

Vertical Multi-Stage Pump

Installation, Operation & Maintenance Manual

SUPERSEDES: NEW

EFFECTIVE: May 1, 2024

SAFETY REQUIREMENTS


This equipment should be installed and serviced by technically qualified personnel who are familiar with the correct selection and use of appropriate tools, equipment, and procedures. Failure to comply with national and local electrical and plumbing codes and within FPS recommendations may result in electrical shock or fire hazard, unsatisfactory performance, or equipment failure.

Know the product's application, limitations, and potential hazards. Read and follow instructions carefully to avoid injury and property damage. Do not disassemble or repair unit unless described in this manual.


Failure to follow installation or operation procedures and all applicable codes may result in the following hazards:

 **DANGER:** Risk of death, personal injury, or property damage due to explosion, fire, or electric shock.

- Do not use to pump flammable, combustible, or explosive fluids such as gasoline, fuel oil, kerosene, etc.
- Do not use in explosive atmospheres or hazardous locations as classified by the NEC, ANSI/NFPA70.
- Do not handle a pump or pump motor with wet hands or when standing on a wet or damp surface, or in water.

 **WARNING:** Risk of severe injury or death.

- To reduce risk of electrical shock, disconnect power before working on or around the system. More than one disconnect switch may be required to de-energize the equipment before servicing.
- Check local electrical and building codes before installation. The installation must be in accordance with their regulations as well as the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
- Wire pump system for correct voltage.
- Ensure that the system is properly grounded all the way to the service entrance panel.
- Use only labeled tie down points to secure unit for transportation. Failure to use labeled tie down points could lead to equipment damage and/or allow unit to come loose during transit and cause injury or death.
- This pump has not been investigated for use in swimming pool or marine areas.
- Employ a licensed electrician.

 **CAUTION:** Risk of bodily injury, electric shock, or equipment damage.

- This equipment must not be used by children or persons with reduced physical, sensory or mental abilities, or lacking in experience and expertise, unless supervised or instructed. Children may not use the equipment, nor may they play with the unit or in the immediate vicinity.
- Equipment can start automatically. Lockout-Tagout before servicing equipment.
- Do not let the unit freeze. Freezing may cause cracking or distortion that may destroy the unit.
- For use with maximum 248 °F (120 °C) water. Must be installed by experienced professionals only.
- The pump has been evaluated for use with water only. Pump should only be used with liquids compatible with pump component materials. If the pump is used with liquids incompatible with the pump components, the liquid can cause failure to the electrical insulation system resulting in electrical shock.
- Pump may become hot during operation.
- Pumps can develop very high pressure in some situations.
- Check that lifting equipment complies with all safety rules, and is suitable to support the weight of the pump.
- Operation of this equipment requires detailed installation and operation instructions provided in this manual for use with this product. Read entire manual before starting installation and operation. End User should receive and retain manual for future use.
- Keep safety labels clean and in good condition.

NOTICE: Risk of damage to pump or other equipment.

- Periodically inspect pump and system components. Regularly check piping for weakness or wear, making certain that all connections are secure.
- Schedule and perform routine maintenance as required and in accordance with the Maintenance section of this manual.
- If the pump package is dropped, impacted, or otherwise mishandled, malfunction can occur.

PRODUCT INFORMATION

The Vertical Multi-Stage booster pump is available in 1-95 m3/h options with all 316 stainless steel hydraulics for superior durability, efficiency, and performance. A small footprint, premium motor, and rugged components ensure this booster pump is capable of a long operating life to provide water pumping solutions in nearly any tough application.

The Vertical Multi-Stage pump is designed for professional use applications involving clean water or similar liquids, characterized by the following:

- a density of 1030 kg/m3
- no more than 50 g/m3 sand content
- 2 cPs maximum viscosity
- suspended solids no larger than 2 mm maximum

The application's room temperature should not exceed 104 °F (40 °C) up to 1000 m altitude. The electrical supply voltage must not deviate more than 6% from the motor rating.

