



# E-Motors Installation & Maintenance Manual



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## 1. SAFETY INSTRUCTIONS

The safety instructions listed in this manual which, if not followed, could result in injury or damage of the product.

### 1.1 DESCRIPTION OF WARNING SYMBOLS

Listed symbols are used to identify the risk of danger.



#### **DANGER**

The instructions in this manual concerning safety are marked by this symbol. Failure to comply with these instructions could expose personnel to health risks.



#### **ELECTRICAL HAZARDS**

The instructions in this manual concerning electrical hazards are marked by this symbol. Failure to comply with these instructions could expose personnel to risks of an electric.

#### **WARNING**

#### **WARNING**

The instructions in this manual concerning damage on the machine and its functions are marked by this symbol. Failure to comply with these instructions could expose damage on product or its functions.

## 2. GENERAL INFORMATION

Our submersible motors & pumps are reliable apparatus designed to provide many years of operation without the need of routine maintenance provided if they are installed correctly.

The purpose of this manual is to provide the necessary information for proper installation, operation and maintenance of the motors & pumps.

The instructions for use contained in the present manual refer to motors & pumps in standard execution and functioning at the conditions reported at section 2.2. Please refer to your sales contract for instructions, situations or events not considered in this manual or in the sale documents.

The staff responsible for the operation, maintenance, inspection and installation must be properly qualified for these tasks and the owner must ensure that the content of operating instructions are fully understood.

We recommend reading this manual carefully and following the instructions contained thoroughly. We decline any responsibility for injury to people and/or damage to property due to failure in following our instructions.

Please keep this manual and any eventual further documentation in suitable place easy to reach by the operators when necessary. Eventual revisions and modifications will be made without previous notice.

## 2.1 PRODUCT CHARACTERISTICS

All submersible motors have been designed to be connected to all types of radial and semi-impeller, submersible pumps for use in domestic, industrial and agricultural systems for the lifting of substantially clean water.

Submersible motors are asynchronous, electric motors with a squirrel cage rotor and are the so called “wet-end” types, that is to say that the winding of the motor is immersed completely under water, or under a water-based mix, and this acts as the motor’s internal liquid coolant.

Our motors are rewindable and offer IP68 grade of protection. Motors are protected against dust and against access to dangerous parts with wiring protected against the effects of the submersion. All motors can operate indifferently in both the clockwise and counterclockwise directions.

## 2.2 OPERATION CONDITIONS

The submersible motors can operate continuously to supply nominal power provided they are powered by nominal voltage and frequency and the external water temperature outside the motor does not exceed 25°C (77°F), according to NEMA standards.

Variations in the power supply voltage must be contained to within roughly 10% of the nominal value. The service factor is 1 for 50 Hz motors, and 1.15 for 60 Hz motors. In applications where the water to be managed has a temperature in excess of 25°C (77°F), it is possible to use these motors but the power must be downgraded according to a specific correction coefficient; please refer to *Table 1*. Otherwise, motors can be constructed with winding wires that are specific for high temperatures. By the way of example, a standard, 20 HP motor working with an external water temperature of 35°C (95°F), can be used to deliver maximum power of  $20 \times 0.80 = 16$  HP.

Table 1 - Coefficient of Correction

WATER TEMPERATURE	COEFFICIENT of CORRECTION
25 °C (77 °F)	1.00
30 °C (86 °F)	0.90
35 °C (95 °F)	0.80
40 °C (104 °F)	0.70

Standard version motors can be used with external water temperatures of up to 40°C (104°F) provided they are downgraded correctly. In this calculations water flow speed around the motor considered not less than 0,5 m / sec in 6”, 1 m / sec in 8”.

International standards do not have, at this time, a code for the Insulation Class of wet-end type submersible motors. The insulation class of an electric motor is defined according to the insulating materials used to construct it. As an international standard is not available for submersible motors, the specification considers the insulating material used for the winding wires is PE2.

The winding wire is in insulated copper with particular thermoplastic resins. For our applications, PE2 (radiated ethylene resin) is used for the winding wire as this offers excellent dielectric properties and resists temperatures up to 95°C (203°F).

