



**INSTALLATION,
OPERATION AND
MAINTENANCE
INSTRUCTIONS**

THIS MANUAL APPLIES TO:

**SUBMERSIBLE VORTEX PUMPS
SUBMERSIBLE NON-CLOG PUMPS
VERTICAL DRY PIT SUBMERSIBLE VORTEX PUMPS
VERTICAL DRY PIT SUBMERSIBLE NON-CLOG**

CAUTION

**CAREFULLY READ ALL SECTIONS IN THIS
MANUAL AND ALL OTHER INSTRUCTION
MANUALS PROVIDED BY MANUFACTURERS OF
OTHER EQUIPMENT SUPPLIED WITH THIS PUMP**

CAUTION

**PRIOR TO WORKING ON ANY ELECTRICAL OR PUMP EQUIP-
MENT, SAFETY ELECTRICAL LOCKOUT CIRCUITS SHOULD BE IN-
STALLED AND LOCKED OUT TO PREVENT SERIOUS INJURY OR
DEATH. REVIEW ALL LOCAL, STATE, FEDERAL CODES AND
OSHA REQUIREMENTS BEFORE WORKING ON ANY PUMPING
EQUIPMENT.
SAFETY IS YOUR RESPONSIBILITY**

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PUMP IDENTIFICATION

Congratulations! You are the owner of the very best submersible pump commercially available. With proper care and maintenance it will provide you with reliable service for many years.

ESSCO pumps are of the heavy duty design with vortex or non-clog impellers. ESSCO offers a wide variety of impeller designs to allow for equipment flexibility. ESSCO pumps are ideally suited for applications such as sewage, slurry, food waste handling, food handling and a variety of other services. Standard construction is cast iron with a carbon ceramic lower mechanical seal. Standard optional materials are available such as 316 S.S. (CF8M), High Chromium Iron, Nihard, CD4MCu, Bronze, and many others. Not all pump models are available in all materials. ESSCO pumps are engineered to accept a wide variety of mechanical seal materials.

This manual applies to:

All sizes of Submersible and Dry Pit Submersible pumps.

4x12x*-10-4 Vortex Pump(1) 4x4x10x3-10-4 Non-Clog Pump	
4x12	Pump size- 4" suction and discharge, 12" max. diameter impeller passing 4" solids.
4x4x10x3	Pump size- 4" suction, 4" discharge, 10" max. diameter impeller passing 3" solids
_*	ESSCO vortex pumps will pass solids equal to the discharge diameter.
-10	Horsepower.
-4	RPM 4= 1750, 6= 1160, 8= 870

In some cases a vortex pump model will be preceded by the suction size such as 8x6x17-100-6.

(1) ESSCO vortex pumps will pass solids equal to the discharge diameter.

CAUTION NOTES AND STORAGE OF PUMPS

These instructions apply to the pump only and are intended to be general and not specific. If the operating conditions change, refer to the factory or local factory representative or distributor for reapplication. Always refer to the manuals provided by manufacturers of the other equipment for their separate instructions and maintenance schedules.

CAUTION IMPORTANT SAFETY NOTICE

The installation, use and operation of this type of equipment is affected by various federal, state and local laws and the regulations concerning OSHA. Compliance with such laws relating to the proper installation, safe operation and maintenance of this type of equipment is the responsibility of the equipment owner and all necessary steps should be taken by the owner to assure compliance with such laws prior to operation and after performing equipment maintenance.

WARNING

DO NOT SUBMERGE CUT ENDS OF POWER CORDS IN LIQUID. THIS WILL DAMAGE CABLES AND VOID THE MANUFACTURER'S WARRANTY. SUBMERSIBLE PUMP POWER CORDS SHOULD BE INSPECTED THOROUGHLY EACH TIME THE PUMP IS REMOVED FROM SERVICE. BE SURE TO CHECK FOR SIGNS OF WEAR, CRACKS IN THE OUTER CABLE JACKET AND SIGNS OF CHEMICAL ATTACK.

STORAGE OF PUMPS

If the equipment is not to be immediately installed and operated, store it in a clean, dry, well ventilated place, free from vibrations, moisture, rapid and wide variations in temperature.

A UNIT IS IN STORAGE WHEN:

1. It has been delivered to the jobsite and is awaiting installation.

2. It has been installed but operation is delayed pending completion of construction.
3. There are long periods (30 days or more) between operation cycles.
4. The pump is shut down for periods of longer than 30 days.

