

INSTALLATION AND OPERATING INSTRUCTIONS

COMMERCIAL PUMPS

Series 4382 & 4302 dualArm Vertical In-Line Pumps

CE CONFORMITIES

For declaration of Conformities, contact Armstrong.

INTRODUCTION

This document contains specific information regarding the safe installation, operating and maintenance of Vertical In-Line pumps and should be read and understood by installing, operating and maintenance personnel. The equipment supplied has been designed and constructed to be safe and without risk to health and safety when properly installed, operated and maintained. The instructions following must be strictly adhered to. If clarification is needed on any point please contact Armstrong quoting the equipment serial number.

WARNING SYMBOLS



Safety instruction where an electrical hazard is involved.



Safety instruction where non-compliance would affect safety risk.



Safety instruction relating to safe operation of the equipment. (ATTENTION)

INSTRUCTIONS FOR SAFE USE

No installation of this equipment should take place unless this document has been studied and understood. Handling, transportation and installation of this equipment should only be undertaken by trained personnel with proper use of lifting equipment. See later diagrams for lifting advice. Refer to the pump nameplate for pump speed, pressure and temperature limitations. The limits stated must not be exceeded without written permission from Armstrong.

TEMPERATURE

Where under normal operating conditions the limit of 68°C/155°F (Restricted Zone) for normal touch, or 80°C/176°F (Unrestricted Zone) for unintentional touch, may be experienced, steps should be taken to minimize contact or warn operators/users that normal operating conditions will be exceeded. In certain cases where the temperature of the pumped liquid exceeds the above stated temperature levels, pump casing temperatures may exceed 100°C/212°F and not withstanding pump insulation techniques appropriate measures must be taken to minimize risk for operating personnel.

NOISE LEVELS

For Pumping Unit Sound Pressure Levels, see Motor Technical Data sheet (File No. 48.11L).

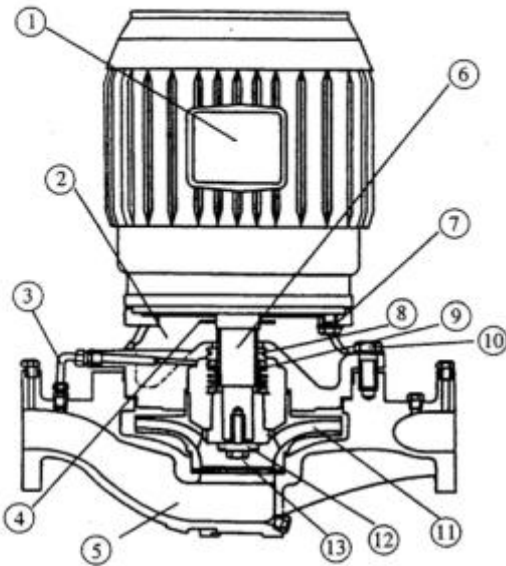
STORAGE

Pumps not immediately placed into service, or removed from service and stored, must be properly prepared to prevent excessive rusting. Pump port protection plates must not be removed until the pump is ready to connect to the piping. Rotate the shaft periodically (At least monthly) to keep rotating element free and bearings fully functional. For long-term storage, the pump must be placed in a vertical position in a dry environment. Internal rusting can be prevented by removing the plugs at the top and bottom of the casing and drain or air blow out all water to prevent rust buildup or the possibility of freezing. Be sure to reinstall the plugs when the unit is made operational. Rust proofing or packing the casing with moisture absorbing material and covering the flanges is acceptable. When returning to service be sure to remove the drying agent from the pump.

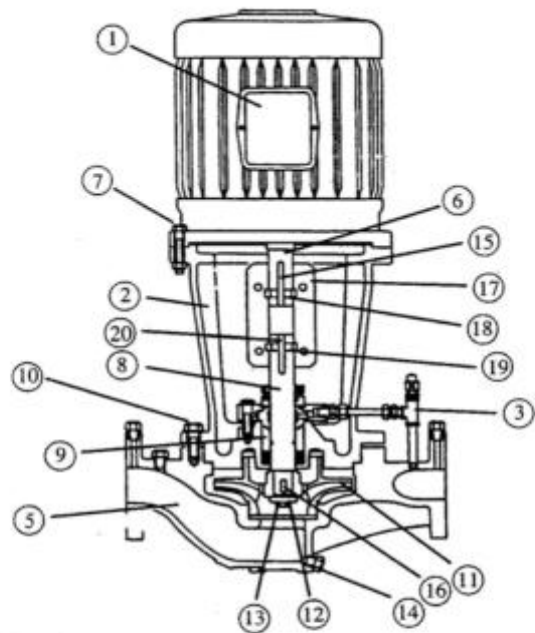
UNCRATING

Armstrong Series 4382 & 4302 dualArm Vertical In-Line pumps are thoroughly inspected before shipment to assure they meet with your order requirements. After removing the pump from the crate, make sure the equipment is in good order and that all components are received as called for on the packing list. Any shortages or damage should be reported immediately. Use extreme care in handling the unit, placing slings and hooks carefully so that stress will not be imposed on the pump. NEVER PLACE CABLE SLINGS AROUND THE PUMP SHAFT. The eye bolts or lifting lugs on the motor are intended for lifting only the motor and not the complete unit.