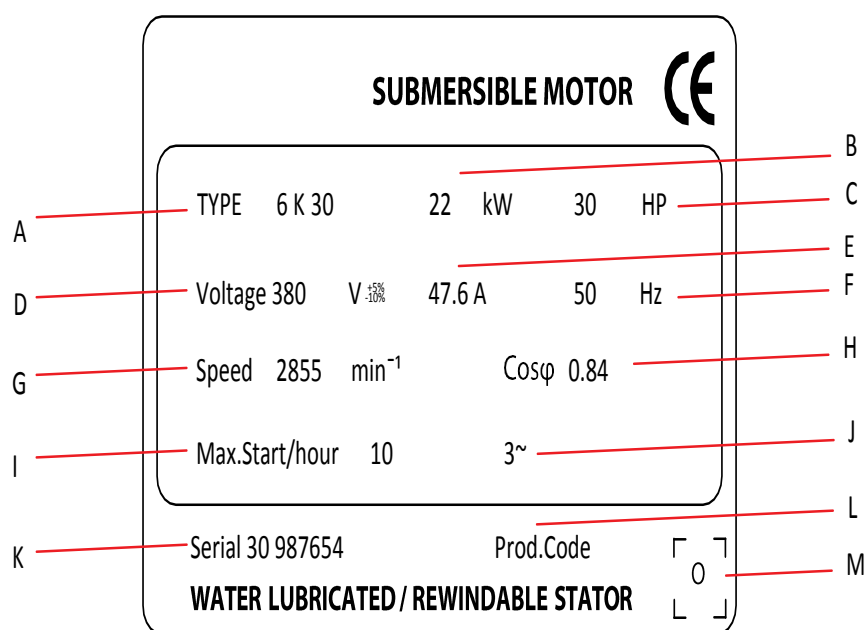
The class of the method used for cooling is IC40: machine with surface cooling using the surrounding flow with free convection. The cooling of the motor is provided by the flow of the external water, which touches its surface, therefore the efficiency of cooling depends on the temperature of the liquid and its speed as it touches the external surface of the motor.

In applications where the water has a high temperature, a method to cool the motor efficiently is to artificially increase the speed of the flow of the liquid that runs over the external parts of the motor. Generally, each time the speed of the liquid is doubled there is an improvement in temperature of approximately 5°C (41°F). The minimum speed of the liquid flow must exceed 0,5 m / sec for 6", 1 m / sec for 8".

### 3. PRODUCT SPECIFICATION

#### 3.1 PRODUCT NAMEPLATE

The motor is supplied complete with nameplates reporting the characteristics data .In case of request of warranty it's important to inform the manufacturer of all characteristic data.Following you can see the nameplate used for standard motors and the nameplate can change based on the model / product.



A -	Type	F -	Hz	K -	Serial No
B -	kW	G -	RPM	L -	Product Code (opt.)
C -	HP	H -	Cosφ	M -	Barcode (opt.)
D -	Voltage	I -	Max.Start		
E -	Ampere	J -	Phase		

All serial numbers are marked on motor body as per as our manufacturing standards.The serial numbers represents ;

X 150 123456 Y

X- power in HP Y- sequential number

As it our policy to continually improve our products, the data in the nameplate, documentation or the product itself may be subject to modification without the manufacturer being obliged to give advance warning.

## 3.2 TECHNICAL SPECTS

Table-2 contains standard features for our motors. Please review technical catalogues and contact with customer service for more details.

**Table-2**

Product Range	Power	Diameter of well
5"	5.5 HP - 30 HP	150 mm or more
6"	5.5 HP - 60 HP	157 mm or more
7"	30 HP - 90 HP	180 mm or more
8"	30 HP - 150 HP	203 mm or more
10"	125 HP - 250 HP	298 mm or more
Winding insulation	Standard	PVC
	Optional	PE2
Voltage Range	220 V .. 1000 V 50/60Hz	% +5 V .. % -10 V
Speed	~2900 rpm @ 50Hz	~3600 rpm @60Hz
Start	DOL or Y-D	
Sound Level	≤ 70 dB (A)	
Water concentration	%30 Glycol - % 70 Water	
Shaft End	wet-end (standard)	
Mechanical Seal	Standard	Carbon-Ceramic (IP68)
	Optional	SIC (IP68)
Connection Flange	5" to 8"	NEMA
	10"	Standard
Temperature Sensor	PT100 (optional)	
	max. Axial Thrust	Standard Lead Length
5" All	32.0 kN	2.5m
6" (5.5HP - 20HP)	15.5 kN	2.5m
6" (25HP - 35HP)	25.0 kN	2.5m
6" (40HP - 60HP)	30.0 kN	4m
7" and 8" - All	45.0 kN	4m
10" - All	60.0 kN	5m
Weight	See in technical catalogues.	
Storage temperature	-15° C to 60 °C	

