

INSTALLATION AND OPERATING INSTRUCTIONS

COMMERCIAL PUMPS Series 4300, 4360 & 4380 Vertical In-Line Pumps

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 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

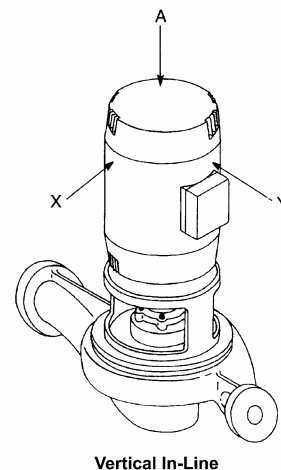
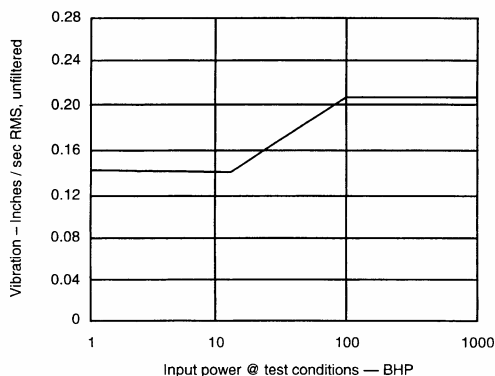
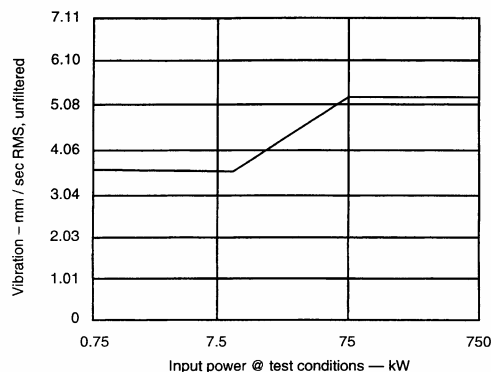


Typical Pumping Unit Sound Pressure Level, Decibels, A-Weighted, at 1 m (3 ft.) from unit.

Frame Designation	1200 rpm				1800 rpm				3600 rpm			
	ODP		TEFC		ODP		TEFC		ODP		TEFC	
	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A
140	0.75 - 1	59	0.75 - 1	58	1 - 3	64	1 - 2	64	1.5 - 3	70	1.5 - 2	79
180	1.5 - 2	61	1.5 - 2	61	3 - 5	66	3 - 5	68	5 - 7.5	74	3 - 5	82
210	3 - 5	66	3 - 5	65	7.5 - 10	70	7.5 - 10	73	10 - 15	76	7.5 - 10	85
250	7.5 - 10	70	7.5 - 10	69	15 - 20	74	15 - 20	78	20 - 25	78	15 - 20	88
280	15 - 20	75	15 - 20	74	25 - 30	74	25 - 30	82	30 - 40	80	25 - 30	89
320	25 - 30	77	25 - 30	77	40 - 50	78	40 - 50	83	50 - 60	83	40 - 50	94
360	40 - 50	80	40 - 50	80	60 - 75	80	60 - 75	89	75 - 100	88	60 - 75	95
400	60 - 75	82	60 - 75	84	100 - 125	83	100	92	125 - 150	92	100	96
440	100 - 125	85	100 - 125	88	150 - 200	87	125 - 150	96	200 - 250	95	125 - 150	98

VIBRATION LEVELS

Armstrong Vertical In-Line pumps are designed to meet vibration levels set by Hydraulic Institute Standard HI Pump Vibration 9.6.4. Standard levels are as detailed below:



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. Rustproofing 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.

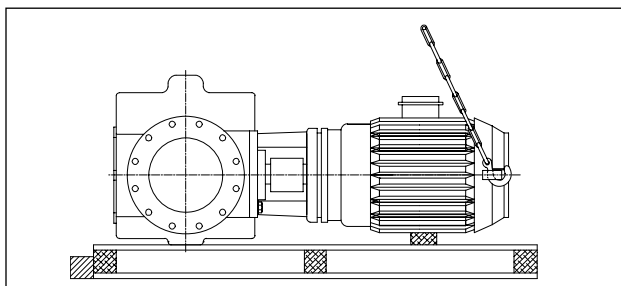
UNCRATING

Armstrong Vertical In-Line pumps are thoroughly inspected before shipment to assure they meet with your order requirements.

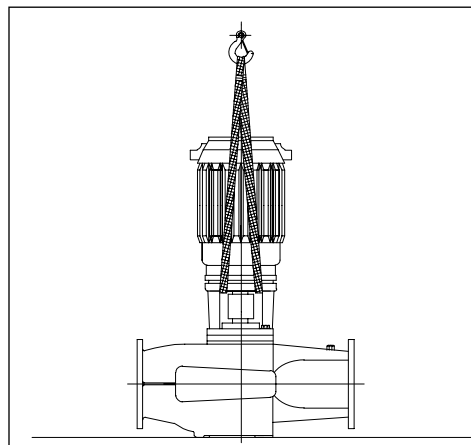
After removing the pump from the crate, make sure the equipment is in good order and that all components are received as called for on the packing list. Any shortages or damage should be reported immediately. Use extreme care in handling the unit, placing slings and hooks carefully so that stress will 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.