Item	NEMA 56	NEMA 182/184	NEMA 213/215	NEMA 254/256	NEMA 284/286	NEMA 324/326 & 364/365
Coupling attachment hardware	10.5±1 Nm	24±2 Nm	24±2 Nm	50±3 Nm	50±3 Nm	50±3 Nm
Filling Plug w/ Needle Pin	30±2 Nm	30±2 Nm	30±2 Nm	30±2 Nm	30±2 Nm	30±2 Nm
Filling Plug Needle Pin	10±1 Nm	10±1 Nm	10±1 Nm	10±1 Nm	10±1 Nm	10±1 Nm
Filling Plug w/out Needle Pin	-	20±2 Nm	20±Nm	20±Nm	20±Nm	20±Nm
Motor Attachment Screw	40±2 Nm	40±2 Nm	40±2 Nm	40±2 Nm	40±2 Nm	40±2 Nm
Coupling Guard Screws	5±1 Nm	5±1 Nm	5±1 Nm	5±1 Nm	5±1 Nm	5±1 Nm
Cartridge Seal	40±2 Nm	40±2 Nm	40±2 Nm	40±2 Nm	40±2 Nm	40±2 Nm
Cartridge Seal Set Screws	3 +1/-0 Nm	3 +1/-0 Nm	3 +1/-0 Nm	3 +1/-0 Nm	3 +1/-0 Nm	3 +1/-0 Nm
Motor Flange Screw	-	16±1 Nm	16±1 Nm	40±2 Nm	40±2 Nm	75±5 Nm
Motor Bracket Screws, T30-T95 only	-	40±3 Nm	40±3 Nm	40±3 Nm	40±3 Nm	40±3 Nm
Bolt Fastener	50±5 Nm	50±5 Nm	50±5 Nm	50±5 Nm	-	-
Tie Bolt Fastener	-	100±5 Nm	100±5 Nm	100±5 Nm	100±5 Nm	100±5 Nm
Drain and Priming Cap, T01/T03/T06/T10 & T15/T20	30±2 Nm	30±2 Nm	30±2 Nm	30±2 Nm	-	-
Drain and Priming Cap, T30-T95 only	-	20±2 Nm	20±2 Nm	20±2 Nm	20±2 Nm	20±2 Nm

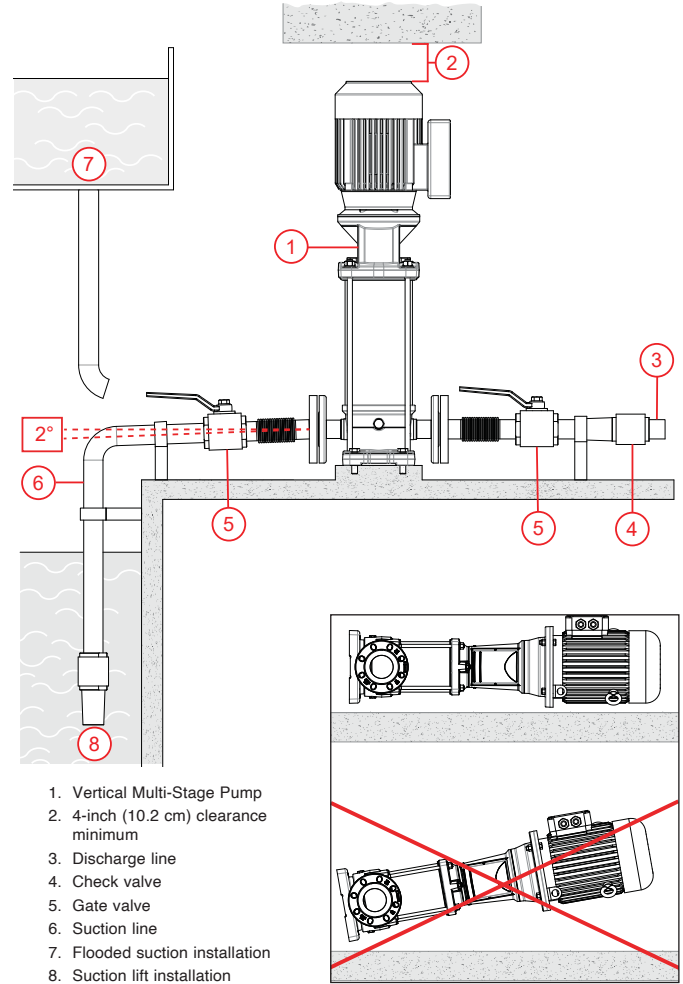
INSTALLATION

Surface pump applications must always take into account NPSH (Net Positive Suction Head), maximum pressure, minimum rated capacity, and other product specifications. Consult the product catalog at www.TacoComfort.com.