### 3.3 INADVISABLE USE

The submersible pumps and motors are not suitable for;

- Operation without water,
- Pumping fluids other than clean water,
- Pumping water containing a concentration of solids exceeding 50 g/m<sup>3</sup> (50 parts per million)
- Pumping flammable fluids
- Closed valve operation for longer than 3 minutes, as this could cause overheating
- Continuous operation with a water speed outside the motor casing of not less than 0.5 m/s for 5-6-7-8" and 1.0 m/s for 10" motor types.
- Operation with frequent stops/starts.
- A pressure on the intake of more than 10 bar or less than required net positive suction head.
- A system pressure surges higher than the one stated in the catalogue
- An immersion depth exceeding 150m.
- Operation in places liable to explosion hazards

Not all submersible pumps are suitable for ;

- Installation in a horizontal position
- Storage at very low temperatures
- Installation in boosters.

### 4 STORAGE, TRANSPORT , LIFTING, DISPOSAL



To reduce risks during lifting and transportation operation, be sure that all equipments are complying with the safety rules and suitable for weight, dimensions and shape of motor.

The pumps and motors are packed in cartons or wooden crates of different sizes and shapes and designed to be stored, transported and handled in the horizontal position.

#### WARNING

Store the product in dry condition and protect against humidity, heat sources and mechanical damage.



If the product is not packed, place it on suitable supports in the horizontal position and prevent misalignments and excessive bending. (Figure-4.1)

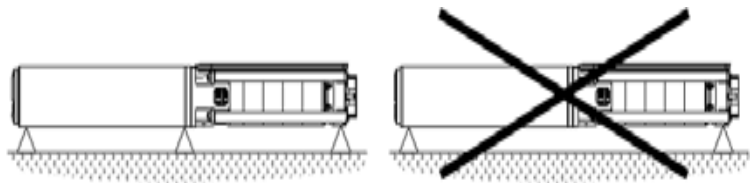


Figure-4.1



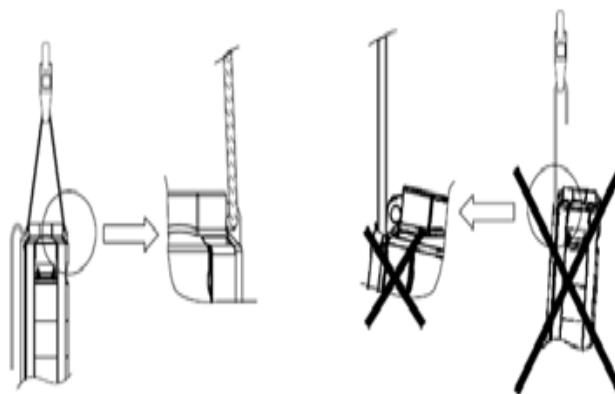
**Never use the lead-out cable for handling or lifting the motor.**

Before lifting check weight and dimension of the pump / motor from manufacturer catalogues.



**When lifting and placing the motor be sure of its stability before releasing the lifting equipment and allways use the hooks on the head. (Figure-4.2)**

When the motor is set in a vertical position, make sure that the cables are not bent. (the minimum radius of the bend must be more than 5 times the diameter of the cable itself.)



**Figure-4.2**

**WARNING**

If you cannot utilize the packing materials for other purposes, dispose of them according to the sorted waste disposal regulations locally in force.

## 5 ASSEMBLY AND START-UP

Assembly and start-up operations must be carried out by qualified and experienced staffs and suitable equipments and protections must be used.

**WARNING**

Observe all the accident prevention regulations in force. Refer allways to the local and/or national regulations, legislation and codes in force relating to the selection of the installation site and the water and power connection.

Submersible motors are generally installed in a vertical, or slightly inclined position in wells whose minimum diameter is equal to the diameter of the bulk of the motor and whose depth is compatible with the capacity of the pump that it is connected to.

With adequate caution, these motors can also be installed horizontally; this application is usually used in tanks and basins. It is essential to ensure that the motor is sufficiently cooled (See 2.2), therefore make sure that the motor is completely immersed under water and that the water is flowing freely.