Close Coupled Arrangement



Split Coupled Arrangement

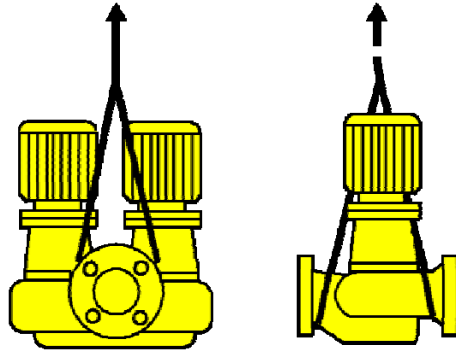


ITEM DESCRIPTION

1.	Motor	8.	Pump Shaft	15.	Motor Shaft Coupler Key
2.	Adapter / Bracket	9.	Seal	16.	Impeller Key
3.	Flush Line	10.	Volute Capscrew	17.	Coupling
4.	Water Slinger	11.	Impeller	18.	Motor Shaft Ring Key
5.	Volute	12.	Impeller Washer	19.	Coupler Ring Key
6.	Motor Shaft	13.	Impeller Capscrew	20.	Coupler Key
7.	Motor / Adapter Capscrew	14.	Drain Plug		

LIFTING METHOD

Use slings as shown in the diagram below to lift the pump. Do not use the motor eyebolts to lift the pump set; the motor eyebolts are for lifting the motor only. See the delivery note for the weight of the set.




LIMITATIONS

See pump nameplate for speed, duty and maximum pressure/temperature limitations. These limits must not, under any circumstances, be exceeded without prior consultation with Armstrong.

LOCATION

Locate the pump so that it is accessible for inspection and maintenance purposes. The ambient air temperature must NOT exceed relevant limitations for ventilation and air movement shall NOT be restricted.

IMPORTANT:  Do not run the pump for any length of time under very low flow conditions or with the discharge valve closed. To do so could cause the water in the casing to reach super heated steam conditions and will cause premature failure and could cause serious and dramatic damage to the pump and surrounding area.

INSTALLATION

1. LOCATION

- In open systems, locate the unit as close as practical to the liquid being pumped, with a short, direct suction pipe. Ensure adequate space is left above and around the unit for operation, maintenance, service and inspection.
- In closed systems, where possible, the pumps should be installed immediately downstream of the expansion tank/make-up connection. This is the point of zero pressure change and is necessary for effective pump operation. Do not install more than one expansion tank connection into any closed hydronic system.
- Electric motor driven pumps should not be located in damp or dusty location without special protection.
- Airflow into the motor and/or motor fan should not be obstructed.

INSTALLATION

- *When installing vertical in-line pumps, an important consideration to accrue full added value from the pump design is to ensure that the pump is pipe-mounted and free to 'float' with any movement, expansion and contraction of the piping. Should any vertical in-line pump use supports to the structure it is imperative that no pipe strain is imposed on the pump flanges. Tell-tale pieces of equipment such as springs or 'waffle' style isolation pads that distort with pressure to indicate added piping weight, should be used under pump supports should the pump not be truly pipe mounted.*
- Recommended installation arrangements are:
 - 2.1 Piping supported at ceiling with additional floor mounted pipe-stools, isolated from the structure by 'waffle' isolation pads, under the Armstrong Suction Guide and Flo-Trex Valve. (Fig. 2.1a) The majority of Series 4302 pumps are installed in this manner. Should additional space saving be required the discharge spool piece and Flo-Trex valve may be replaced by a long-radius elbow and the Flo-Trex valve field converted to a straight-through valve and installed in the vertical discharge pipe. (Fig 2.1b)
 - 2.2 Supported from the ceiling by pipe hangers. (Fig. 2.2) This could be at sufficient height to use zero floor space.

