SPE
Stainless steel submersible pump for environmental applications
Installation and operating instructions
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1. Limited warranty

Products manufactured by GRUNDFOS PUMPS CORPORATION (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos' manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by Grundfos are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos' products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions.

Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed. GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limit actions on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.
2. Symbols used in this document

*Warning*
If these safety instructions are not observed, it may result in personal injury!

*Caution*
If these safety instructions are not observed, it may result in malfunction or damage to the equipment!

*Note*
Notes or instructions that make the job easier and ensure safe operation.

3. Introduction

*Warning*
The use of this product requires experience with and knowledge of the product. Persons with reduced physical, sensory or mental capabilities must not use this product, unless they are under supervision or have been instructed in the use of the product by a person responsible for their safety.

*Caution*
Children must not use or play with this product.

Your Grundfos SPE environmental pump is of the utmost quality. Combined with proper installation, your Grundfos pump will give you many years of reliable service.

To ensure the proper installation of the pump, carefully read the complete manual before attempting to install the pump.

3.1 Delivery and handling

3.1.1 Delivery

**Shipment inspection**
Examine the components carefully to make sure no damage has occurred to the pump end, motor, or cable during shipment.

*Caution*
The pumps should remain in the packing until they are placed in vertical position during installation.

The shipping carton should contain:
- pump end
- motor
- cable
- these installation and operating instructions.

3.1.2 Handling

This Grundfos SPE environmental pump should remain in its shipping carton until it is ready to be installed. The carton is specially designed to protect it from damage.

During unpacking and prior to installation, make sure that the pump is not contaminated, dropped or mishandled.

*Caution*
The motor is equipped with an electrical cable. Under no circumstance should the electrical cable be used to support the weight of the pump.

You will find a loose data plate wired to the pump. It should be securely mounted at the well or attached to the control box.

3.2 Applications

3.2.1 Pumped liquids

SPE pumps are designed for pumping cold groundwater that is free of air or gasses. Decreased pump performance and life expectancy can occur if the groundwater is not cold or contains air or gasses.

4. Operating conditions

| Flow (Q): | Max. 50 gpm (11.4 m³/h) |
| Head (H): | Max. 500 ft (152 m) |
| Liquid temp: | +32 °F to +104 °F (0 °C to 40 °C) |

5. Installation

5.1 Pre-installation checks

Before beginning installation, the following checks should be made. They are all critical for the proper installation of this submersible pump.

5.1.1 Condition of the well

If the pump is to be installed in a new well, the well should be fully developed and bailed or blown free of cuttings and sand. Dispose of discharged materials in accordance with the specific job site requirements. The stainless steel construction of the SPE Environmental Pump makes it resistant to abrasion; however, no pump, made of any material, can forever withstand the destructive wear that occurs when constantly pumping sandy groundwater.

Determine the maximum depth of the well, and the drawdown level at the pump’s maximum capacity. Pump selection and setting depth should be based on this data.

**Diameter of well casing**

The inside diameter of the well casing should be checked to ensure that it is not smaller than the size of the pump and motor.

5.1.2 Condition of the water

SPE pumps are designed for pumping cold groundwater that is free of air or gasses. Decreased pump performance and life expectancy can occur if the groundwater is not cold or contains air or gasses.
5.1.3 Installation depth
Pumping sand or well sediment can occur when the pump motor is installed lower than the top of the well screen or within 5 ft of the well bottom. This can reduce the performance and life expectancy of the pump and should be avoided. If the pump is to be installed in a lake, containment pond, tank or large diameter well, the water velocity passing over the motor must be sufficient to ensure proper motor cooling. The minimum recommended water flow rates which ensure proper cooling are listed in section 9.1 Minimum water flow requirements for submersible pump motors on p. 13.

5.1.4 Electrical supply
The motor voltage, phase and frequency indicated on the motor nameplate should be checked against the actual electrical supply.

5.1.5 Wire cable type
The wire cable used between the pump and control box or panel should be approved for submersible pump applications. The conductor insulation should have a continuous Teflon® jacket with no splices and must be suitable for use with submersible pumps.