### 5.1 ASSEMBLY

The connection with the submersible pump varies according to the size of the motor: Motors connection by means of flange and shaft end, according to NEMA MG1-standards, with toleration according to the same standards.





If you buy the pump without the motor and couple it to a motor other than those described in our catalogue, the safety of the unit must be guaranteed by the person making the coupling.

## WARNING

The power of the motor must be greater or at least equal to that required by the pump to which the motor is to be coupled. If you use a motor other than a standard one, make sure that the axial thrust tolerated by the motor is greater than the maximum axial thrust generated by the pump.

### Before assembly :

- Make sure that the pump shaft rotates freely while the motor stands vertically.
- Check and verify the liquid level of motor as described below. (Figure 5.1)
- Clean surfaces of parts to be connected.

### Liquid level control :

1. Disconnect electrical power supply.
2. Store the motor in vertical position
3. Remove filler plug at the top side.
4. Fill the motor with tap or bottled water slowly until no air remains in the motor.
5. Reinstall and tighten two filler plugs.

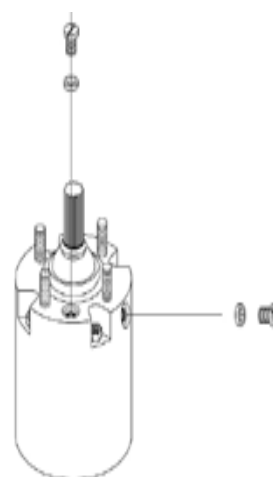
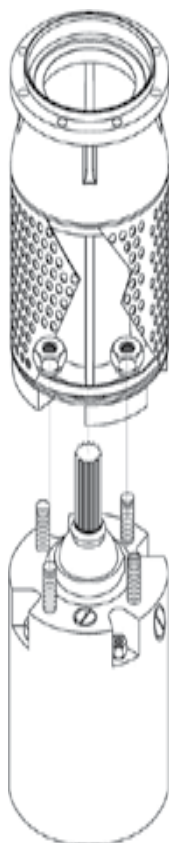



Figure 5.1

### Motor-Pump coupling :



1. Place the motor in a vertical position with the shaft lug bolt directed towards the top
2. Secure the motor so that it cannot move or fall while it is being connected.
3. Remove cable guard from the pump after unscrewing the fastening screws.
4. Lift the pump with a crane or a hoist
5. Put the pump into position over the motor
6. Align pump and motor on the same axis.
7. Lower the pump slowly until it completely engages the grooved shaft of the motor in the coupling.
8. Tighten the fastening nuts and washers diagonally.
9. Use a screwdriver to lever the connection coupling of the two drive shafts
10. Check the pump has some axial play.
11. Secure the cable guard to the pump, passing the motor cable under the guard.

## 52 MOTOR-PUMP INSTALLATION INTO A WELL


 Check the lifting equipment comply with safety rules and is suitable to support to weight of the group adding the weight of rising pipe, valve and the cables.

Lower the group into the well carefully in order to prevent damage to the pump and, more especially the electric cable.

During the installation it is necessary to measure several times the insulation resistance. According to the length of electric cable, it is normal to find a small variation of the insulation resistance value. Its minimum value with a 500 V d.c test voltage should be 5M-Ohm in air and 2 M-Ohm in water.

In case of important and sudden variation of the insulation resistance value, consequence of damage of the electric cable, it is necessary to find and to repair the damage. It shouldn't be considered that poorly made connections can easily damage the motor and/or the power supply cable.

If the electric pumps is insalled in a well, make sure that the distance between the bottom of the well and the lower end of the motor is at least 1 m. (See Figure 5.1)

 The electrical connections must be performed by a qualified installation technician in compliance with the regulation in force.

