available). In order to prevent oxidation of the bearings and ensure an even distribution of the lubricant, rotate the motor shaft at least once a month (at least five turns), always leaving it in a different position. For bearings with oil mist lubrication systems, the motor must be stored horizontally with ISO VG 68 oil in the bearing, with the amount indicated in the motor manual available in the website and the shaft must be turned every week. If the motors are stored for more than two years, it is recommended to change the bearings, or to remove, wash, inspect and relubricate them before the motor is started. After this storage period, it is also recommended to change the start capacitors of single-phase motors since they loss their operating characteristics.



Always handle the motor carefully in order to prevent impacts and damages to the bearings and always install the shaft transportation/locking device (if supplied) when transporting the motor.

Use only the eyebolts to lift the motor. However these eyebolts are designed for the motor weight only. Thus never use these eyebolts to lift the motor with additional loads coupled to it.
The lifting eyebolts of the terminal box, fan cover, etc., are intended to handle only these parts when disassembled from the motor. Additional information regarding the maximum allowable angle-of-inclination is indicated in the general manual.

Periodically and mainly before the initial star-up, measure the insulation resistance of the motor winding. Check the recommended values and the measuring procedures in the website.

3. Installation



During the installation, the motors must be protected against accidental energization.
Check the motor direction of rotation, turning it without load before it is coupled to the load.

Remove thetransportation devices and shaft locking device (if supplied) before starting the motor installation.
Motors must be only installed in places compatible with their mounting features and in applications and environments for which they are intended. It must be respected the type of protection and the EPL of the motor, according to the classification of the area where the motor will be installed.
The motors with feet must be installed on bases duly planned in order to prevent vibrations and assure perfect alignment. The motor shaft must be properly aligned with the shaft of the driven machine. Incorrect alignment, as well as improper belt tension, will certainly damage the bearings, resulting in excessive vibrations and even causing the shaft rupture. The admissible shaft radial and axial loads indicated in the general manual of the website must be respected. Use flexible coupling whenever possible.
When motors are fitted with oil lubricated bearings or oil mist lubrication systems, connect the cooling and lubrication tubes (if available).
For oil lubricated bearings, the oil level must be in the center of the sight glass.
Remove the corrosion protection grease from the shaft end and flange only right before the motor installation.
Unless specified otherwise in the purchase order, motors are dynamically balanced with "half key" and without load (uncoupled). The driving elements, such as pulleys, couplings, etc., must be balanced with "half key" before they are mounted on the shaft of the motors.



The motor must always be positioned so the drain hole is at the lowest position.

Motors supplied with rubber drain plugs leave the factory in the closed position and must be opened periodically to allow the exit of condensed water. For environments with high water condensation levels and motor with degree of protection IP55, the drain plugs can be mounted in open position .

For motors with degree of protection IP56, IP65 or IP66, the drain plugs must remain at closed position, being opened only during the motor maintenance procedures.

The drain system of motors with Oil Mist lubrication system must be connected to a specific collection system.

The drain plugs of explosion proof motors cannot be removed during installation and maintenance procedures.

Do not block the motor ventilation openings. Ensure a minimum clearance of ¼ of the diameter of the air intake of the fan cover from the walls. The air used for cooling the motor must be at ambient temperature, limited to the temperature range indicated on the motor nameplate (when not indicated, -20 °C to +40 °C must be considered).

Motors installed outdoors or in the vertical position require the use of additional shelter to protect them from water; for instance, use of a drip cover.

To prevent accidents, ensure that the grounding connection has been performed according to the applicable standards and that the shaft key has been well-fixed fastened before the motor is started.

Connect the motor properly to the power supply by means of safe and permanent contacts, always considering the data informed on the nameplate, such as rated voltage, wiring diagram, etc.

When using terminals, all wires that form the stranded cable must be fastened inside the sleeve. The insulation of the accessories cables must be kept up to 1 mm from the connector connection point.

For power cables and grounding system connections and terminal box assembly, the tightening torques indicated on Tables 1 and 2 must be respected.

Table 1 - Tightening torques for fixing elements [Nm]

Type of protection of enclosure	Component		M4	M5	M6	M8	M10	M12	M14	M16	M20
Class I Division 1 Class II Division 1 Class I Zone 1	Terminal Box Cover	Class 8.8/12.9	-	3,5 to 5	6 to 12	14 to 30	28 to 60	45 to 105	75 to 110	115 to 170	230 to 330
		Class A2-70 / A4-70	-	3,5 to 5	6 to 8,5	14 to 19	28 to 40	45 to 60	75 to 100	115 to 170	225 to 290
	Grounding		1,5 to 3	3 to 5	5 to 10	10 to 18	28 to 40	45 to 70	-	115 to 170	-
	Terminal Block / Flying leads		1 to 1,5	2 to 4	4 to 6,5	6,5 to 9	10 to 18	15,5 to 30	-	30 to 50	50 to 75
Class I Division 2 Class II Division 2 Class I Zone 2	Terminal Box Cover		-	3 to 5	4 to 8	8 to 15	18 to 30	25 to 40	30 to 45	35 to 50	-
	Grounding		1,5 to 3	3 to 5	5 to 10	10 to 18	28 to 40	45 to 70	-	115 to 170	-
	Terminal Block / Flying leads		1 to 1,5	2 to 4	4 to 6,5	6,5 to 9	10 to 18	15,5 to 30	-	30 to 50	50 to 75
	Terminal block fixing bolts		-	3 to 5	5 to 10	10 to 18	28 to 40	45 to 70	75 to 110	115 to 170	-