5.2 Mechanical installation

5.2.1 Riser pipe or hose
The riser pipe or hose should be properly sized and selected based on estimated flow rates and friction-loss factors. A back-up wrench should be used when attaching a riser pipe or metallic nipple to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. The body of the pump, cable guard or motor should not be gripped under any circumstance.

5.2.2 If a steel riser pipe is used
An approved pipe thread compound should be used on all joints. Make sure the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

Caution
When tightened, the first section of the riser pipe must not come in contact with the check valve retainer in the discharge chamber of the pump.

After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. Do not clamp the pump.

When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only.

Make sure that the electrical cables are not cut or damaged in any way when the pump is being lowered in the well.

Caution

The drop cable should be secured to the riser pipe at frequent intervals to prevent sagging, looping or possible cable damage.

5.2.3 If plastic or flexible riser pipe is used
Use the correct compound recommended by the pipe manufacturer or specific job specifications. Make sure that joints are securely fastened. Besides making sure that joints are securely fastened, the use of a torque arrester is recommended when using these types of pipe.

Do not connect the first plastic or flexible riser section directly to the pump.

Always attach a metallic nipple or adapter into the discharge chamber of the pump. When tightened, the threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber of the pump.

The drop cable should be secured to the riser pipe at frequent intervals using an approved clip or tape to prevent sagging, looping and possible cable damage.

Important — plastic and flexible pipe tend to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe.

Leave enough slack between tie points to allow for this stretching. This tendency for plastic and flexible pipe to stretch will also affect the calculation of the pump setting depth. If the depth setting is critical, check with the manufacturer of the pipe to determine how to compensate for pipe stretch.

When these types of pipe are used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge piece of SPE submersibles is designed to accommodate this cable; see fig. 1.

Fig. 1 SPE submersible with safety cable attached
5.2.4 Protect the well from contamination
While installing the pump, proper care should be used not to introduce foreign objects or contaminants into the well. The well should be finished off above grade to protect against surface water from entering the well, causing contamination.

5.3 Electrical installation

Warning
To reduce the risk of electrical shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor, at least the size of the circuit supplying the pump, to the grounding screw provided within the wiring compartment.

All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor voltage, phase, frequency and full-load current information can be found on the nameplate attached to the motor. Motor electrical data can be found in section 9.3 Electrical data on p. 13.

If voltage variations are larger than + / - 10 %, do not operate the pump.

Direct on-line starting is used due to the extremely fast run-up time of the motor (0.1 second maximum), and the low moment of inertia of the pump and motor. Direct on-line starting current (locked rotor amp) is between 4 and 6.5 times the full-load current.

5.3.1 Engine-driven generators
If the SPE pump is going to be operated using an engine driven generator, Grundfos suggests the manufacturer of the generator be contacted to ensure the proper generator is selected and used. See section 5.3.1 Engine-driven generators on p. 13 for generator sizing guide.

5.3.2 Control box/panel wiring
Single-phase motors must be connected as indicated in the motor control box. See fig. 2.

5.3.3 High voltage surge arresters
A high voltage surge arrester should be used to protect the motor against lightning and switching surges. The correct voltage rated surge arrester should be installed on the supply (line) side of the control box; see fig. 3.

The surge arrester must be grounded in accordance with the National Electric Code, local codes and regulations.

5.3.4 Control box and surge arrester grounding
The control box shall be permanently grounded in accordance with the National Electrical Code and local codes or regulations.

The ground wire should be a bare copper conductor at least the same size as the drop cable wire size. The ground wire should be run as short a distance as possible and be securely fastened to a true grounding point. True grounding points are considered to be:
- a grounding rod driven into the water strata
- steel well casing submerged into the water lower than the pump setting level
- steel discharge pipes without insulating couplings.
If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel.

**Caution**  
*Do not ground to a gas supply line.*

Connect the grounding wire to the ground point first and then to the terminal in the control box or panel.