- 2.3 Floor mounted saddle supports. (Fig. 2.3) Typical for condenser water pumps where cooling tower base is at mechanical room elevation.
- 2.4 Where required, additional floor support may be used as shown in Fig. 2.4. Note that the pump should not be rigidly attached to the column. Leave a small gap between pump and column or install a 'waffle' isolation pad under the pump. It is critical that piping be installed so that the pump does not become a pipe support.
- 2.5 Flange mounted stanchion plates can be used on pump flanges. Fig. 2.5a indicates stanchion plates as pump legs that may be supplied for installation convenience. As with Fig. 2.4, 'waffle' style isolation pads must be used under the legs and pipe hangers adjusted to ensure the pump casing is not a piping support. Fig. 2.5b uses the stanchion plates along with seismically rated isolation pads or snubbers to restrain the pump during a seismic event. Again it must be stressed that pipe hangers carry the weight of the equipment as seismic components are designed only to restrain the equipment during a seismic event.
- 2.6 DO NOT support the unit by the motor eyebolts (Fig. 2.6) or by any other part of the motor.
- 2.7 DO NOT rigidly connect the pump to a permanent base (Fig. 2.7). This is similar to the notes under Fig. 2.4. If the pump is connected to a permanent base, the pump becomes a base-mounted unit and must be isolated from the piping by flexible connectors and the base isolated from the building structure on an inertia base.
- 2.8 Close coupled in-line units (Series 4382 dualArm) up to 11 kW (15 hp) may be installed with the shaft horizontal. (Fig. 2.8) For horizontal mounting of large units or Series 4302 Split-Coupled style consult the factory.
- 2.9 Many Vertical In-Line pumps are piped successfully into grooved piping systems. In-line pumps are supported well by grooved piping however flange adapter locking devices or a welded flange at the pump should be used to prevent the possibility of pipe mounted pumps from rotating in the piping. Armstrong offers grooved suction and discharge piping accessories with inherent locking devices to prevent this possibility. The Armstrong grooved piping accessories are versions of the suction guides (Diffusers) and Flo-Trex (Triple-Duty) valves detailed in the Pump piping section below.

IMPORTANT:

All Series 4382 and 4302 dualArm pumps contain a tapped hole in the motor bracket above the discharge flange (see Fig. 2.10) for draining the well. Pipe this drain hole to a floor drain to avoid overflow of the cavity caused by collecting chilled water condensate or from seal failure.

3. PUMP PIPING - GENERAL

- Never connect a pump to piping, unless extra care is taken to measure and align the piping flanges well. Always start piping from pump.
- Use as few bends as possible and preferably long radius elbows.
- Do not use flexible connectors on the suction or discharge of a vertical in-line pump, unless the pump is rigidly mounted to a foundation.
- Ensure the piping exerts no strain on the pump as this could distort the casing causing breakage or early failure due to pump misalignment.
- All connecting pipe flanges must be square to the pipework and parallel to the pump flanges.
- Suction and discharge pipes may be increased or decreased at pump nozzle to suit pump capacity and particular conditions of installation. Use eccentric reducers on suction connection with flat side uppermost.
- Layout the suction line with a continual rise towards the pump without high points, thus eliminating possibility of air pockets that may prevent the pump from operating effectively.
- A strainer of three or four times the area of the suction pipe, installed in the suction line, will prevent the entrance of foreign materials into the pump. 3/16" (5 mm) diameter perforations in the strainer is typical.
- In open systems, test suction line for air leaks before starting; this is essential with long suction line or static lift.
- Install, at the pump suction, a straight pipe of a length equivalent to 4 or 6 times its diameter; this becomes essential when handling liquids above 49°C (120°F). Armstrong suction guides may be used in place of the straight pipe run and in-line strainer.
- Install an isolation valve in both suction and discharge lines on flooded suction application; these valves are used primarily to isolate the pump for inspection or repair
- Install a non-slam non-return check valve in discharge line between pump and isolation valve to protect pump from excessive back pressure and to prevent water running back through the pump in case of driver failure on open systems. An Armstrong Flo-Trex valve may be used in place of non-return check valve and isolation valve on pump discharge.

CAUTION:



The discharge valve only is to be used to throttle pump flow, not the suction valve. Care must be taken in the suction line layout and installation, as it is usually the major source of concern in centrifugal pump applications.

4. ALIGNMENT

- Alignment is unnecessary on close-coupled pumps, Series 4382 dualArm, as there is no shaft coupling.
- Series 4302 units are aligned at the factory prior to shipping and do not need re-aligning when installed.
- Alignment on a Series 4302 unit may be verified by assuring an equal and parallel gap between coupling halves on both sides of the coupling.