IMPORTANT: Refer to the motor manufacturer for motor hazards, installation, operation, and maintenance.

TYPICAL INSTALLATION

IMPORTANT: Always install the pump-motor vertically with the motor above the pump, except in a properly-supported horizontal installation.



PUMP LOCATION



CAUTION: Risk of bodily injury or damage to pump or other equipment.

- Check that lifting equipment complies with all safety rules, and is suitable to support the weight of the pump.

IMPORTANT: If high pressure units are installed, the high pressure pump must be placed second in the flow path.

- Install the pump in a clean, dry, and ventilated location shielded from direct sun and precipitation.
- Provide adequate room for future servicing, protection from freezing temperatures, flooding, and equipment drainage.
- Bolt unit down evenly on a good foundation, preferably concrete, to prevent unnecessary stresses from pump movement.
- Install as close as possible to water source to minimize suction piping length.

PIPING INSTRUCTIONS

NOTICE: Risk of damage to pump or other equipment.

- Properly support all suction and discharge piping to avoid strain on the pump.

- Ensure piping matches the pump inlet and outlet connection sizes.
- Calculate the maximum distance allowable between the pump and water source, and pipe accordingly.
- For long runs, increase connections by one pipe size.
- The use of pipe thread sealant is recommended.
- Use flexible hoses or expansion joints.
- Avoid the use of unions on the suction line if possible.
- Do not over-tighten piping connections.
- Include a gate valve and check valve in the discharge line.

Suction Line

- Set up piping in suction lift applications to rise vertically, or in a continual slope of 2° or greater, from the water source.
- Ensure there are no high spots that cannot be evacuated of air during the priming process.
- All suction line connections must be airtight.
- Include a gate valve.

OPERATION

! WARNING: Risk of severe injury or death by electrical shock, high temperatures, or pressurized fluids.

- To minimize risk of electrical shock, disconnect power before working on or around the system.
- Do not continuously run pump against closed discharge. Release all system pressure before working on any component.

NOTICE: Risk of damage to pump or other equipment.

- Do not let the unit run dry (without liquid). It is designed to be cooled by pumping fluid. The seal may be damaged and the motor may fail if the pump is allowed to run dry.

Priming the Pump

NOTE: it may be necessary to remove the coupling cover guards during priming. Refer to "Maintenance" on page 3.

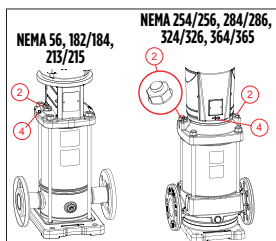
Flooded Suction Installation

1. Ensure the discharge line gate valve is closed.
2. Loosen the needle pin on the filling plug.
3. Open the inlet discharge gate valve.
4. Allow water to enter until it comes out the filling plug.
5. Tighten the needle pin on the filling plug.
 - Refer to "Torque Specifications" on page 2.

Suction Lift Installation

NOTE: Ensure the suction gate valve remains open.

1. Close the discharge gate valve.
2. Remove the filling plug(s).
3. Fill the pump and suction line with water.
4. Rotate motor shaft to let air in casing escape, following the pump rotation arrow.
5. Refill the pump and suction line with water.
6. Reattach the filling plug(s).
 - Refer to "Torque Specifications" on page 2.



Starting the Pump

1. Check pump rotation.
 - If direction is wrong, interchange any two of three wires either at the motor or starter.
2. Close all system outlets.
3. Slightly open one system outlet to allow excess air to bleed out of the system.
4. Start the pump.
5. Gradually open the discharge valve halfway.
 - Several starting attempts may be necessary to expel all air from the pump and suction lines.
 - After initial start-up, pump operation ought to be smooth and quiet.
 - If water is not delivered within seconds, stop the motor and prime again. Refer to "Priming the Pump" on page 3.
6. Once the pump is fully functioning, completely open the discharge valve and system outlets.