HANDLING LARGE VIL UNITS

One effective way of lifting a large Series 4300 unit from the shipment pallet following uncovering the unit is to place lifting hooks through the motor lifting rings or straps around the upper part of the motor and carefully lift sufficiently to stand the pump vertically. Lift only sufficiently to remove the pallet then lower onto a flat surface. The pump and motor unit will free-stand on the casing ribs. Remove the coupling guard and place (2) lifting straps through the pump/motor pedestal, one on each side of the motor shaft and secure to the lifting device. With the straps in place, using a spacer bar if necessary to protect the motor fan cover, the whole assembly can now be lifted securely and placed in position in the piping.



Secure pallet and lift pump vertical using motor eye-bolts lift only to clear pallet then sit on the flat surface



Remove coupling guard and place lifting straps on each side of coupling, use spacer bar if necessary to protect motor fan cover.



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 of parts.
- 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.

2. 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 neoprene 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.*
- Various installation arrangements are detailed on Pages 7 & 8:
 - 2.1 Vertical In-Line pumps may be installed directly in the system piping with no additional support. Pipe hangers are simply sized for the additional weight of the pumping unit. Many pumps are installed in this manner and are mounted at sufficient height to take zero floor space. (Fig. 2.1)
 - 2.2 Piping in many mechanical rooms is hung close to the ceiling and larger pumps are mounted near ground level for ease of maintenance. Fig 2.2 illustrates such an arrangement with the piping supported at the ceiling and the VIL unit installed with an Armstrong Suction Guide and triple function Flo-Trex valve. Many very large VIL pumps are installed in this manner.
 - 2.3 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 2.3)

- 2.4 Fig 2.4 illustrates a similar arrangement to Fig 2.2 with additional floor mounted pipe-stools isolated from the structure by 'waffle' style neoprene isolation pads under the Armstrong Suction Guide and Flo-Trex Valve.
- 2.5 Floor mounted saddle supports (Fig. 2.5) are typical for condenser water pumps where cooling tower base is near mechanical room elevation.
- 2.6 Where required, additional floor support may be used as shown in Fig. 2.6. 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 in such a manner that the pump does not become a pipe support.
- 2.7 Fig. 2.7 illustrates stanchion plates at the pump inlet and outlet ports that may be supplied for installation convenience. Isolation pads must be used under the legs and monitored as pipe hangers are adjusted to ensure the pump flanges are not supporting the piping. Bolting to the floor or housekeeping pad is not recommended. If the stanchions are bolted down the bolts must be isolated from the stanchion or an inertia base and flexible pipe connectors used.
- 2.8 Fig. 2.8 illustrates installations with stanchion plates for seismically active regions. Seismically rated isolation pads or snubbers with bolts isolated from the stanchion plates are installed to restrain the pump during a seismic event. Pipe hangers carry the weight of the equipment as seismic components are designed only to restrain the equipment during a seismic event.
- 2.9 Close coupled in-line units (Series 4360 & 4380) up to 15 hp / 11 kW may be installed with the shaft horizontal. (Fig. 2.9) For horizontal mounting of large units or Series 4300 Split-Coupled style consult the factory.
- 2.10 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 rotating in the piping. Armstrong offers grooved suction guides with cast-in outlet flanges and triple function Flo-Trex valves with inherent locking devices to prevent this possibility. (Fig. 2.10)
- 2.11 DO NOT support the unit by the motor eye bolts (Fig. 2.11) or by any other part of the motor.
- 2.12 Connecting the pump to a permanent rigid base (Fig. 2.12) is not recommended unless isolated from the piping by flexible connectors and the base isolated from the building structure on an inertia base. (Fig. 2.12 is generally acceptable when using plastic piping).

IMPORTANT:

All Series 4300 pumps contain a tapped hole in the motor bracket above the discharge flange (see Fig. 2.13) 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 piping exerts no strain on 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 becomes 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 120°F (49°C). 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 4360 & 4380, as there is no shaft coupling.
- Series 4300 units are accurately aligned at the factory prior to being shipped and do not need re-aligning when installed.
- Alignment on a Series 4300 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 4300 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 4360 & 4380 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.
- “Bump” or energize the motor momentarily and check that the 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 the 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 milliseconds 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 100°F/40°C).



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 4300 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 on the 20x20x19 size without disturbing the motor or other major pump components.
- Service instructions for the lower bearing is 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 discharge of the pump casing on Series 4300 pumps and is flushed/vented to the suction on close coupled pumps, Series 4360 & 4380.
- The Series 4300 pump is flushed from the pump discharge because the mechanical seal chamber is isolated from the liquid in the pump by a throttle bushing. Because the seal chamber is isolated, seal environmental controls such as filters and separators, when installed in the Series 4300 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 4360 & 4380: File 43.81
 - Series 4300: P-Base and TCZ Motor Frames – File 43.84
TC Motor Frame – File 43.88

8. SYSTEM CLEANLINESS

- Before starting the pump the system must be thoroughly cleaned, flushed and 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.