OPERATION

5. STARTING PUMP

- Ensure that the pump turns freely by hand, or with some mechanical help such as a strap and lever on larger pumps. Ensure that all protective guarding is securely fixed in position.
- The pump must be fully primed on start up. Fill the pump casing with liquid and rotate the shaft by hand to remove any air trapped in the impeller. On Series 4302 any air trapped in the casing as the system is filled must be removed by the manual air vent in the seal flush line. Series 4382 dualArm units are fitted with seal flush/vent lines piped to the pump suction area.
When these units operate residual air is drawn out of the pump towards the suction piping.
- Energize the motor momentarily and check that rotation corresponds with the directional arrow on the pump casing.
- To reverse rotation of a three-phase motor, interchange any two power leads.
- Start the pump with the discharge valve closed and the suction valve open, then gradually open the discharge valve when the motor is at operating speed. The discharge valve may be “cracked” or open slightly at start up to help eliminate trapped air.
- When stopping the pump: Close the discharge valve and de-energize the motor.
- DO NOT run pump against a closed discharge valve for an extended period of time. (A few minutes maximum).
- Star-Delta motor starters should be fitted with electronic/mechanical interlocks that have a timed period of no more than 40 milli-seconds before switching from star (Starting) to delta (Run) connection yet allow the motor to reach full star (Starting) speed before switching to delta (Run).
- Should the pump be noisy or vibrate on start-up a common reason is overstated system head. Check this by calculating the pump operating head by deducting the suction pressure gauge value from the discharge gauge reading. Convert the result into the units of the pump head as stated on the pump nameplate and compare the values. Should the actual pump operating head be significantly less than the nameplate head value it is typically permissible to throttle the discharge isolation valve until the actual operating head is equal to the nameplate value. Any noise or vibration usually disappears. The system designer or operator should be made aware of this soon as some adjustment may be required to the pump impeller diameter or drive settings, if applicable, to make the pump suitable for the system as installed.

CAUTION:

Check rotation arrow prior to operating the unit. The rotation of all Armstrong Vertical In-Line units is “clockwise” when viewed from the drive end. (Looking from on top of / behind the motor).

6. GENERAL CARE

- Vertical In-Line pumps are built to operate without periodic maintenance, other than motor lubrication on larger units. A systematic inspection made at regular intervals, will ensure years of trouble-free operation, giving special attention to the following:
 - Keep unit clean
 - Provide the motor with correctly sized overload protection
 - Keep moisture, refuse, dust or other loose particles away from the pump and ventilating openings of the motor.
 - Avoid operating the unit in overheated surroundings (Above 40°C/100°F).

WARNING:

Whenever any service work is to be performed on a pumping unit, disconnect the power source to the driver, LOCK it OFF and tag with the reason. Any possibility of the unit starting while being serviced must be eliminated.

- If mechanical seal environmental accessories are installed, ensure water is flowing through the sight flow indicator and that filter cartridges are replaced as recommended. (See Armstrong files 43.85 & 43.86 for seal environmental instructions).

7. LUBRICATION

Pump

- Lubrication is not required. There are no bearings in the pump that need external lubrication service.
- Large Series 4302 units are installed with a shaft bushing located beneath the impeller that is lubricated from the pump discharge. This bearing is field removable for service without disturbing the motor or other major pump components.
- Service instructions for the lower bearing are to be found on File No: 43.805.

Motor

- Follow the lubrication procedures recommended by the motor manufacturer. Many small and medium sized motors are permanently lubricated and need no added lubrication. Generally if there are grease fittings evident the motor needs periodic lubrication. None if not.
- Check the lubrication instructions supplied with the motor for the particular frame size indicated on the motor nameplate.

Mechanical Seal

- Mechanical seals require no special attention. The mechanical seal is fitted with a flush line. The seal is flushed from the discharge of the pump casing on Series 4302 pumps and is flushed/vented to the suction on close-coupled pumps, Series 4382 dualArm.
- The Series 4302 pump is flushed from the pump discharge because the mechanical seal chamber is isolated from the liquid in the pump by a throttle bush. Because the seal chamber is isolated, seal environmental controls such as filters and separators, when installed in the Series 4302 flush line are very effective, as only the seal chamber needs cleansing, and will prolong seal life in HVAC systems.
- Do not run the pump unless properly filled with water, as the mechanical seals need a film of liquid between the faces for proper operation.
- Mechanical seals may 'weep' slightly at start-up. Allow the pump to continue operating for several hours and the mechanical seal to 'seat' properly prior to calling for service personnel.
- The following Armstrong files are available for mechanical seal replacement instructions:
 - Series 4382 dualArm: File 43.81
 - Series 4302: P-Base and TCZ Motor Frames – File 43.83
TC Motor Frame – File 43.88

8. SYSTEM CLEANLINESS

- Before starting the pump, system must be thoroughly cleaned, flushed, drained and replenished with clean liquid.
- Welding slag and other foreign materials, "Stop Leak" and cleaning compounds and improper or excessive water treatment are all detrimental to the pump internals and sealing arrangement.
- Proper operation cannot be guaranteed if the above conditions are not adhered to.

CAUTION:



Under no circumstances should the pump be used for flushing out the system. In line with CIBSE commissioning code W: 1994, the pump should be out of line or bypassed during flushing.

NOTE:

Particular care must be taken to check the following before the pump is put into operation:

- a. Pump primed?
- b. Rotation OK?
- c. Lubrication OK?
- d. Pipe work properly supported?
- e. Voltage supply OK?
- f. Overload protection OK?
- g. Is the system clean?
- h. Is the area around the pump clean?