MAINTENANCE

! WARNING: Risk of severe injury or death by electrical shock, high temperatures, or pressurized fluids.

- To minimize risk of electrical shock, disconnect power before working on or around the system.
- Do not continuously run pump against closed discharge. Release all system pressure before working on any component.

NOTICE: Risk of damage to pump or other equipment.

- Do not let the unit run dry (without liquid). It is designed to be cooled by pumping fluid. The seal may be damaged and the motor may fail if the pump is allowed to run dry.
- Drain the pump, water tanks, and all piping exposed to freezing temperatures.

NOTE: For replacement parts, visit www.TacoComfort.com.

Draining the Pump

NOTE: To remove all liquid, completely disassemble the pump.

1. Close the suction and discharge gate valves.
2. Release pump pressure.
3. Partially unscrew the needle pin on the filling plug.
4. Completely remove the drain and priming cap.
5. Allow the water to drain.
6. Fully tighten the drain and priming cap and the needle pin on the filling plug.
 - Refer to "Torque Specifications" on page 3.

Periodic Service

NOTICE: Risk of damage to pump or other equipment.

- **Periodic service of the pump should only be done by certified or licensed professionals. Inspect the pump system condition and operation after the first 500 hours of work and every month after - more frequently in heavy use applications.**

NOTE: Check guards and safety devices daily for proper operation.

1. Observe the unit during normal operation to notice any odd noises, vibrations, loose or rubbing parts, etc.
 - Service immediately if any unusual noise, leaks, or vibrations develop.
2. Disconnect power.
3. Check the power cords and electrical outlet/control panel for damage or corrosion.
 - If the pump cord is damaged, replace pump.
 - If the electrical outlet/control panel is damaged or corroded, employ a licensed electrician to replace the affected parts.
4. Check for seal wear indicators.
 - Remove a cover guard.
 - Inspect the shaft passage for any liquid leaks.

Disassembly

1. Unscrew the coupling guard screws and remove the coupling guards.
2. Loosen the set screws of the cartridge seal a quarter-turn.
3. Unscrew and remove the coupling attachment hardware.
 - For NEMA 56 - NEMA 213/215, set aside the extractable half of the coupling.
 - For NEMA 254/256 - NEMA 364 - 365, set aside the two halves of the coupling.
4. Remove the pin from the pump shaft.

NOTE: To remove the cartridge seal without removing the motor, omits steps 6-8.

5. Unscrew and remove the motor attachment screws.
6. Remove the motor.
7. Loosen any motor flange screws and remove the thrust bearing.

NOTE: NEMA 56 builds do not have motor flange screws.

8. Unscrew and remove the cartridge seal.

Reassembly

NOTE: Refer to "Torque Specifications" on page 2.

Cartridge Seal & Thrust Bearing Reassembly

NOTE: If a cartridge seal for NEMA 254-365 motors was replaced without disassembling the motor, omit 4-6.

1. Lubricate the shaft and threads with cleaning alcohol.
 - Wipe away any residues.
2. Insert new cartridge seal and tighten to the appropriate torque.
3. Tighten the set screws of the cartridge seal.
4. Apply white-knight anti-seize to the face of the thrust bearing flange.
5. Align the flange with the threaded holes of the coupling housing.
6. Tighten any motor flange screws.

NOTE: NEMA 56 assemblies do not have motor flange screws.

Motor and Coupling Reassembly

NEMA 56 - NEMA 213/215

1. Grease the entire motor shaft's surface.
2. Position the motor on the pump thrust bearing assembly.
3. Install the motor attachment screws.
4. Insert the coupling pin into the extractable half of the coupling.
5. Install the pin and extractable piece of the coupling.
6. Tighten the coupling hardware to the appropriate torque, keeping the two coupling halves symmetrical.
7. Ensure the impeller spins freely, spinning it by hand and listening for interference.
8. Assemble the coupling cover guards.

NEMA 254/256 - NEMA 364/365

NOTE: If a cartridge seal for NEMA 254-365 motors was replaced without disassembling the motor, omit steps 1-3.