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.

INSTALLATION LAYOUTS

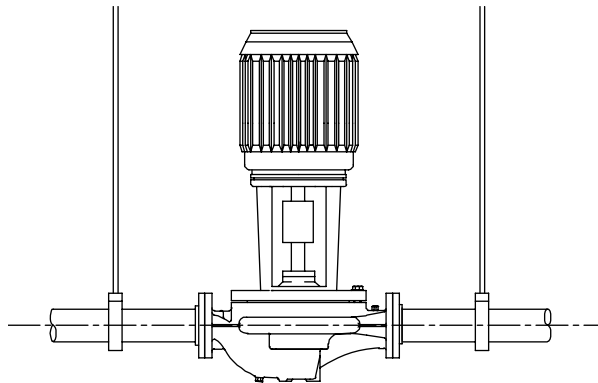


Fig. 2.1 Hanger supported pipe mounted

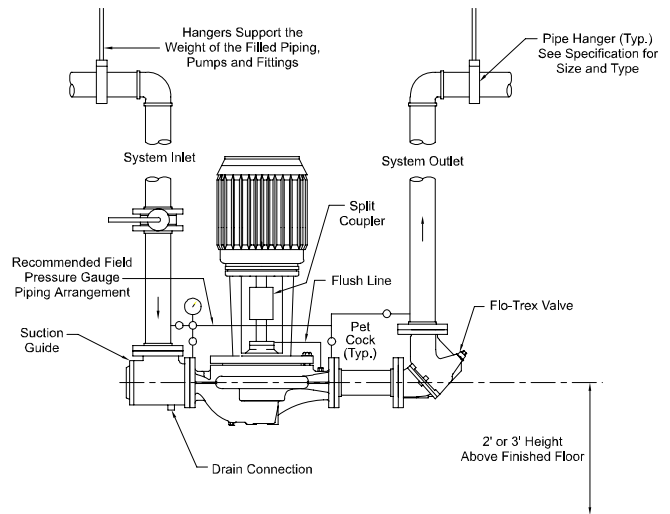


Fig. 2.2 Pipe mounted supported at ceiling

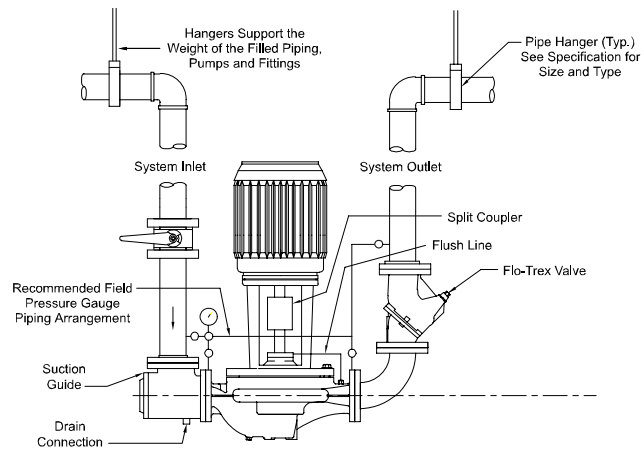


Fig. 2.3 Discharge elbow for minimum footprint

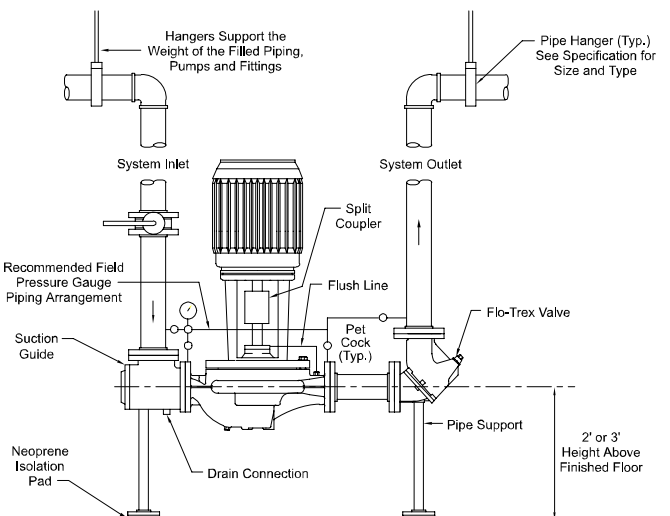


Fig. 2.4 With additional pipe supports