### 5.3.5 Wiring checks

Before making the final wiring connections of the drop cable to the control box terminal, it is a good practice to check the insulation resistance to ensure that the cable is good.

Measurements for a new installation must be at least 1,000,000 ohm. Do not start the pump if the measurement is less than this. If it is higher, finish wiring and verify that all electrical connections are made in accordance with the wiring diagram. Check to ensure the control box and high voltage surge arrester have been grounded.

### 6. Startup

After the pump has been set into the well and the wiring connections have been made, the following procedures should be performed:

1. Attach a temporary horizontal length of pipe with installed gate valve to the riser pipe.
2. If required, make provisions to capture discharged fluids for disposal.
3. Adjust the gate valve one-third open.
4. Start the pump and let it operate until the water runs clear of sand and silt.
5. As the water clears, slowly open the gate valve in small increments until the desired flow rate of clear water is reached. The pump should not be operated beyond its maximum flow rating and should not be stopped until the groundwater runs clear.
6. If the groundwater is clean and clear when the pump is first started, the valve should still be opened until the desired flow rate is reached.
7. Disconnect the temporary piping arrangements and complete the final piping connections.
8. **Under no circumstances should the pump be operated for any prolonged period of time with the discharge valve closed.** This can result in motor and pump damage due to overheating.

A properly sized relief valve should be installed at the well head to prevent the pump from running against a closed valve.

If the pump fails to operate, or there is a loss of performance, refer to section 8. Troubleshooting.

For additional information, refer to the MP1, SPE VFD (Variable Frequency Drive) Installation and Operating Instructions manual.

### 7. Operation

The pump and system should be periodically checked for water quantity, pressure, drawdown, periods of cycling, and operation of controls.
8. Troubleshooting

Warning

WHEN WORKING WITH ELECTRICAL CIRCUITS, USE CAUTION TO AVOID ELECTRICAL SHOCK. It is recommended that rubber gloves and boots be worn and that care is taken to have metal control boxes and motors grounded to power supply ground or steel drop pipe or casing extending into the well.

Warning

Submersible motors are intended for operation in a well. When not operated in a well, failure to connect motor frame to power supply ground may result in a serious electrical shock.

The majority of problems that develop with submersible pumps are electrical, and most of these problems can be corrected without pulling the pump from the well. The following charts cover most of the submersible service work. As with any troubleshooting procedure, start with the simplest solution first; always make all the above-ground checks before pulling the pump from the well.

Usually only two instruments are needed — a combination voltmeter/ammeter, and an ohmmeter. These are relatively inexpensive and can be obtained from most water systems suppliers.

8.1 Checking pump performance

The troubleshooting chart in section 8.2 Troubleshooting chart on p. 10 may require that you test the pump’s performance against its curve. To do so, perform these steps:

1. Install pressure gauge
2. Start pump
3. Gradually close the discharge valve
4. Read pressure at shut-off.
5. After taking reading, open valve to its previous position.
6. To calculate pump performance, first convert psi reading to feet.
   (For water: psi x 2.31 = ____ ft.).
7. Add this to the total vertical distance from the pressure gauge to the water level in the well while the pump is running.
8. Refer to the specific pump curve for the shut-off head for that pump model. If the measured head is close to the curve, pump is probably OK.
## 8.1.1 Preliminary Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>How to measure</th>
<th>What it means</th>
</tr>
</thead>
</table>
| **Supply voltage** | **By means of a voltmeter, which has been set to the proper scale,** measure the voltage at the control box.  
• **On single-phase units,** measure between line and neutral. | When the motor is under load, the voltage should be within ±10% of the nameplate voltage. Larger voltage variation may cause winding damage.  
Large variations in the voltage indicate a poor electrical supply and the pump should not be operated until these variations have been corrected.  
If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage. |
| **Current**        | • **By use of an ammeter,** set on the proper scale,** measure the current on each power lead at the control box or starter.**  
See section 9.3 Electrical data on p. 13 for motor amp draw information.  
• **Current should be measured when the pump is operating at a constant discharge pressure with the motor fully loaded.** | If the amp draw exceeds the listed service factor amps (SFA) check for the following:  
• Burnt contacts on motor starter.  
• Loose terminals in starter or control box or possible cable defect. Check winding and insulation resistances.  
• Supply voltage too high or low.  
• Motor windings are shorted.  
• Pump is damaged, causing a motor overload. |
| **Winding resistance** | • **Turn off power and disconnect the drop cable leads in the control box.**  
• Using an ohmmeter, set the scale selectors to Rx1 for values under 10 ohms and Rx10 for values over 10 ohms.  
• Zero-adjust the meter and measure the resistance between leads. Record the values.  
• Motor resistance values can be found in section 9.3 Electrical data on p. 13.  
Cable resistance values can be found in section 9.3.1 Total resistance of drop cable (Ohms) on p. 14. | If all the ohm values are normal, and the cable colors correct, the windings are not damaged.  
If any one ohm value is less than normal, the motors may be shorted.  
If any one ohm value is greater than normal, there is a poor cable connection or joint. The windings or cable may also be open.  
If some of the ohm values are greater than normal and some less, the drop cable leads are mixed. To verify lead colors, see resistance values in section 9.3 Electrical data on p. 13. |
| **Insulation resistance** | • **Turn off power and disconnect the drop cable leads in the control box.**  
• Using an ohm or mega ohmmeter, set the scale selector to Rx 100K and zero-adjust the meter.  
• Measure the resistance between the lead and ground (discharge pipe or well casing, if steel). | For ohm values, refer to 8.1.2 Ohm value chart on p. 9.  
Motors of all hp, voltage, phase and cycle duties have the same value of insulation resistance. |
# 8.1.2 Ohm value chart

<table>
<thead>
<tr>
<th>Motor not yet installed</th>
<th>Ohm value (or more)</th>
<th>Megaohm value</th>
<th>Condition of motor and leads/recommended procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2,000,000</td>
<td>2.0</td>
<td>New motor.</td>
</tr>
<tr>
<td></td>
<td>1,000,000 (or more)</td>
<td>1.0</td>
<td>Used motor which can be reinstalled in the well.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor in well (Ohm readings are for drop cable plus motor)</th>
<th>Ohm value</th>
<th>Megaohm value</th>
<th>Condition of motor and leads/recommended procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500,000 - 1,000,000</td>
<td>0.5 - 1.0</td>
<td>A motor in reasonably good condition.</td>
</tr>
<tr>
<td></td>
<td>20,000 - 500,000</td>
<td>0.02 - 0.5</td>
<td>A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.</td>
</tr>
<tr>
<td></td>
<td>10,000 - 20,000</td>
<td>0.01 - 0.02</td>
<td>A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will still operate, but probably not for long.</td>
</tr>
<tr>
<td></td>
<td>Less than 10,000</td>
<td>0 - 0.01</td>
<td>A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run in this condition.</td>
</tr>
</tbody>
</table>
### 8.2 Troubleshooting chart