1. Grease the entire motor shaft's surface.
2. Position the motor on the pump thrust bearing assembly.
3. Install the motor attachment screws.
4. Insert the pin into the pump shaft.
5. Engage one half of the coupling to the motor shaft's shoulder.

IMPORTANT: The coupling must remain in position once released.

6. Arrange the second coupling half to the motor shaft.
7. Tighten the coupling attachment screws to the appropriate torque, keeping the two coupling parts symmetrical.
8. Ensure the impeller spins freely, spinning it by hand and listening for interference.
9. Assemble the coupling cover guards.

TROUBLESHOOTING

Problem	Probable Causes	Corrective Action
Motor fails to start or not running	Motor thermal protector tripped	Correct cause for high amperage, such as low voltage or excessive pumping.
	Open circuit breaker or blown fuse	Check electric wiring and motor for short circuits and correct.
	Impeller binding	Remove pump case and check for debris.
	Motor improperly wired	Check complete suction line and all fittings for air leaks and verify foot valve has adequate submergence.
	Defective motor	Take to an authorized motor shop for repair or replacement.
Little or no discharge	Pump is not primed: air or gases in pumpage	Check suction line and foot valve for leaks. Make sure that water level has not dropped to uncover suction inlet. Prime pump.
	Discharge or suction plugged or valve closed	Clear obstructions from suction and discharge lines.
	Incorrect rotation (3 Phase only)	Interchange any two of three wires either at the motor or starter.
	Low voltage or phase loss	Correct incoming power to match motor nameplate requirements.
	Impeller worn or plugged	Clean or replace impeller.
	System head too high	Reduce system head (back-pressure on pump) or resize pump.
	Excessive suction lift or losses, or NPSHA too low for the pump	Locate pump closer to the water source, increase pipe size or resize pump.
Low pump capacity or pressure	Valves in suction or discharge lines partially closed	Open valves to reduce possible restrictions.
	Suction or discharge line partially plugged	Clear obstructions from discharge line.
	Wrong pump rotation	Correct to proper rotation.
Excessive power consumption	Impeller binding	Remove pump case and check for debris.
	Discharge head too low creating excessive flow rate	Close down discharge valve to increase pressure and throttle back flow rate.
	Fluid viscosity: specific gravity too high	Modify fluid properties or resize pump.
Excessive noise and vibration	Impeller binding	Remove pump case and check for debris.
	Pump is not primed: air or gases in pumpage	Check complete suction line and all fittings for air leaks and verify foot valve has adequate submergence.
	Discharge or suction plugged or valve closed	Clear obstructions from suction and discharge lines.
	Impeller worn or plugged	Clean or replace impeller.

LIMITED WARRANTY STATEMENT

Taco, Inc. (Taco) will repair or replace without charge (at the company's option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

Motors provided on commercial pumps are not covered by this warranty, and are warranted by the motor manufacturer. For complete details on motor warranty returns, the purchaser should contact the motor manufacturer's local service repair center or contact the motor manufacturer directly.

Seals provided on commercial pumps are not covered by this warranty.

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local Taco stocking distributor or Taco in writing and promptly deliver the subject product or part, delivery pre-paid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local Taco stocking distributor or Taco. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subject to accident, disaster, neglect, misuse, misapplication, inadequate operating environment, repair, attempted repair, modification or alteration, or other abuse, will not be covered by this warranty.

Taco products are not intended for use to support fire suppression systems, life support systems, critical care applications, commercial aviation, nuclear facilities or any other applications where product failure could lead to injury to person, loss of life, or catastrophic property damage and should not be sold for such purposes.

If in doubt as to whether a particular substance is suitable for use with a Taco product or part, or for any application restrictions, consult the applicable Taco instruction sheets or contact Taco at 401-942-8000.

Taco reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. Taco reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

TACO OFFERS THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET FORTH IN THE FIRST PARAGRAPH ABOVE.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR STATUTORY, OR ANY OTHER WARRANTY OBLIGATION ON THE PART OF TACO.

TACO WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS OR ANY INCIDENTAL COSTS OF REMOVING OR REPLACING DEFECTIVE PRODUCTS.

This warranty gives the purchaser specific rights, and the purchaser may have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts or on the exclusion of incidental or consequential damages, so these limitations or exclusions may not apply to you.



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