NOTE: Storage requirements vary depending on the length of storage, the climatic environment and the equipment. For storage periods of three months or longer, contact the manufacturer for specific instructions. Improper storage could damage the equipment which would result in non-warranty covered restoration or non-warranty covered product failures.

INTRODUCTION

This manual contains information which is the result of engineering research and experience. It is designed to supply instructions for the installation, operation and maintenance of your pump. Failure or neglect to properly install, operate or maintain your pump may result in personal injury, property damage or unnecessary damage to the equipment.

Variations exist in both the equipment used with these pumps and in the particular installation of the pump and motor. Specific operating instructions are not within the scope of this manual. The manual contains general rules for installation, operation and maintenance of the pump. Observe and heed all caution or danger tags attached to the equipment or included in this booklet.

INSTALLATION OF SUBMERSIBLE AND DRY PIT SUBMERSIBLE PUMPS

UNPACKING AND INSPECTION

Upon receipt, carefully unpack and inspect the pump and driver assemblies and individual parts to insure none are missing or damaged. Inspect all boxes and packing material for loose parts before discarding and report immediately to the

factory involved, any missing parts or damage incurred during shipment. **You** must file a "damaged or lost in shipment" claim with the carrier immediately.

COOL AGIVENTS

All ESSCO submersible pumps are furnished with Cool Agivents. Cool Agivents are used to cool the exterior of the motor surface while the motor is operating exposed to the atmosphere for extended periods of time. The Cool Agivents also agitate the wet well and vent the pump case. **Do not plug the Cool Agivents**

DRY PIT PUMP VENT

ESSCO Dry Pit Submersible pumps are shipped with a vent valve and short nipple ready for field installation. It is recommended that the pumpage from the vent valve be piped back to the wet well above the high water level.

MINIMUM SUBMERGENCE OF PUMP SUCTION AND PIT DESIGN

Generally it is required that an evenly distributed flow of non-aerated water be supplied to the pump suction. Improper pit design or insufficient suction submergence can result in intake vortexing which reduces the pump's performance and can result in severe damage to the pump.

We recommend that you secure the advice of a qualified Consulting Engineer for the analysis and design of the suction pit. Significant engineering data on pit design is provided in the Hydraulic Institute Standards.

Upon request, ESSCO will review plans and give general comments on the installation, but will not approve such plans for a specific installation and will accept no responsibility or liability for the performance of the pump intake structure.

CAUTION

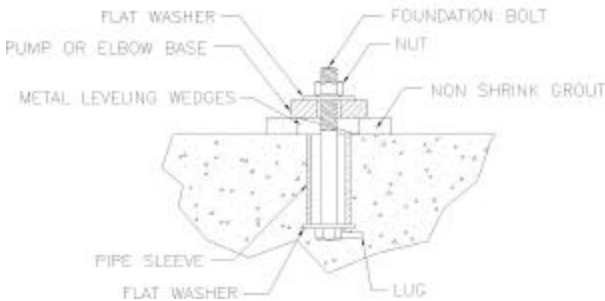
UNDER NO CIRCUMSTANCES SHALL THE MINIMUM SUBMERGENCE LEVEL BE BELOW THE PUMP VOLUTE AND MOTOR BRACKET ADAPTER PLATE.

INSTALLATION WHEN PUMPS ARE FURNISHED WITH A BOLT DOWN STAND OR VERTICAL PUMP STAND

FOUNDATION FOR PUMP STANDS

The foundation should have a level surface and be of sufficient mass to prevent vibration and form a permanent rigid support for the unit. The most satisfactory foundations are concrete with anchor bolts of adequate size embedded in the foundation in pipe sleeves with an inside diameter 2-1/2 times larger than the bolt diameter. This will allow for final accurate positioning of the unit.

Recommended anchor bolt design is shown below.



LEVELING OF THE PUMP UNIT

Lower the pump onto the foundation, positioning the pump so the anchor bolts are aligned in the middle of the holes.

Set the pump on metal shims or metal wedges placed directly under the part of the stand carrying the greatest weight, and spaced close enough to give uniform support and stability.

Adjust the metal shims or wedges until the discharge flange of the submersible pump is **level and plumb**. Make sure that all shims or wedges

fit firmly between the foundation and the stand.

If leveling nuts are installed on the anchor bolts and are used for alignment, follow the same procedure as with shims or wedges. Support the pump with additional shims or wedges if necessary. Make sure that all nuts and shims are in firm contact with the stand. Tighten the foundation bolts snugly, but not too firmly, and recheck for alignment before grouting.