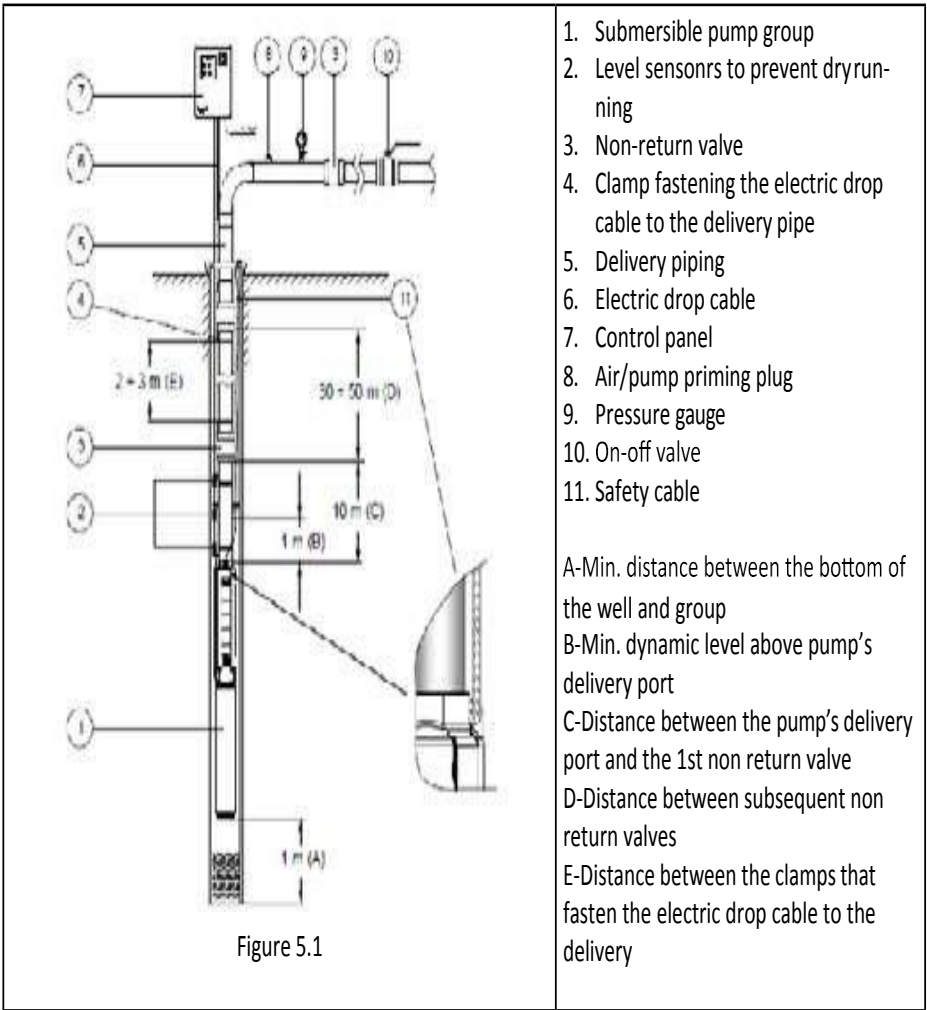


Figure 5.1

# WARNING

Make sure that the supply voltages and frequencies are suited to the characteristics of the electric motor.

## Direction of Rotation:

The correct direction of rotation of the shaft is cross-clockwise when facing the delivery side of the pump. This direction is usually indicated by an arrow on discharge or pump body. In case of visual check is not possible the correct direction can be found by finding highest pressure in both different position of two phase conductors (to reverse the direction of motor)

## Connection Cabels:

Enviromental conditions and national regulations must be considered while cable selection.



**Grounding must be connected before network cabels in compliance with safety regulations.**

The power supply cables for the connection of the motor to the control panel must fulfill three fundamental requirements.



**The power supply cable must be suitable for operation in wet environments and its class of insulation must be above the nominal voltage for the system.**



**The capacity of the cable must be in excess of the charge current; this value is equal to the nominal current of the motor for the type with three terminal wires, and is equal to 58% of the nominal current of the motor for the type with six terminals.**



**Voltage drops along the power supply line must be contained to within strict limits (max 5%)**

The capacity of electric cables are defined by the CEI-UNEL standards and the relative data is supplied according to a room temperature of 30°C (86°F). For applications where the room temperature is different to that envisaged by the standard, the capacity of the cable is calculated by applying a correction factor; refer to *Table 5.1* for the factors to be applied according to various temperatures and check technical catalogues for general cable selection guidanance.

The correction factor for the capacity is also applied in cases where the motor is the type with six terminal wires, or where the lines have been doubled to reduce the sections of the wires.