Take the required measures in order to ensure the type of protection, the EPL and the degree of protection indicated on the motor nameplate:
- unused cable inlet holes in the terminal boxes must be properly closed with certified plugs;
- components supplied loose (for example, terminal boxes mounted separately) must be properly closed and sealed;
The cable entries used must be fitted with components (such as, cable glands and conduits) that meet the applicable standards and regulations for each country. For "Ex db" motors, the conduit entries are permitted only for electrical equipment of group II.
The fixing elements mounted in the threaded through holes in the motor enclosure (for example, the flange) must be properly sealed, with the products listed in item 5, to ensure the degree of protection indicated on the motor nameplate.

The motor must be installed with overload protection devices. These protection devices can be integrated to the motor (such as thermistors in the windings) or external protection devices, where the motor load is monitored by the nominal current. For three-phase motors, it is recommended to install a phase failure protection device. Delta connected motors must be protected against phase fault. To do that, connect the overload relay in series to the winding phases and set it to 0.58 times the rated current.
For Class I & II Division 1 motors and/or motors driven by frequency inverters, the use of the thermal protections is mandatory (except for temperature classes T2B or higher).
For Division 2 or non-hazardous areas, the use of the thermal protections is optional.



For flying leads motors, do not push the overlength of leads into the motor in order to prevent that they touch the rotor.

Ensure the correct operation of the accessories (brake, encoder, thermal protection, forced ventilation, etc.) installed on the motor before it is started. The temperature limits for alarm and tripping of the thermal protection can be defined according to the application, however they may not exceed the values shown in Table 3.

Table 3 - Maximum operating temperature of the thermal protection

Component	Classified area marked on nameplate	Classified area where product will be installed	Maximum operating temperature (°C)	
			Alarm	Tripping
Winding	Ex db	Ex db	130	150
	Ex ec	Ex ec	130	155
	Ex t	Ex t	120	140
	Ex eb	Ex eb	-	110
	Ex ec + Ex t	Ex ec	140	155
		Ex t	-	140
	Ex db + Ex t	Ex db	140	150
		Ex t	-	140
	Class I Div. 1	Class I Div. 1	130	150
	Class I Div. 2	Class I Div. 2	130	155
	Class II Div. 1	Class II Div. 1	120	140
Bearings	All	All	110	120

Notes:

1)The quantity and type of thermal protections installed in the motor are infomed in the additional nameplates included on it.

2) In case of calibrated thermal protection (for example, Pt-100), the monitoring system must be set at the operation temperature indicated on Table 3.

In “Ex eb” motors application, the thermal protection device, in case of overload or locked rotor, must actuate with time delay according to the current and track the external power cables. The “t_E” time indicated in the motor nameplate can not be exceeded. The “Ex eb” motors, submitted to acceleration time conditions greater than 1,7 x “t_E” time, must be protected with protection devices against overcurrent.



Motors fitted with Automatic Thermal Protectors will reset automatically as soon as the motor cools down. Thus, do not use motors with Automatic Thermal Protection in applications where the auto-reseting of this device may cause injuries to people or damage to equipment. If the Automatic Thermal Protector trips, disconnect the motor from the power supply and check the cause why the thermal protector trips.

For more information about the use of variable frequency drives, you must follow the instructions in the motor manual in the website and in the manual of the variable frequency drive.

4. Operation



During operation, do not touch the non-insulated energized parts and never touch or stay too close to rotating parts.

Ensure that the space heater is always OFF during the motor operation.

The rated perfomance values and the operating conditions are specified on the motor nameplate. The voltage and frequency variations of the power supply should never exceed the limits established in the applicable standards.

Occasional different behavior during the normal operation (actuation of thermal protections, noise level, vibration level, temperature and current increase) must always be assessed by qualified personnel. In case of doubt, turn off the motor immediately and contact the nearest service center.Do not use roller bearings for direct coupling. Motors fitted with roller bearings require a minimum radial load to ensure a proper operation.

For motors fitted with oil lubrication or oil mist systems, the cooling system must be ON even after the machine is OFF and until the machine is at complete standstill.

In case of failure in the lubrication and/or cooling system, turn hetmotor OFF immediatly.

After complete standstill, the cooling and lubrication systems (if any exist) must be switched OFF and the space heaters (if available) must be switched ON.

In case of doubts, turn the motor OFF immediately and contact the nearest authorized service Center for explosive atmospheres.

5. Maintenance



Before any service is performed, ensure that motor is at standstill, disconnected from the power supply and protected against accidental energization. Even when the motor is stopped, dangerous voltages may be present in space heater terminals.

Motor disassemble during the warranty period must be performed by a authorized service center for Explosive Atmospheres only.