CAUTION

DO NOT OVER-TIGHTEN ANCHOR BOLTS OR THE STAND MAY BE DISTORTED.

GROUTING

When the alignment is correct, the unit should be grouted using a high grade non-shrinking grout.

Do not fill the pipe sleeves with grout.

If leveling nuts are used, make sure they are not embedded in grout. Provide access in the grout to the leveling nuts so that they can be backed off after the grout has cured. Allow the grout to fully cure before backing off the leveling nuts (if used) and firmly tightening the foundation bolts. Then recheck the alignment before connecting the piping.

PIPING

CAUTION

ALL PIPING CONNECTIONS MUST BE MADE WITH THE PIPE IN A FREE SUPPORTED STATE, AND WITHOUT THE NEED TO APPLY VERTICAL OR SIDE PRESSURE TO OBTAIN ALIGNMENT OF THE PIPING WITH THE PUMP DISCHARGE FLANGE. DO NOT USE PUMP TO SUPPORT DISCHARGE PIPING.

CAUTION

THE MOTOR THERMAL CIRCUIT AND MOISTURE DETECTORS MUST BE CONNECTED PER MANUFACTURER'S REQUIREMENTS, OTHERWISE THE MOTOR WARRANTY WILL BE VOID.

OPERATING AT REDUCED CAPACITY

In a typical application covering a wide range of flow rates, a variable speed driver is often used to adjust pump capacity and this is taken into consideration by ESSCO when selecting the pump and impeller trim. Although these pumps are applicable over a wide range of operating conditions, care should be exercised when doing so, especially when the actual conditions differ from the sold for conditions. You should always contact your nearest ESSCO representative before operating the pumps at any condition other than that for which they were sold.

INITIAL STARTUP OF THE PUMPS

WARNING

DO NOT SUBMERGE CUT ENDS OF POWER CORDS IN LIQUID. THIS WILL DAMAGE CABLES AND VOID THE MANUFACTURERS WARRANTY. SUBMERSIBLE PUMP POWER CORDS SHOULD BE INSPECTED THOROUGHLY EACH TIME THE PUMP IS REMOVED FROM SERVICE. BE SURE TO CHECK FOR SIGNS OF CHEMICAL ATTACK.

WARNING

BEFORE APPLYING POWER TO PUMP MOTOR CHECK SUPPLY VOLTAGE TO BE SURE IT IS CORRECT. BE SURE MOTOR IS WIRED FOR CORRECT VOLTAGE.

A. After the pump is installed and with the discharge valve closed, start the motor according to the manufacturer's instructions.

B. Open the discharge valve slowly to prevent water hammer, and to allow the discharge line to fill completely.

C. Monitor the motor amperage as the discharge gate valve is opened. Do not exceed the service factor of the motor or extreme damage to the motor may occur.

CAUTION

PRIOR TO WORKING ON ANY ELECTRICAL OR PUMP EQUIPMENT, SAFETY ELECTRICAL LOCKOUT CIRCUITS SHOULD BE INSTALLED AND LOCKED OUT TO PREVENT SERIOUS INJURY OR DEATH. REVIEW ALL LOCAL, STATE, FEDERAL CODES AND OSHA REQUIREMENTS BEFORE WORKING ON ANY PUMPING EQUIPMENT.

SAFETY IS YOUR RESPONSIBILITY

MECHANICAL SEALS

CAUTION

DRY OPERATION OF THE PUMP WILL CAUSE DAMAGE TO THE MECHANICAL SEAL. MAKE ABSOLUTELY CERTAIN THE VOLUTE IS PRIMED.

For Dry Fit Submersible pumps be sure the vent valve is open to allow air to escape from the volute. If the vent valve is not open an air pocket can form and cause damage to the mechanical seal.

SUBMERSIBLE VORTEX PUMP TROUBLESHOOTING

If you have followed the installation and startup procedures outlined in this manual, your pump should provide reliable service and long life. However, if operating problems do occur, significant time and expense can be saved if you use the following check list to eliminate the most common causes of those problems.

CAUTION
TO REDUCE POSSIBILITY OF IGNITION OF HAZARDOUS MATERIALS DO NOT OPEN ELECTRICAL EQUIPMENT UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS, AND ALL ELECTRICAL POWER IS DISCONNECTED TO ELECTRICAL EQUIPMENT.