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause/how to check</th>
<th>Possible remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pump does not run.</td>
<td>a) No power at pump panel.</td>
<td>If no voltage at panel, check feeder panel for tripped circuits.</td>
</tr>
<tr>
<td></td>
<td>How to check: Check for voltage at panel.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Fuses are blown or circuit breakers are tripped.</td>
<td>Replace blown fuses or reset circuit breaker. If new fuses blow or circuit breaker trips, the electrical installation and motor must be checked.</td>
</tr>
<tr>
<td></td>
<td>How to check: Remove fuses and check for continuity with ohmmeter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Defective controls.</td>
<td>Replace worn or defective parts.</td>
</tr>
<tr>
<td></td>
<td>How to check: Check all safety and pressure switches for operation. Inspect contacts in control devices.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Motor and/or cable are defective.</td>
<td>If open motor winding or ground is found, remove pump and recheck values at the surface. Repair or replace motor or cable.</td>
</tr>
<tr>
<td></td>
<td>How to check: Turn off power. Disconnect motor leads from control box. Measure the lead-to-lead resistances with the ohmmeter (Rx1). Measure lead-to-ground values with ohmmeter (Rx100K). Record measured values.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) Defective capacitor (single-phase only).</td>
<td>If there is no ohmmeter needle movement, replace the capacitor.</td>
</tr>
<tr>
<td></td>
<td>How to check: Turn off the power, then discharge capacitor. Check with an ohmmeter (Rx100K). When meter is connected, the needle should jump forward and slowly drift back.</td>
<td></td>
</tr>
<tr>
<td>Problem</td>
<td>Possible cause/how to check</td>
<td>Possible remedy</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| 2. Pump runs but does not deliver water. | a) Groundwater level in well is too low or well is collapsed.  
How to check:  
Check well draw-down. | Lower pump if possible. If not, throttle discharge valve and install water level control. |
| | b) Integral pump check valve is blocked.  
How to check:  
Check the pump’s performance against its curve; see section 8.1 Checking pump performance on p. 7. | If the pump is not operating close to the pump curve, remove pump and inspect discharge section. Remove blockage, repair valve and valve seat if necessary. Check for other damage. Rinse out pump and re-install. |
| | c) Inlet strainer is clogged.  
How to check:  
Check the pump’s performance against its curve; see section 8.1 Checking pump performance on p. 7. | If pump is not operating close to the pump curve, remove pump and inspect. Clean strainer, inspect integral check valve for blockage, rinse out pump and re-install. |
| | d) Pump is damaged.  
How to check:  
Check the pump’s performance against its curve; see section 8.1 Checking pump performance on p. 7. | If pump is damaged, repair as necessary. Rinse out pump and re-install. |
| 3. Pump runs but at reduced capacity. | a) Draw-down is larger than anticipated.  
How to check:  
Check draw-down during pump operation. | Lower the pump if possible. If not, throttle discharge valve and install water level control. |
| | b) Discharge piping or valve leaking.  
How to check:  
Examine system for leaks. | Repair leaks. |
| | c) Pump strainer or check valve are clogged.  
How to check:  
Remove pump and inspect. | Clean, repair, rinse out pump and reinstall. |
| | d) Pump is worn.  
How to check:  
Check the pump’s performance against its curve; see section 8.1 Checking pump performance on p. 7. | If not close to pump curve, remove pump and inspect. |
<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause/how to check</th>
<th>Possible remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Pump cycles too much.</td>
<td>a) Pressure switch is not properly adjusted or is defective. How to check: Check pressure setting on switch and operation. Check voltage across closed contacts.</td>
<td>Re-adjust switch or replace if defective.</td>
</tr>
<tr>
<td></td>
<td>b) Level control is not properly set or is defective. How to check: Check setting and operation.</td>
<td>Re-adjust setting (refer to manufacturer data.) Replace if defective.</td>
</tr>
<tr>
<td></td>
<td>c) Plugged snifter valve or bleed orifice. How to check: Examine valve and orifice for dirt or corrosion.</td>
<td>Clean and/or replace snifter valve or bleed orifice if defective.</td>
</tr>
<tr>
<td>5. Fuses blow or circuit breakers trip</td>
<td>a) High or low voltage. How to check: Check voltage at pump panel. If not within ± 10%, check wire size and length of run to pump panel.</td>
<td>If wire size is correct, contact power company. If not, correct and/or replace as necessary.</td>
</tr>
<tr>
<td></td>
<td>b) Control box wiring and components. How to check: Check that control box parts match the parts list. Check to see that wiring matches wiring diagram. Check for loose or broken wires or terminals.</td>
<td>Correct as required.</td>
</tr>
<tr>
<td></td>
<td>c) Defective capacitor. How to check: Turn off power and discharge capacitor. Check using an ohmmeter (Rx100K). When the meter is connected, the needle should jump forward and slowly drift back.</td>
<td>If there is no ohmmeter needle movement, replace the capacitor.</td>
</tr>
<tr>
<td></td>
<td>d) Starting relay (Franklin single-phase motors only). How to check: Check resistance of relay coil with an ohmmeter (Rx1000K). Check contacts for wear.</td>
<td>Replace defective starting relay.</td>
</tr>
</tbody>
</table>
9. Technical data