For motors with permanent magnet rotor (lines W22 Quattro and W22 Magnet), the motor assembly and disassembly require the use of proper devices due to the attractive or repulsive forces that occur between metallic parts. This job must be only performed by a Authorized service center specifically trained for such an operation. People with pacemakers cannot handle these motors.

The permanent magnets can also cause disturbances or damages to other electric equipment and components during maintenance.

For Flameproof or Protection by Enclosure motors, only open the terminal box and/or disassembly the motor when the motor surface temperature is at ambient temperature.

For the W50 and HGF motor lines provided with axial fans, the motor and the axial fan have different markings for indicating the direction of rotation for prevent incorrect assembly.
The axial fan must be assembled so that the indicative arrow for direction of rotation is always visible, viewing the non-drive end side. The marking indicated on the axial fan blade, CW for clockwise direction of rotation or CCW for counterclockwise direction of rotation, indicates the direction of rotation of the motor viewing the drive end side.

Motors with degree of protection greater than IP55 are supplied with a rust inhibitor on joints and fixing bolts. Before assembly the components with machined surfaces (for example, terminal box cover of Flameproof motors), clean these surfaces and apply a new layer of this product.
For Flameproof motors joints only the following products can be used: Lumomoly PT/4 (manufacturer: Lumobras – for ambient temperature ranging from -20 °C to +80 °C) or Molykote DC 33 (manufacturer: Dow Corning – for ambient temperature ranging from -55 °C to +80 °C). For motors with other types of protection, use Loctite 5923 (manufacturer: Henkel) on joints. For explosion-proof motors special care should be taken with

the machined surfaces of the flame path. These surfaces must be free of burrs, scratches, etc. that reduce the flame path length and increase the gap. The gaps between terminal boxes and the respective terminal box covers should not exceed the values specified in Table 4.

Table 4 - Maximum clearance between terminal box and terminal box cover for flameproof motors

Product line	Frame size	Flat joint		Cylindrical joint	
		Gap (max)	Lenght (min)	Gap (max)	Lenght (min)
	IEC 90 to 355 NEMA 143 to 586/7	0.05 mm	Under request	Not available	
	IEC 71 and 80	Not available		0.15 mm	12.5 mm
	IEC 90 to 355 NEMA 143 to 586/7	0.075 mm	6 mm	0.15 mm	19 mm

For terminal box cover mounting, please follow the tightening torques indicated on Table 1 for fixing bolts.
In case of replacement of a fixing bolt, it is necessary to keep its dimensions and quality of material. For flameproof motors, the yield stress of the fastener elements of motor and terminal boxes enclosures must be at least equal to class 12.9 for carbon steel bolts and class A2-70 or A4-70 for stainless steel bolts.
Motors which may have a potential risk of electrostatic charge accumulation, supplied duly identified, must receive proper cleaning and maintenance interventions, i.e. with the use of a damp cloth, avoiding electrostatic discharges.
For Protection by Enclosure motors (group III), the maximum permissible dust layer on the motor enclosure is five millimeters (5 mm).



Regularly inspect the operation of the motor, according to its application, and ensure a free air flow. Inspect the seals, the fastening bolts, the bearings, the vibration and noise levels, the drain operation, etc. The lubrication interval is specified on motor the nameplate.

6. Additional information

For further information about shipment, storage, handling, installation, operation and maintenance of electric motors, access the website *www.larsonelectronics.com*.

For special applications and operating conditions (for example, smoke extraction motors, totally enclosed air over (TEAO), motors for high thrust applications, motors with brake, motors with encoder) refer to the dedicated manual supplied with the equipment, or the manual 50034162 available in the website or contact Larson Eleectronics.
When contacting o, please, have the full description of the motor at hand, as well as the serial number and manufacturing date, indicated on the motor nameplate.

Table 2 - Tightening torques for cable-glands and threaded plugs [Nm]

Thread	Material	M16	M20	M25	M32	M40	M50	M63	M80
Metric	Plastic	3 to 5	3 to 5	6 to 8	6 to 8	6 to 8	6 to 8	6 to 8	6 to 8
	Metallic	40 to 50	40 to 50	55 to 70	65 to 80	80 to 100	100 to 120	115 to 140	160 to 190
Thread	**Material**	**NPT 1/2"**	**NPT 3/4"**	**NPT 1"**	**NPT 1 1/2"**	**NPT 2"**	**NPT 2 1/2"**	**NPT 3"**	**NPT 4"**
NPT	Plastic	-	5 to 6	6 to 8	6 to 8	6 to 8	6 to 8	6 to 8	6 to 8
	Metallic	40 to 50	40 to 50	55 to 70	65 to 80	100 to 120	115 to 140	150 to 175	200 to 240

For power cables, switching and protection devices dimensioning, consider the rated motor current, the service factor, and the cable length, among others. For motors without terminal block, insulate the motor terminal cables by using insulating materials that are compatible with the insulation class informed on the nameplate. The minimum insulation distance between the non-insulated live parts themselves and between live parts and the grounding must meet the applicable standards and regulations for each country.