IF THE PUMP IS OPERATING IN THE REVERSE ROTATION, THE MOTOR WILL DRAW UP TO 50% MORE AMPERAGE THAN WHEN OPERATING IN THE CORRECT ROTATION.

INSUFFICIENT DISCHARGE PRESSURE OR FLOW

1. Pump not primed, Cool Agivents plugged.
2. Speed too low. Check driver.
3. Discharge head too high.
4. Impeller damaged.
5. Air in liquid.
6. Impeller diameter too small.
7. Insufficient net positive suction head.
8. Discharge valves not open.

LOSS OF SUCTION DURING OPERATION

1. Air or gases in liquid.
2. Wrong direction of rotation.

EXCESSIVE POWER CONSUMPTION

1. Pumps are running in wrong direction.
2. Speed too high.
3. Head lower than rating, pumps too much liquid.

4. Specific gravity or viscosity of liquid pumped is too high.
5. Mechanical defects: Shaft bent. Rotating element bind.
6. System head lower than design.
7. Incorrect diameter impeller.

VIBRATION OR NOISE

1. Foundation bolts loose or defect in grouting.
2. Mechanical defects: Shaft bent. Rotating element bind.
3. Head lower than rating, pumps too much liquid.
4. Pump strain - improperly supported or aligned.
5. Pump running at shut-off condition.
6. Air in liquid.
7. Suction partially plugged.
8. Pump operating in the wrong rotation.

CAUTION
ALL ELECTRICAL EQUIPMENT INSTALLED IN THE WET WELL SHALL BE RATED FOR HAZARDOUS LOCATIONS OR BE INTRINSICALLY SAFE.

CAUTION
U.L. LISTING APPLIES ONLY TO CLASS 1, DIVISION 1, GROUPS C AND D WHEN USED WITH RELIANCE OR US ELECTRICAL SUBMERSIBLE MOTOR.

NOTE: ALL REPAIRS ON U.L. LISTED SUBMERSIBLE MOTORS SHOULD BE PERFORMED BY AN AUTHORIZED REPAIR FACILITY.

CAUTION
PRIOR TO WORKING ON ANY ELECTRICAL OR PUMP EQUIPMENT, SAFETY ELECTRICAL LOCKOUT CIRCUITS SHOULD BE INSTALLED AND LOCKED OUT TO PREVENT SERIOUS INJURY OR DEATH. REVIEW ALL LOCAL, STATE, FEDERAL CODES AND OSHA REQUIREMENTS BEFORE WORKING ON ANY PUMPING EQUIPMENT.

SAFETY IS YOUR RESPONSIBILITY

DRY PIT SUBMERSIBLE VORTEX PUMPS

PRIMING THE PUMP

The priming procedure is different for positive and negative head* systems. The following procedures should be followed for a positive or flooded suction head system:

1. Open the vent valve on the highest point of the pump casing or motor flange.
2. Open all suction valves.
3. Allow the liquid to flow from the vent valve until all the air bubbles have escaped.
4. Be sure the vent openings remain open to avoid air locking the pump.
5. The pump is now primed.

*- Consult ESSCO or ESSCO's local representative before using a vortex pump in a system where a negative head condition exists.

STARTING THE PUMP

A. After the pump is primed, and with the discharge valve closed and the suction valve open, start the motor according to the manufacturer's instructions.

B. Open the discharge valve slowly to prevent water hammer, and allow the discharge line to fill completely.

C. Monitor the motor amperage as the discharge gate valve is opened. Do not exceed the service factor of the motor or extreme damage to the motor may occur.

DRY PIT SUBMERSIBLE VORTEX PUMPS TROUBLESHOOTING

If you have followed the installation and startup procedures outlined in this manual, your pump should provide reliable service and long life. However, if operating problems do occur, significant time and expense can be saved if you use the following check list to eliminate the most common causes of those problems.

CAUTION

IF THE PUMP IS OPERATING IN THE REVERSE ROTATION, THE MOTOR WILL DRAW UP TO 50% MORE AMPERAGE THAN WHEN OPERATING IN THE CORRECT ROTATION.

INSUFFICIENT DISCHARGE PRESSURE OR FLOW

1. Pump not primed, Cool vent plugged.
2. Speed too low. Check driver.
3. Discharge head too high.
4. Impeller damaged.
5. Air in liquid.
6. Impeller diameter too small.
7. Insufficient net positive suction head.
8. Discharge valves not open.
9. Pump operating in the wrong rotation.