WARRANTY

Does not cover any damages to the equipment resulting from failure to observe the above precautions. Refer to Armstrong General Terms and Warranty sheet. Contact your local Armstrong representative for full information.

9. Flapper Valve

The Series 4382 & 4302 dualArm unit is fitted with internal valves to allow isolation of one pump for service whilst the other is still running, to automatically prevent recirculation of the flow when only one pump is running.

Procedure for parallel or standby pumping

- Discharge and suction valve stems should be locked in the centre position. This is indicated by both locking handles in the vertical position and the centre pin of the locking arms locked by the handles. This procedure allows the discharge valve plates to pivot freely but locks the suction valve firmly in the centre position.

Procedure for isolation of one side

- Stop the pump to be serviced.
- Close and lock suction and discharge valves (see locking instructions below).
- Ensure Seal flush line interconnect valve is closed and drain isolated casing. Service isolated pump as required.

Procedure for start after service

- Ensure serviced pump is fully assembled including seal flush lines and drain plug.
- Fill the dry casing with water by opening the seal flush line interconnecting valve and the air vent fitting.
- Allow the pressure to equalize in the two casings
- Unlock the discharge valve per attached instructions
- Unlock the suction valve per attached instructions
- Lose the seal flush line interconnect valve and restart the pump.

Valve Operation – Discharge Valve

- This valve performs the dual function of automatically sealing the discharge of the inactive pump when one pump is running and can manually be closed and locked to isolate one pump for service.

Automatic flapper operation

- In the flapper mode the two halves of the discharge valve are free to pivot independently in the flow. The locking handle (3) should be secured with the set-screw (11) in the vertical position with the centre pin of the locking arm (4) trapped by the locking handle (3).

Manual valve locking

- The locking feature on this valve is to ensure a positive close off of the discharge port on the pump to be serviced.

Locking

- Loosen the discharge side set screw (11) to release the locking handle (3).
- Rotate the discharge side-locking handle (3) so that the handle points towards the pump to be serviced and secure in the horizontal position, using the set-screw (11). This releases the discharge-locking arm (4).
- Rotate the discharge valve shaft (16) towards the pump to be isolated. The orientation of the shaft is indicated by the centre pin on the locking arm (4).
- Raise the locking handle (3) so that the cam on the base of the handle forces the pin of the locking arm (4) towards the pump to be isolated. The locking handle (3) should be raised to between 45° and the vertical position. This handle should not be rotated past the vertical position.

Unlocking

CAUTION:

Ensure the isolated pump is not operating before attempting to release the lock mechanism. Failure to do so may result in injury to the operator and/or damage to the pump. Particular care should be taken when performing the following procedures.

- Open the interconnecting valve on the seal flush line to pressurize the serviced pump and vent air through bleeder valve. Close this valve once the pressure is equalized.
- Loosen set screw (11) and lower the locking handle (3) to the horizontal position, secure with set screw (11).
- Rotate valve to centre position so that the centre pin of the locking arm (4) locates in the recess on the locking handle (3).
- Loosen set screw (11) and raise locking arm (4) to the vertical position, secure with set screw (11).

Suction Valve – Manual Operation

The suction side valve is designed for use as a manually operated isolation valve. This valve does not automatically pivot, as does the discharge valve.

Locking

- Ensure that the pump to be isolated is not running.
- Loosen suction side set screw (11) to release the locking handle (3)
- Rotate the suction side-locking handle (3) so that the handle points toward the pump to be serviced and secures in the horizontal position, using set screw (11). This releases the suction locking arm (4).

CAUTION:



The locking handle (3) should only be rotated towards the pump stopped for servicing. If the locking handle (3) is rotated towards the running pump the valve may slam shut on that pump. This may cause the locking handle and arm to move with sufficient force to injure the operator and/or cause damage to the pump.