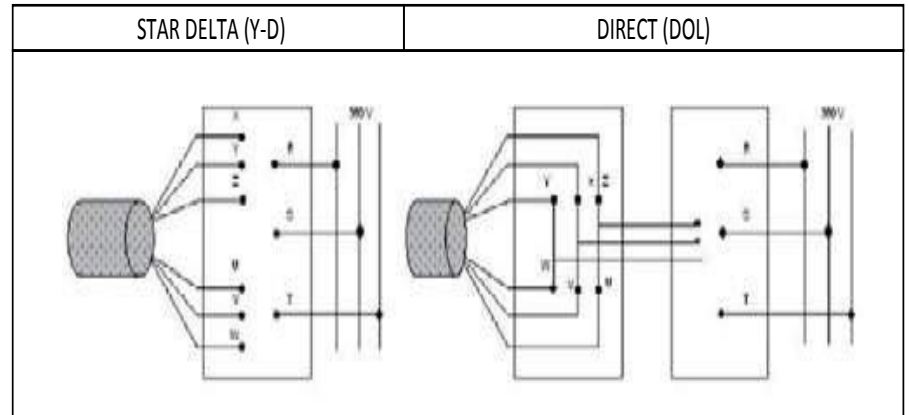
Room Temperature	Correction Factor
10°C (50°F)	1.22
15°C (59°F)	1.17
20°C (68°F)	1.12
25°C (77°F)	1.06
<u>30°C (86°F)</u>	<u>1.00</u>
35°C (95°F)	0.94
40°C (104°F)	0.87
45°C (113°F)	0.79
50°C (122°F)	0.71
55°C (131°F)	0.61
60°C (140°F)	0.50

**Table 5.1**

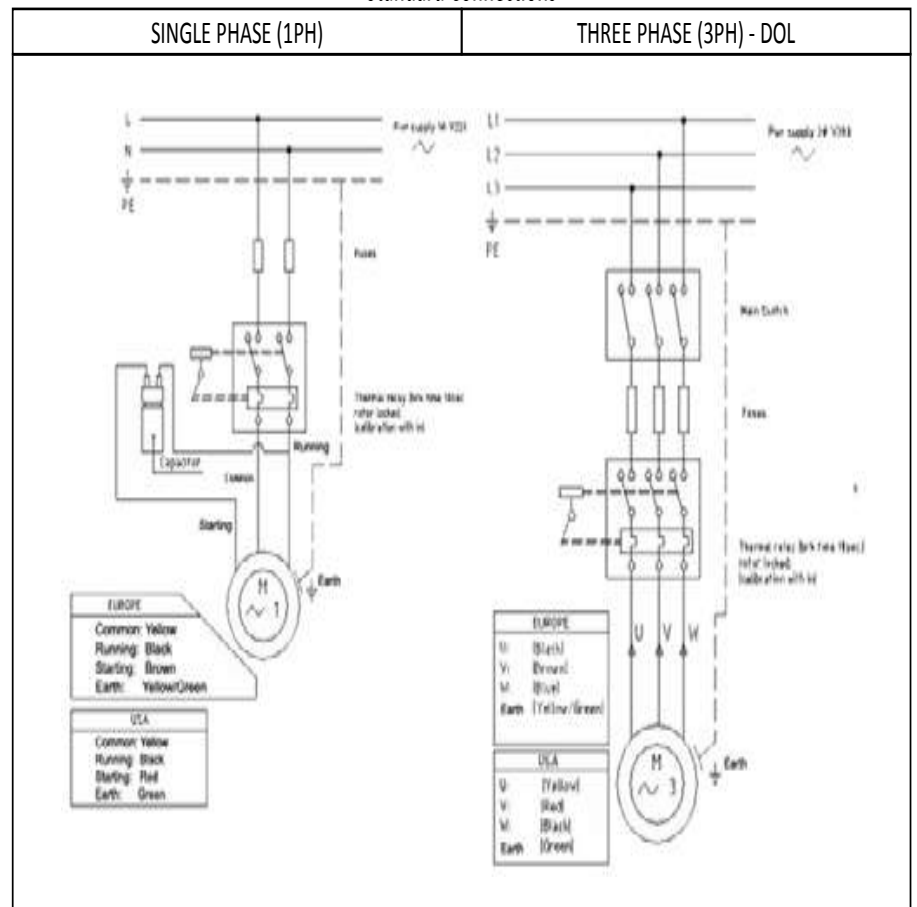
### 53 WIRING DIAGRAMS

Single voltage motors contains a series of three wires exits the motor in addition to a fourth, yellow-green wire for earth connection; these must be connected to the terminals for the controls.

Dual voltage motors (220V-380V) are designed as three are two series of three wires each, in addition the ground connection wire.