LOSS OF SUCTION DURING OPERATION

1. Air or gases in liquid.
2. Wrong direction of rotation.

EXCESSIVE POWER CONSUMPTION

1. Pumps are running in wrong direction.
2. Speed too high.
3. Head lower than rating, pumps too much liquid.
4. Specific gravity or viscosity of liquid pumped is too high.
5. Mechanical defects: Shaft bent. Rotating element bind.
6. System head lower than design.
7. Incorrect diameter impeller.

VIBRATION OR NOISE

1. Foundation bolts loose or defect in grouting.
2. Mechanical defects: Shaft bent. Rotating element bind.
3. Head lower than rating, pumps too much liquid.
4. Pump strain - improperly supported or aligned.
5. Pump running at shut-off condition.
6. Air in liquid.

7. Suction partially plugged.
8. Pump operating in the wrong rotation.

CAUTION

ALL ELECTRICAL EQUIPMENT INSTALLED IN THE WET WELL SHALL BE RATED FOR HAZARDOUS LOCATIONS OR BE INTRINSICALLY SAFE.

CAUTION

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**SUBMERSIBLE NON-CLOG PUMPS
TROUBLESHOOTING**

If you have followed the installation and startup procedures outlined in this manual, your pump should provide reliable service and long life. However, if operating problems do occur, significant time and expense can be saved if you use the following check list to eliminate the most common causes of those problems.

CAUTION

TO REDUCE POSSIBILITY OF IGNITION OF HAZARDOUS MATERIALS DO NOT OPEN ELECTRICAL EQUIPMENT UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS, AND ALL ELECTRICAL POWER IS DISCONNECTED TO ELECTRICAL EQUIPMENT.

IF THE PUMP IS OPERATING IN THE REVERSE ROTATION, THE PUMP WILL VIBRATE AND PRODUCE UNSTABLE FLOW AND PRESSURE. IN SOME CASES THE PUMPS MAY MAKE NOISE.

**INSUFFICIENT DISCHARGE PRESSURE
OR FLOW**

1. Pump not primed, Cool Agivents plugged.
2. Speed too low. Check driver.
3. Discharge head too high.

4. Impeller damaged.
5. Air in liquid.
6. Impeller diameter too small.
7. Insufficient net positive suction head.
8. Discharge valves not open.
9. Pump operating in the wrong rotation.

LOSS OF SUCTION DURING OPERATION

1. Air or gases in liquid.
2. Suction plugged or smothered.

EXCESSIVE POWER CONSUMPTION

1. Speed too high.
2. Head lower than rating, pumps too much liquid.
3. Specific gravity or viscosity of liquid is too high.
4. Mechanical defects: Shaft bent. Rotating element bind.
5. System head lower than design.
6. Incorrect diameter impeller.

VIBRATION OR NOISE

1. Foundation bolts loose or defect in grouting.
2. Mechanical defects: Shaft bent. Rotating element binds.
3. Head lower than rating, pumps too much liquid.
4. Pump strain - improperly supported or aligned.
5. Pump running at shut-off condition.
6. Air in liquid.
7. Suction partially plugged and/or impeller partially plugged.
8. Pump is running in the wrong direction.
9. Impeller and case wear ring clearance too close.

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DRY PIT SUBMERSIBLE NON-CLOG PUMPS

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1. Open the vent valve on the highest point of the pump casing or motor flange.
2. Open all suction valves.
3. Allow the liquid to flow from the vent valve until all the air bubbles have escaped.
4. Be sure the vent openings remain open to avoid air locking the pump.
5. The pump is now primed.

*- Consult ESSCO or ESSCO's local representative before using a non-clog pump in a system where a negative head condition exists.

STARTING THE PUMP

- A. After the pump is primed, and with the discharge valve closed and the suction valve open, start the motor according to the manufacturer's instructions.
- B. Open the discharge valve slowly to prevent

water hammer, and allow the discharge line to fill completely.

- C. Monitor the motor amperage as the discharge gate valve is opened. Do not exceed the service factor of the motor or extreme damage to the motor may occur.

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4. Impeller damaged.
5. Air in liquid.

6. Impeller diameter too small.
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9. Pump operating in the wrong rotation.

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PREVENTATIVE MAINTENANCE LOG

Pump Model Number:		Pump Serial Number:	
Date	ETM Hour Meter Reading	Amp Reading	Comments