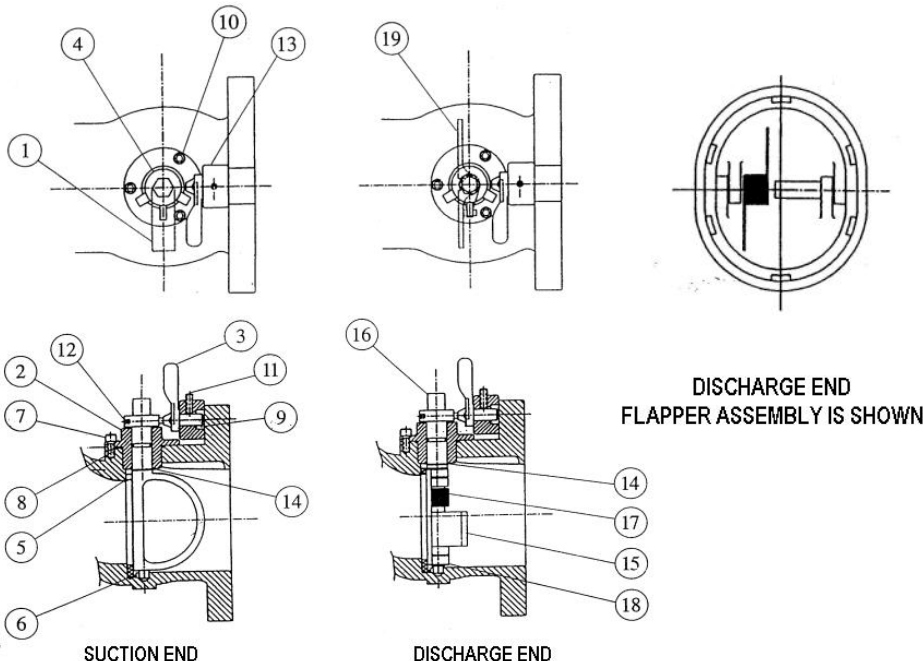
- Rotate the flapper towards the pump to be isolated.
- Loosen the set screw (11) and raise the locking handle (3) so that the cam on the base of the handle forces the pin of the locking arm (4) towards the pump to be isolated. The locking handle (3) should be raised to between 45° and the vertical position. This handle should not be rotated past the vertical position.
- Tighten set screw (11) to secure the locking handle (3) in position.

Unlocking



CAUTION: Particular care should be taken when performing the following procedures.

- Ensure the side to be unlocked is not operating.
- Open the interconnecting valve on the seal flush line to pressurize the serviced pump and vent air through bleeder valve. Close this valve once the pressure is equalized.
- Loosen the set screw (11) and lower the locking handle (3) to the horizontal position, secure it with a set screw (11).
- Rotate the valve to centre position so that the centre of the locking arm (4) locates in the recess on the locking handle (3).
- Loosen the set-screw (11) and raise the locking arm (4) to the vertical position, secure it with a set-screw (11).



ITEM DESCRIPTION	
1	Flapper Valve
2	Gland Plate
3	Lock Handle
4	Locking Arm
5	Flapper Seat
6	Retainer Ring
7	Quad Ring For Flapper Valve
8	'O' Ring
9	Reinforced Push On
10	SOC Holcap SCR
11	Hex SOC Set Screw
12	Hex SOC Set Screw Cup Pt
13	Adaptor for Lock Handle
14	Truarc
15	Locking Block
16	Shaft (2 pcs flapper)
17	Torsion Spring
18	Truarc
19	2 pcs Flapper