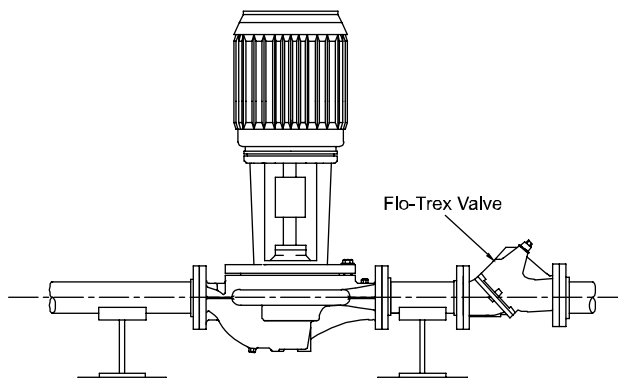


Fig. 2.5 Floor saddle support

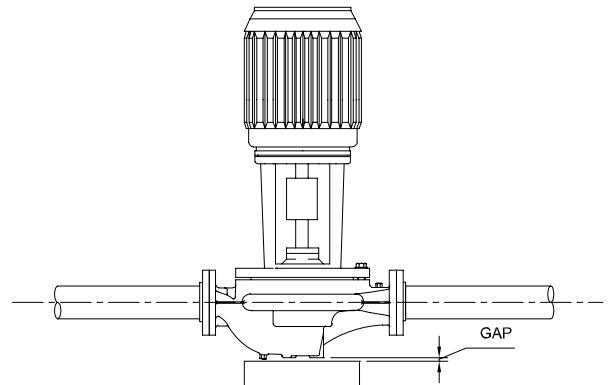


Fig. 2.6 Additional floor support

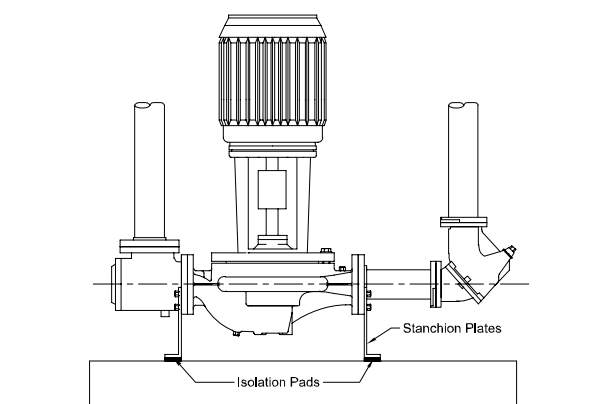


Fig. 2.7 With stanchion plates

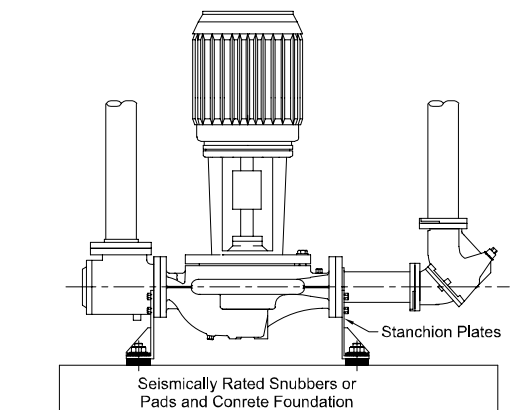


Fig. 2.8 Seismic region installation

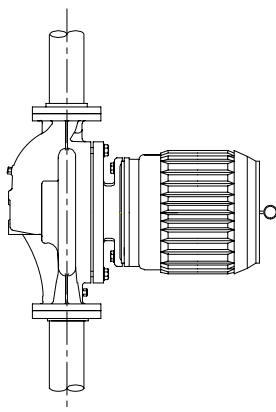


Fig. 2.9 Horizontal mounting –
4360/4380 only to 15 hp (11 kW)