9.1 Minimum water flow requirements for submersible pump motors

<table>
<thead>
<tr>
<th>Motor diameter</th>
<th>Casing or sleeve I.D. [inches]</th>
<th>Min. flow past the motor [gpm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>4</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>30</td>
</tr>
</tbody>
</table>

Notes:
- A flow inducer or sleeve must be used if the water enters the well above the motor or if there is insufficient water flow past the motor.
- The minimum recommended water velocity over 4" motors is 0.25 feet (0.08 m) per second.

9.2 Guide for engine-driven generators in submersible pump applications

<table>
<thead>
<tr>
<th>Motor [hp]</th>
<th>Minimum kilowatt rating of generator for three-wire submersible pump motors [kW]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Externally regulated</td>
</tr>
<tr>
<td>0.33</td>
<td>1.5</td>
</tr>
<tr>
<td>0.5</td>
<td>2.0</td>
</tr>
<tr>
<td>0.75</td>
<td>3.0</td>
</tr>
<tr>
<td>1</td>
<td>4.0</td>
</tr>
<tr>
<td>1.5</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Notes:
- Table is based on typical 176 °F (80 °C) rise continuous duty generators with 35 % maximum voltage dip during start-up of single-phase motors.
- Contact the manufacturer of the generator to assure the unit has adequate capacity to run the submersible motor.
- If the generator rating is in KVA instead of kilowatts, multiply the above ratings by 1.25 to obtain KVA.

9.3 Electrical data

Grundfos submersible pump motors - 60 Hz
4-inch, single phase, 2-wire motors (control box not required)

<table>
<thead>
<tr>
<th>Hp</th>
<th>Ph</th>
<th>Volt [V]</th>
<th>S.F.</th>
<th>Amperage Full load</th>
<th>Full load</th>
<th>Line-to-line resistance [ohms]</th>
<th>KVA code **</th>
<th>Max. thrust (lbs)</th>
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<td>34.5</td>
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Grundfos submersible pump motors - 60 Hz
4-inch, single phase, 3-wire motors

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<th>Ph</th>
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<th>S.F.</th>
<th>Amperage Full load</th>
<th>Full load</th>
<th>Line-to-line resistance [ohms]</th>
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<th>Max. thrust (lbs)</th>
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9.3.1 Total resistance of drop cable (Ohms)

The values shown in this table are for copper conductors. Values are for the total resistance of drop cable from the control box to the motor and back.

To determine the resistance:
1. Disconnect the drop cable leads from the control box or panel.
2. Record the size and length of drop cable.
3. Determine the cable resistance from the table.
4. Add drop cable resistance to motor resistance. Motor resistances can be found in section 9.3 Electrical data on p. 13.
5. Measure the resistance between each drop cable lead using an ohmmeter. Meter should be set on Rx1 and zero-balanced for this measurement.
6. The measured values should be approximately equal to the calculated values.

<table>
<thead>
<tr>
<th>Distance from control box to pump motor [ft]</th>
<th>12 AWG wire resistance [ohms]</th>
<th>14 AWG wire resistance [ohms]</th>
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<td>10</td>
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<td>0.05</td>
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<td>0.15</td>
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<tr>
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<tr>
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<td>0.29</td>
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<td>0.32</td>
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</table>

10. Disposal

Warning
Adherence to environmental regulations — when handling and operating the SPE environmental pump, all environmental regulations concerning the handling of hazardous materials must be observed. When the pump is taken out of operation, great care should be taken to ensure that the pump contains no hazardous materials that might cause injury to human health or to the environment.
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Telefax: +52-81-8144 4010
Being responsible is our foundation
Thinking ahead makes it possible
Innovation is the essence