INSTALLATION LAYOUTS

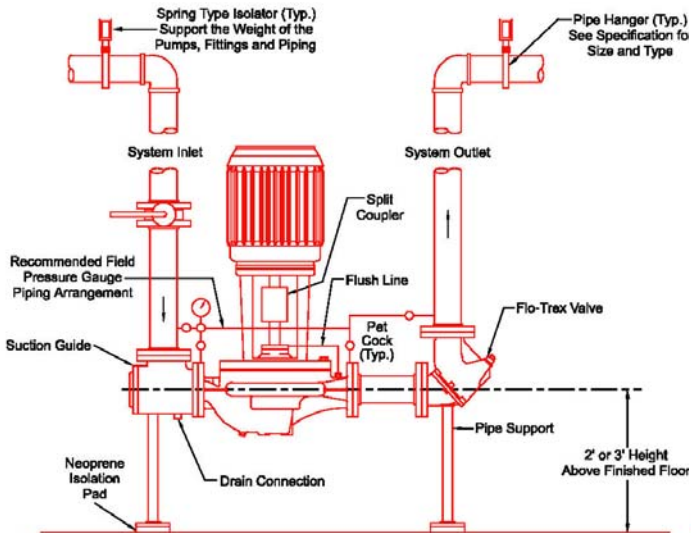


Fig. 2.1a Recommended Installation

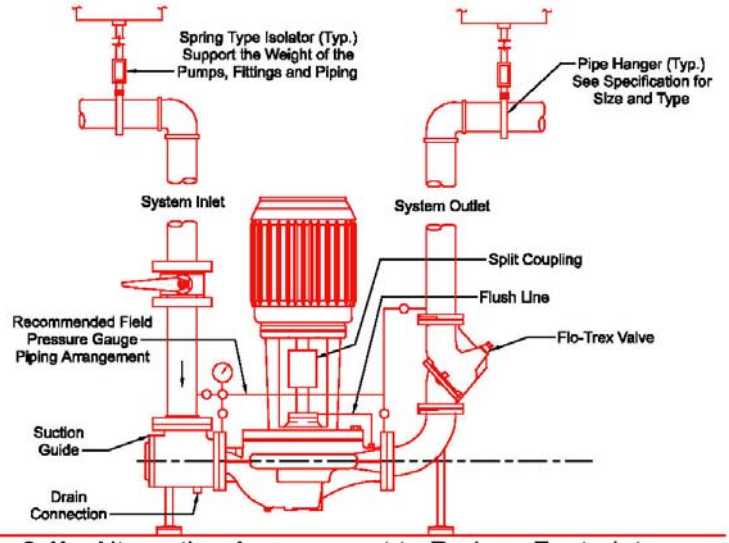


Fig. 2.1b Alternative Arrangement to Reduce Footprint

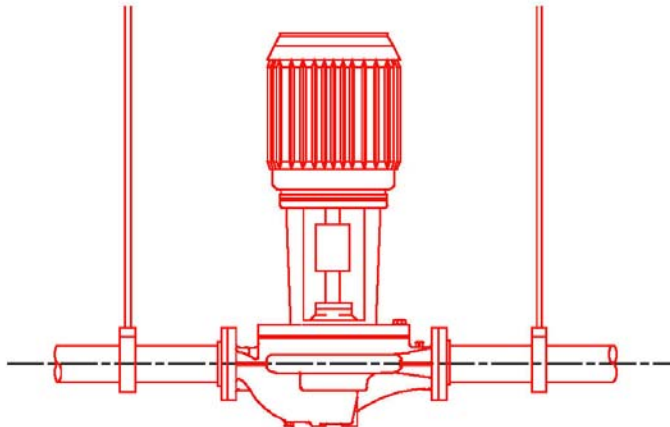


Fig. 2.2 Pipe Hanger Support

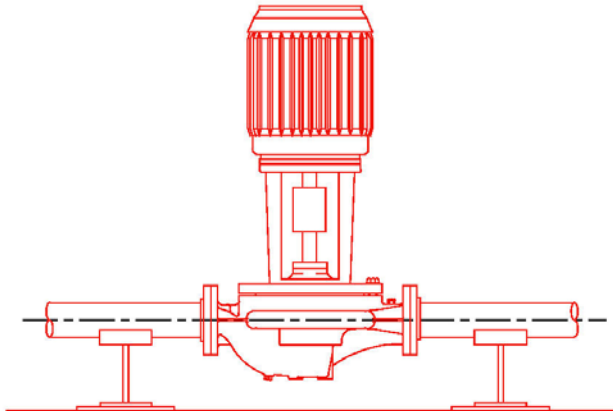


Fig. 2.3 Floor Saddle Support

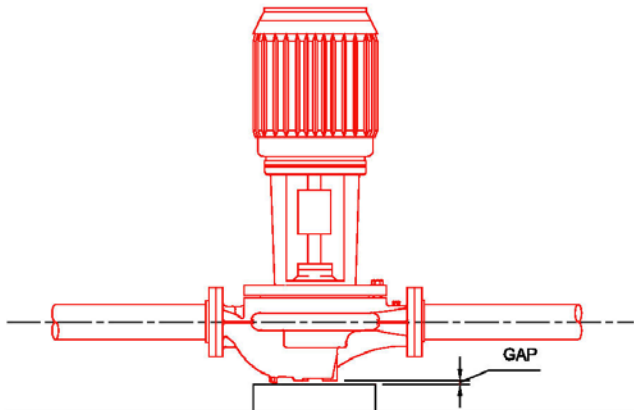


Fig. 2.4 Additional Floor Support

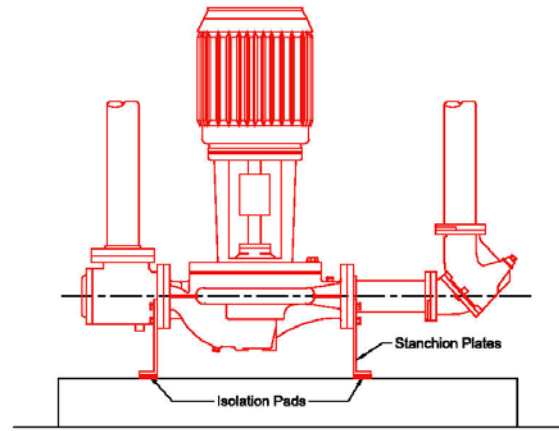


Fig. 2.5a Mounting VIL with Stanchion Plates

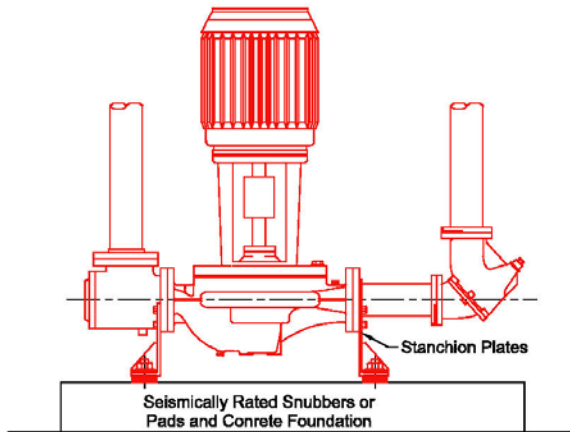