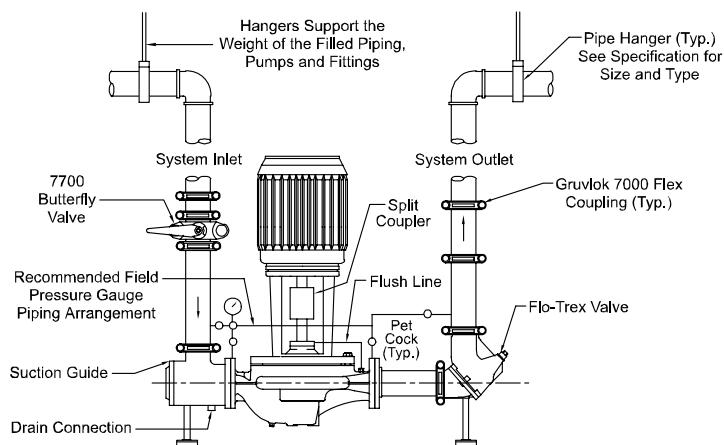


Fig. 2.10 Mounting in grooved pipe systems

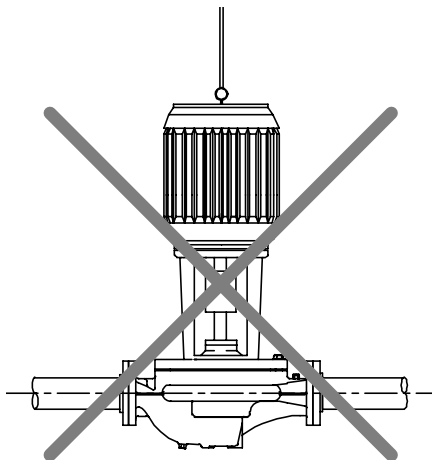


Fig. 2.11 Motor lifting hook supported

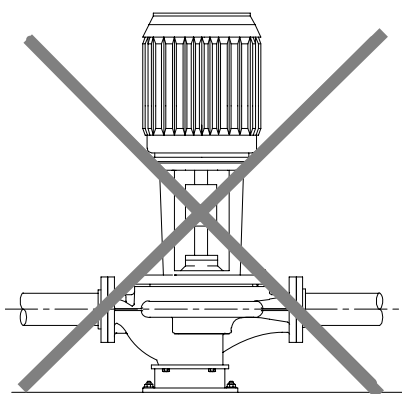
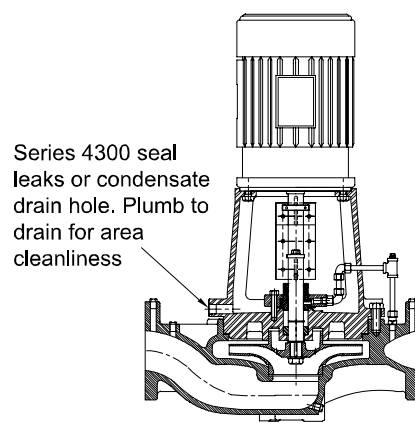


Fig. 2.12 Mounted on rigid base
without flexible connectors



Series 4300 seal
leaks or condensate
drain hole. Plumb to
drain for area
cleanliness

Fig. 2.13 Tapped collection well
on Series 4300

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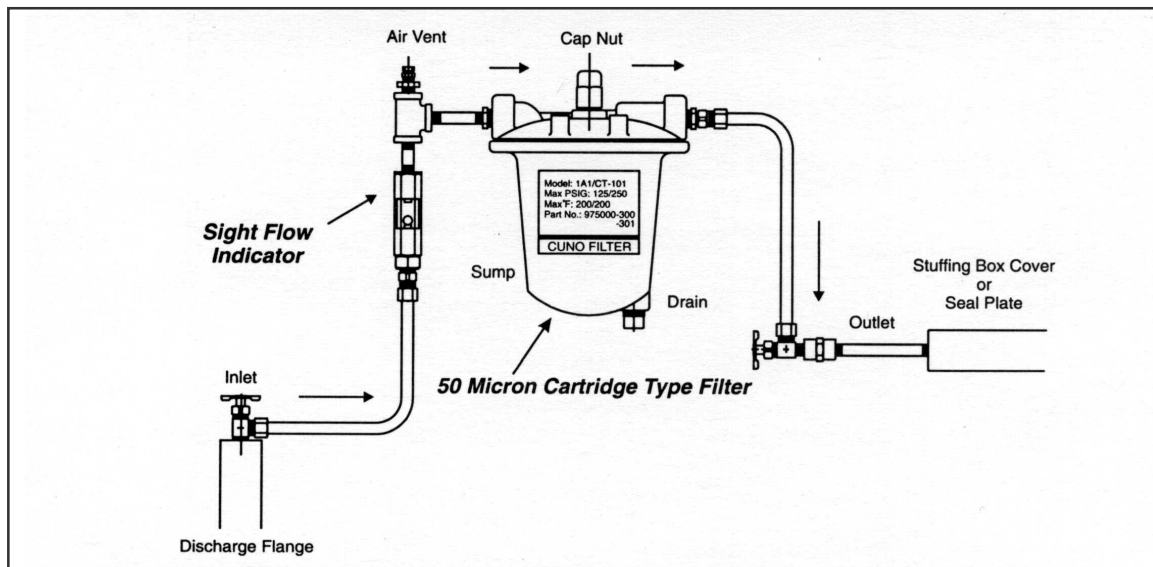


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INSTALLATION & OPERATING INSTRUCTIONS

Cuno Filter and Sight Flow Indicator

The cuno filter and sight flow indicator are seal environmental accessories, factory installed on the flushline. The cuno filter removes abrasives from the flushing liquid to extend the life of the mechanical seal.



Typical Piping Arrangement

Filter Cartridge replacement

- Close off inlet and outlet filter lines. Loosen cap nut to relieve pressure in filter housing.
- Remove drain plug and drain filter.
- Remove sump by unscrewing cap nut - do not drop or lose cap nut gasket.
- (Cartridge replacement only) Pull old cartridge out of sump and clean out sump. Replace head gasket and cap nut gasket if damaged or deteriorated.
- Install new cartridge by sliding it over the center post (centered by ribs at bottom of sump). Reassemble sump to head. Do not over tighten drain plug.
- Slowly open inlet valve to fill filter and check for leaks. If filter leaks, shut off inlet valve, back off cap nut to relieve pressure, then tighten cap nut. Recheck for leaks. Then open inlet and outlet valves fully. Filter is now in operation.

