



## **SUBMERSIBLE MOTOR ENGINEERING**

### **INSTALLATION INSTRUCTIONS FOR 3 PHASE WD SUBMERSIBLE MOTORS.**

# **WARNING**

**CATASTROPHIC OR FATAL ELECTRIC SHOCK MAY RESULT FROM FAILURE TO CONNECT THE MOTOR CONTROL ENCLOSURE, METAL PLUMBING, AND ALL OTHER METAL NEAR THE MOTOR OR CABLE, TO THE POWER SUPPLY GROUND TERMINAL. TO REDUCE THE RISK OF ELECTRICAL SHOCK, DISCONNECT POWER BEFORE WORKING ON OR AROUND THE WATER SYSTEM.**

#### **DO NOT USE IN SWIMMING AREAS**

**THIS EQUIPMENT IS INTENDED FOR INSTALLATION BY TECHNICALLY QUALIFIED PERSONNEL. FAILURE TO INSTALL IN COMPLIANCE WITH NATIONAL AND LOCAL REGULATIONS, AND SUBMERSIBLE MOTOR ENGINEERING RECOMMENDATIONS, MAY RESULT IN ELECTRIC SHOCK OR FIRE HAZARD, UNSATISFACTORY PERFORMANCE, AND EQUIPMENT FAILURE. SUBMERSIBLE MOTOR ENGINEERING INSTALLATION INFORMATION IS AVAILABLE FROM PUMP MANUFACTURERS AND DISTRIBUTORS OR DIRECTLY FROM SUBMERSIBLE MOTOR ENGINEERING.**

#### **HANDLING AND INITIAL CHECKS**

- 1. Inspect the motor and cable for transport damage. Report any visible damage to the transport company and to your supplier immediately.**
- 2. Do not lift the motor using the supply cable. Do not pull the supply cable. The supply cable needs to be protected at all times as a damaged cable may allow water into the individual conductors causing an Earth fault.**
- 3. Check the motor nameplate data and ensure that it matches your purchase order and meets your requirements.**

4. Motors are usually supplied with factory-installed oil in the Mechanical Seal chamber. Please check for any signs of oil leakage, and advise the supplier immediately if there appears to be any oil leakage.
5. On new installations and if the motor has not been used for a long period it must be “Meggered” at 1000V prior to operation. The Megger reading / Insulation Resistance should be at least 100 Mohms before operation and at least 50 Mohm when hot after running.
6. Verify that the motor Mechanical Seal chamber is full of oil to the fill plug level prior to Installation. **FAILURE TO ENSURE THAT THE SEAL CHAMBER IS FULL OF OIL PRIOR TO OPERATION WILL VOID ANY WARRANTY CLAIMS. The oil chamber should only be filled to the level of the fill plugs when the motor is standing vertical.** Ensure all filling plugs, drain plugs, cable connections, and mounting bolts are tight.
7. The impeller should be a tight sliding fit on the shaft. Do not hammer or force the impeller onto the shaft as this could damage the Thrust bearing.
8. Check that the rotor is free to turn by rotating it by hand. (Motors with mechanical seals may feel stiff when turned by hand).
9. If the motor is to be operated in the Horizontal SME must be advised prior to installation.

**IF THERE IS A WARRANTY INSPECTION THE MOTOR MUST BE RETURNED TO THE ORIGINAL SUPPLIER, OR SME, WITH CABLES INTACT.**

#### CHECK LIST PRIOR TO INSTALLATION

Please check the following:

1. Ambient Temperature of the water to be pumped and ensure that it is less than the temperature rating of the motor.
2. The PH of the water is between 6.5 and 8.
3. Maximum Chlorine content in water is less than 500 PPM.
4. Maximum Sulphuric Acid Iron content in the water is less than 15 PPM.
5. Maximum Fluorine content in the water is less than 0.8 PPM.
6. Maximum Sand content is less than 50 PPM.
7. The electrical control equipment includes suitable fast acting current overload protection, which is set to shut the motor down within 3 seconds under locked rotor current or starting current conditions.
8. The electrical control equipment includes suitable fuses or circuit breakers to disconnect the system if there is a fault.
9. Variation of the supply voltage and frequency combination is within 5% of the motor nameplate voltage and frequency.
10. Maximum voltage unbalance is less than 5%.
11. The cable sizes are calculated to ensure that the voltage at the motor is still within 2% of the motor nameplate voltage after allowing for volt drop at full load current.
12. Waterproof submersible type cables must be used with these motors.
13. The motor has been correctly selected to suit the pump, thrust load from the pump, electrical supply capacity, and water availability. The motor should be installed to be submerged at all times as this will ensure a long service life.
14. **Motors with no water jackets may overheat if they are run continuously on full load while not submerged. Motors with water jackets do not need to be submerged provided there is water flowing through the water jacket.**
15. Connection of the motor to an incorrect supply will void any warranty.
16. Protection against single phasing is strongly recommended. If the motor fails due to single phasing the warranty will be void.

17. Installation of Lighting Arrestors is also recommended to protect the control panel, motor cables, and the motor. Any failure due to lightening will not be covered by warranty.
18. Any cable joints must be done properly by technically competent technicians. They must be waterproof and give a good electrical connection with no significant volt drop. (SME can supply a recommended procedure for splicing cable joints on request).
19. Reduced voltage starting using Soft Starters, VVVF drives, Autotransformers, (or Star-Delta starters if the motor has been supplied with 6 leads out), can create additional problems for submersible motors. Please ensure compliance with the following points.
  - A. Correctly selected Overloads or Circuit Breakers are correctly installed and correctly set to protect the motor.
  - B. Suitable Short Circuit Protection is installed.
  - C. The starter will allow the motor to generate sufficient torque to start the pump and run it up to speed. (In general the torque is reduced by the square of the voltage – a small reduction in voltage will lead to a large reduction in starting torque).
  - D. Timers are set to ensure that the motor has enough voltage for enough time to run the motor up to speed as quickly as possible, and also switch the motor over to full voltage as quickly as possible and prolonged running at reduced voltage will stress the motor windings.

## COMMISSIONING and OPERATION

1. After energising the motor for the first time, ensure that the starting current drops to below the nameplate current within 5 seconds, which means that the motor has run up to full speed.
2. Check the flow and pressure from the pump to make sure the motor is running in the correct direction of rotation. Swapping any 2 of the 3 phase supply leads will change the direction of rotation.
3. While the motor is running for the first time check the water for sand. If sand appears continue to pump until the water clears. If the motor is switched off while the pump is still pumping sand this could accumulate in the pump and cause it to seize up.
4. During testing or checking rotation the number of starts and the time between starts needs to be controlled. As a general rule the motor should be allowed 5 minutes to cool down between each start.
5. Most SME WD motors are fitted with PTC Thermistors, as standard, and it is recommended these are connected to a suitable thermistor relay to protect the motor.
6. **It is strongly recommended that the “Over Current” protection is set to trip at about 5% higher than the steady state current recorded when the motor/pump is commissioned. It is not recommended that the “Over Current” protection is set at just above Full Load Nameplate Current, as, in a lot of cases, this will not protect the motor if the current increases, especially if the motor is not fully loaded. We believe that the operator needs to know if the current starts to increase, so they can determine why.**
7. All temperatures and all 3 phases of voltage and current and insulation levels should be recorded throughout the life of the installation and monitored and reviewed as a form of preventative maintenance.

## MAINTENANCE

The ball bearings have been greased for life during assembly – there is no need for additional oil or greasing during the operating life of the motor and bearings. The motor

cannot be accessed unless it is removed from the sump, so everything that can be monitored needs to be monitored on a regular basis, and any unexplained changes investigated.

1. The normal running temperatures – if PT100s are installed, current, and voltage on all 3 phases need to be recorded on a regular basis.
2. The motor winding and the cable insulation needs to be recorded on a regular basis with reference to the temperature of the motor – hot or cold – if the motor does not have temperature monitoring installed. If the cold insulation drops below 2 Megohms the installation needs to be carefully checked out.
3. The output pressure and flow from the pump should also be monitored on a regular basis.
4. The overall performance of the pump and motor can be reviewed based on the information being recorded and this can be used to determine any need for maintenance or overhauling, which might be required.
5. **SME** have a separate brochure, which details how to carry out maintenance on the motor including strip down, inspection, and re-assembly.

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