Fig. 2.5b Seismic Region Installation

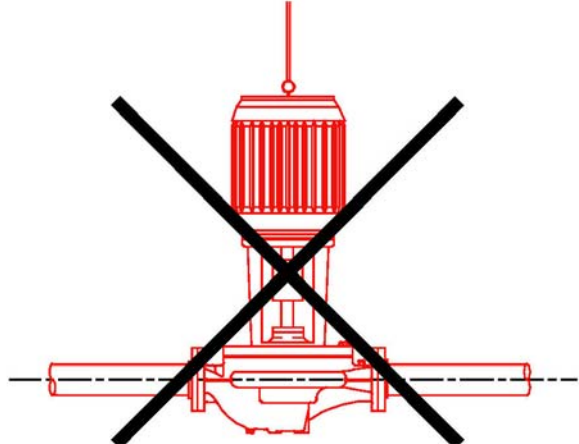


Fig. 2.6 Not Recommended – Hanging

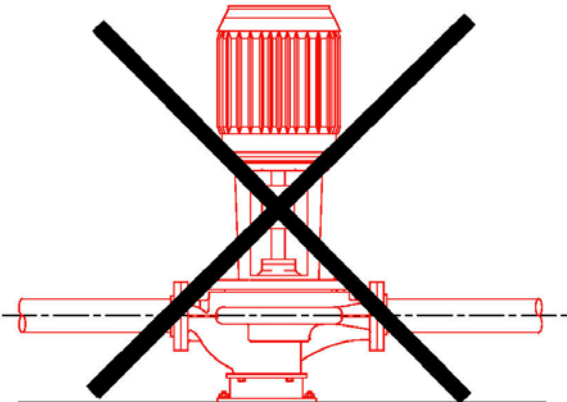


Fig. 2.7 Not Recommended – Rigid Base

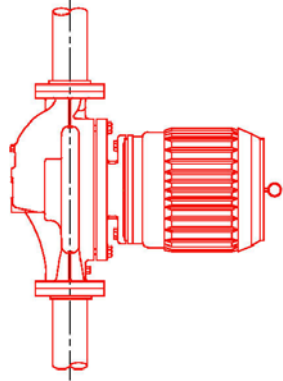


Fig. 2.8 Horizontal Mounting - 4360/4380 only to 11 kW (15 hp)

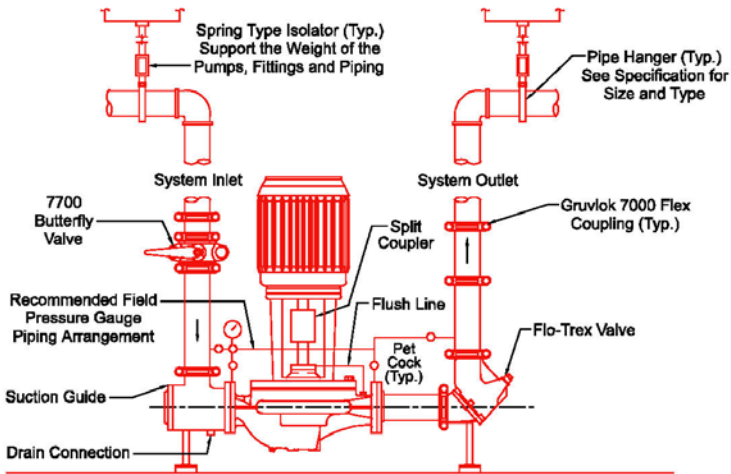


Fig. 2.9 Mounting in Grooved Pipe systems

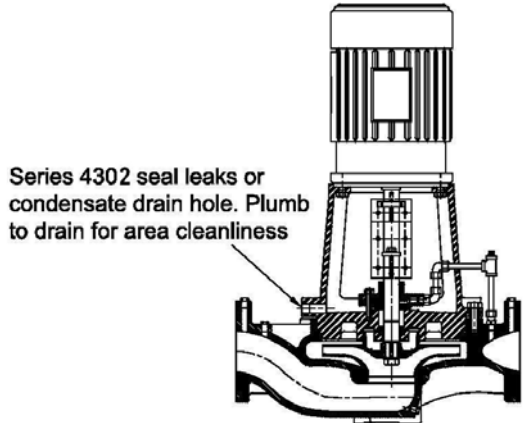


Fig. 2.10 Seal leaks or condensate drain hole. Plumb to drain for area cleanliness.

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