Note: Operator must ensure that while the pump is operating, the ball in the sight flow indicator is moving freely. When the ball moves very little, or not at all, the filter cartridge requires changing. Failure to do so could result in mechanical seal damage.

Filter Cartridge part number for:	Model 1AI Filter (3.75" Long)	Part No. 975000 - 300
	CT-101 Filter (9.75" Long)	Part No. 975000 -301
Head Gasket for:	Model 1AI or CT-101 Filter	Part No. 975000 - 410

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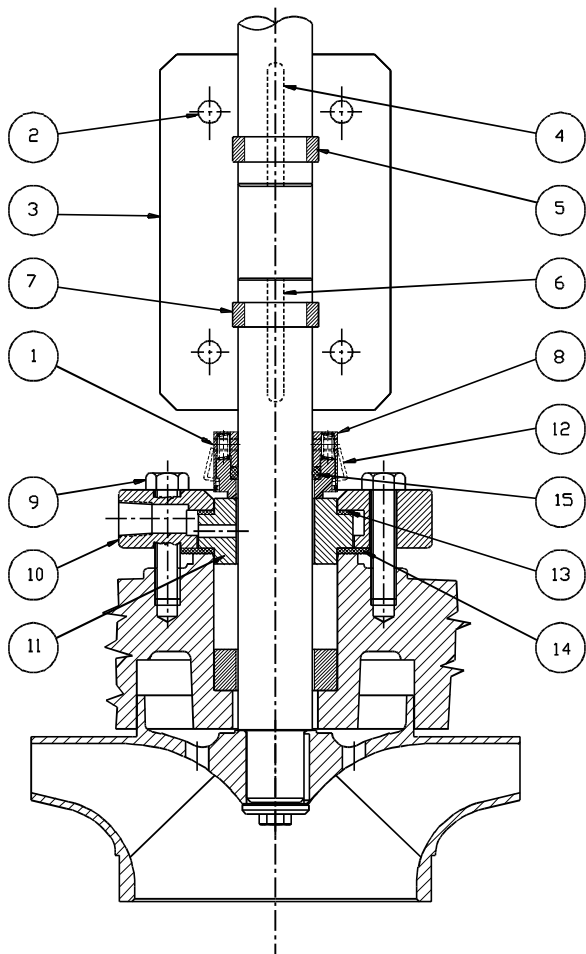
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MECHANICAL SEAL REPLACEMENT INSTRUCTIONS

SERIES 4300 & 4302 OUTSIDE MECHANICAL SEAL WITH P-BASE & TCZ MOTOR FRAME



SEAL REPLACEMENT

Handle mechanical seal carefully to protect seal faces from damage. Do not contaminate seal faces with finger prints.

- E) Replace the stationary seat (11) with gaskets (13 & 14). Ensure the large diameter gasket (14) is on the bottom. Replace seal plate (10) and tighten the seal plate bolts (9) evenly and diagonally. (DO NOT OVERTIGHTEN)

TIP: For best seal flush, align seat flush hole with seal plate flush line connection (10 A)

- F) When installing the mechanical seal (8), make sure that all parts are perfectly clean.
- G) Apply a sparse amount of silicone lubricant (provided) to the seal 'O' ring (15). Carefully slide the mechanical seal rotating assembly (8) down the shaft onto the stationary seat (11). Care must be taken not to cut the seal 'O' ring on the keyways. Do not tighten the set screws (1) on the side of the mechanical seal yet. Do not remove holding clips (12).
- H) Coupling halves (3) are machined together and identified by match marks, (a letter or numeral stamped on each coupling half). Make sure that the match marks correspond with each other before installing the coupling.
- I) Fit the motor shaft key and collar (4 & 5) and the pump shaft key and collar (6 & 7) and install the keyed coupling halves (3). Tighten the coupling bolts (2) evenly and firmly. Should the coupling not fit the dimensions between the shafts, lift the pump shaft to position collar (7) in coupling half (3).
- J) Push mechanical seal (8) firmly onto the stationary seat (11) and tighten the set screws (1). Remove the holding clips (12) for operation.

SEAL REMOVAL

An important feature of the Series 4300 and 4302 pump is that the design permits removal of the mechanical seal without disturbing the pump, motor or electrical wiring.

- A) Disconnect the power supply at the main switch and close the isolating valves on the suction and discharge. Empty casing by removing drain plug(s) located at the bottom.
- B) Loosen off the seal collar set screws (1) Remove the coupling bolts (2) and separate the coupling halves (3). Remove the motor shaft key (4) and the pump shaft key and collar (4 & 5) and the pump shaft key and collar (6 & 7).
- C) Remove the mechanical seal rotating assembly (8) through the gap between the pump and motor shafts.
- D) Disconnect the seal flush piping (10A). Mark seal plate (10) position. Remove the seal plate bolts (9) and seal plate (10). Remove the stationary seat (11) and seat gaskets (13 & 14)

NOTE

- 1) The mechanical seal is preset at the correct working length.
- 2) Installation of the coupling automatically locates the impeller in the pump.