Standard Connections



4" Series Connections

#### Adjustments of Protection Devices:

Adjust the overload relay of the appliance to the value of the nominal current of the motor and start it.

With an ammeter check the three phases, the amp-draw must be balanced (the maximum acceptable unbalance is 8%) and must be less than the value of the current shown on the label of the motor.

Reduce slowly the calibration of the overload relay until it starts. Increase the calibration of the relay by 5% and start the motor again. If the relay starts again, it will be necessary to increase calibration by a further 5% or otherwise leave the fixed value.

## 6. TROUBLESHOOTING

If the problem involves situations not listed in the table, call technical support.

MULFUNCTION OR FAULT	LIKELY CAUSES	ACTION
The overload relay trips amp-draw is not balanced	The voltage is not the same on all 3 phases. The cable is to ground. The coil-winding is to ground. The pump or the motor are jammed. The connection of the motor is not correct.	Check the appliance and the line. Repair or replace the cable. Disassemble the motor and rewind it. Disassemble and overhaul it. Check the connection.
Lower head than the declared one.	Wrong direction of rotation. Leaks in delivery pipe. Worn internal parts. Air or gas in the water.	Reverse the direction of rotation. Replace the pipe or gasket. Dismantle and overhaul. Call the manufacturer.
Delivery inadequate	Impellers clogged. The level in the well becomes lower than usual.	Dismantle and overhaul. Check the capacity of the well.
The functioning of the assembly is irregular.	The pump operates at too low a head. The water level is too close to the inlet.	Regulate the gate valve on the deliver. Reduce the rate of flow. Lower the installation depth of the pump
The assembly vibrates.	Mechanical parts worn out. The NPSH of the system is insufficient	Dismantle and overhaul. Reduce the rate of flow. Lower the installation depth of the pump.

### 6.1 MAINTANANCE AND SPARE PARTS



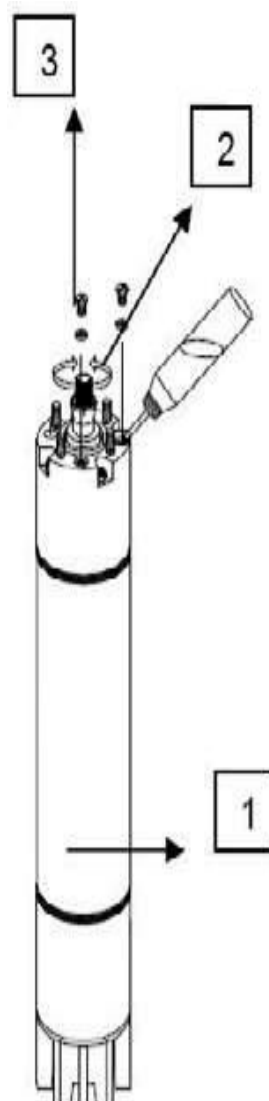
Before performing any maintanance operation on motor-pump group , make sure that the motor voltage is free.

Use only original spare parts to replace any components and review manufacturer technical catalogues. The use of unsuitable spare parts may cause malfunctions, damage and injuries.

#### **WARNING**

Always specify the exact pump/motor type and identification code when requesting technical information or spare parts from the manufacturer.

**WARNING**  
**TO KEEP YOUR MOTOR WORKING LONGER**  
**READ THIS MANUAL CAREFULLY BEFORE INSTALLATION**



**CHECK THE WATER LEVEL BEFORE INSTALLATION AND FILL THE MOTOR AS DESCRIBED.**

1. STORE MOTOR IN VERTICAL POSITION. (1)
2. MANUALLY VERIFY IF MOTOR SHAFT IS FREE TO ROTATE IN BOTH DIRECTIONS. (2)
3. TO FILL THE MOTOR REMOVE (UNSCREW) FILLER PLUG AT THE TOP SIDE OF THE MOTOR AS SHOWN (3).
  - FILL MOTOR WITH TAP OR BOTTLED WATER SLOWLY UNTIL ITS FULL AND NO AIR REMAINS IN THE MOTOR.
  - REINSTALL AND TIGHTEN TWO FILLER PLUGS (3)
4. DO NOT OPEN THE FILLER PLUG WHEN THE MOTOR IS IN HORIZONTAL POSITION.
5. DO NOT CONNECT POWER SUPPLY OF MOTOR UNTIL THIS OPERATION COMPLETED.