- K) Replace the seal flush piping (10A) and drain plug(s). **Series 4302:** Equalize pump pressure within **dualArm** pump by temporarily opening valve on connecting tubing.
- L) Open all isolating valves prior to operating pump(s). Reconnect power supply.

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MECHANICAL SEAL REPLACEMENT INSTRUCTIONS

SERIES 4300 & 4302 OUTSIDE MECHANICAL SEAL WITH TC FRAME MOTOR

SEAL REPLACEMENT

Handle mechanical seal carefully to protect seal faces from damage. Do not contaminate seal faces with finger prints.

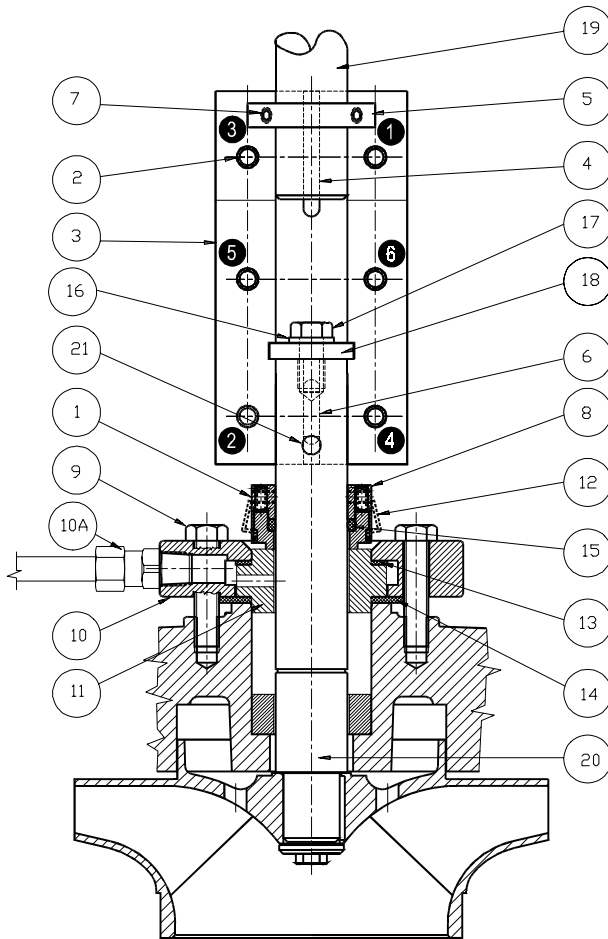
- E) Replace the stationary seat (11) with gaskets (13 & 14). Ensure the large diameter gasket (14) is on the bottom. Replace seal plate (10) and tighten the seal plate bolts (9) evenly and diagonally. (DO NOT OVERTIGHTEN)

TIP: For best seal flush, align seat flush hole with seal plate flush line connection (10 A)

- F) When installing the mechanical seal (8), ensure parts are perfectly clean.
- G) Apply a sparse amount of silicone lubricant (provided) to the seal 'O' ring (15). Carefully slide the mechanical seal rotating assembly (8) down the shaft onto the stationary seat (11). Do not tighten the set screws (1) on the side of the mechanical seal yet. Do not remove holding clips (12).

If motor is replaced: Loosen set screws (7) on motor shaft collar (5) and remove from old motor shaft. To position the collar (5) correctly on the new motor shaft, temporarily fit motor shaft collar (5) into groove of the keyed coupling half. Slide collar, with coupling half onto new motor shaft until end of shaft lines up with line scored into coupling. Tighten the visible set screws (7) in the collar (5) enough to hold the collar in place on the shaft and remove the coupling half. Tighten all collar set screws (7) evenly and diagonally. Order replacement motors with locked lower bearing.

- H) Insert the coupling screw allen wrench into location hole (21) to prevent pump shaft rotation and replace collar, lockwasher, and capscrew (18, 16, & 17). **Capscrew (17) must be firmly tightened on the pump shaft with a wrench.** Coupling halves (3) are machined together and identified by match marks, (a letter or numeral stamped on each coupling half). Make sure that the match marks correspond with each other before installing the coupling.
- I) Fit the motor shaft key (4) and the pump shaft key (6) then install the keyed coupling half (3) first. Note: For easier coupling installation, motor and pump shaft keys (4 & 6) should be 180 degrees from the working area. To automatically locate the impeller(s) in the pump, insert the coupling screw allen wrench into positioning hole (21) and lift pump shaft until the pump shaft collar is positioned in the coupling groove, then rotate shaft to locate the pump shaft key (6) into blind keyway in coupling.
- J) Place the second coupling half into position and tighten the coupling screws (2) following the tightening pattern shown on the illustration. Note: Snug fit the coupling screws and confirm even gap spacing between coupling halves, then firmly tighten coupling screws following the tightening pattern illustrated. Then push (or slide) mechanical seal (8) firmly onto the stationary seat (11) and tighten the set screws (1). Remove the holding clips (12) for operation. **The mechanical seal is now preset at the correct working length.**
- K) Replace the seal flush piping (10A) and drain plug(s). **Series 4302:** Equalize pump pressure within **dualArm** pump by temporarily opening valve on connecting tubing. Open all isolating valves prior to operating pump(s). Reconnect power supply.



SEAL REMOVAL

An important feature of the Series 4300 and 4302 pump is that the design permits removal of the mechanical seal without disturbing the pump, motor or electrical wiring.

- A) Disconnect the power supply at the main switch and close the isolating valves on the suction and discharge. Empty casing by removing drain plug(s) located at the bottom.
- B) Loosen off the seal collar set screws (1) Remove the coupling screws (2) and separate the coupling halves (3). Remove the motor shaft key (4) and the pump shaft key (6). **DO NOT REMOVE MOTOR COLLAR (5) FOR SEAL REPLACEMENT.** Insert coupling screw allen wrench into positioning hole (21) to prevent shaft rotation and remove the capscrew, lockwasher and collar (17, 16, & 18) from the pump shaft.
- C) Remove the mechanical seal rotating assembly (8) through the gap between the pump and motor shafts.
- D) Disconnect the seal flush piping (10A). Mark seal plate (10) position. Remove the seal plate bolts (9) and seal plate (10). Remove the stationary seat (11) and seat gaskets (13 & 14)

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SERVICE WORK INSTRUCTIONS

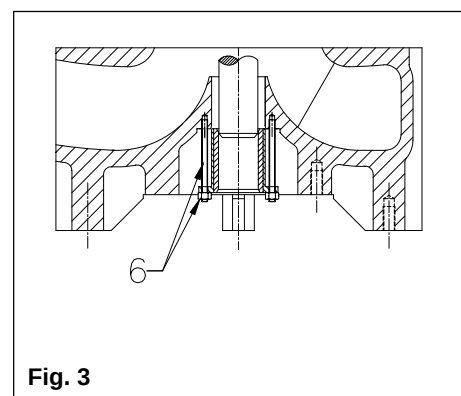
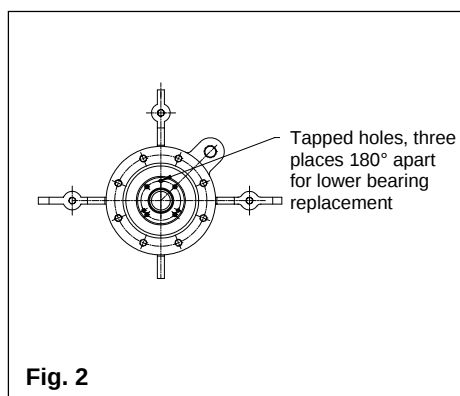
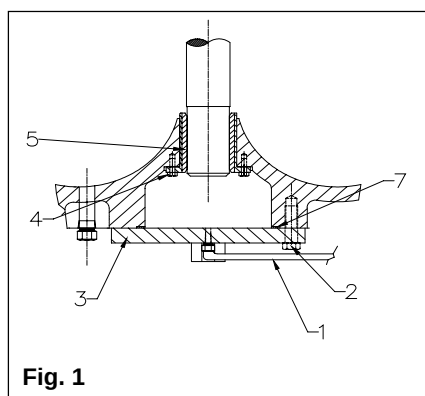
Series 4300 Vertical In-Line Pump Port Sizes: 16" x 16"

LOWER BEARING REPLACEMENT PROCEDURE:

1. Stop the pump. Lock off the breaker. Isolate and drain the pump.
2. Remove lower bearing flush line (1) from the bottom of casing.
3. Remove the eight bolts (2) from the lower bearing cover (3) and remove the cover and gasket.
4. Check clearance between shaft and bearing. If 0.015" (0.38 mm) or greater the bearing should be replaced.
5. Remove the four bolts (4) from lower bearing (5) and relocate three of them into the tapped holes on lower bearing flange.
6. Tightening three bolts in sequence slowly and evenly, jacking out the lower bearing. Bearing-puller or longer bolts (see item 8) can be used to complete the removal of the bearing.
7. Ensure mating bore on casing, between casing and lower bearing, is clean.
8. Insert new lower bearing into the casing bore. Use two studs 3/8-16 x 5" long with nuts (6) 180° apart to install lower bearing into the casing bore. Tightening stud nuts (6) slowly and evenly, lower bearing will slide into the casing bore (Fig. 3).
9. When lower bearing (5) is close to being fully installed, replace long studs (6) by bolts (4) and complete the installation.
10. Install new gasket (7) if necessary and place lower bearing cover (3).
11. Tighten all eight bolts (2) evenly and equally and re-install flush line (1).

REPLACEMENT PART NUMBERS:

1. Lower bearing for 16x16x15 – 427494-000
2. Lower bearing for 16x16x19 – 427524-000
3. Gasket - 426401-003



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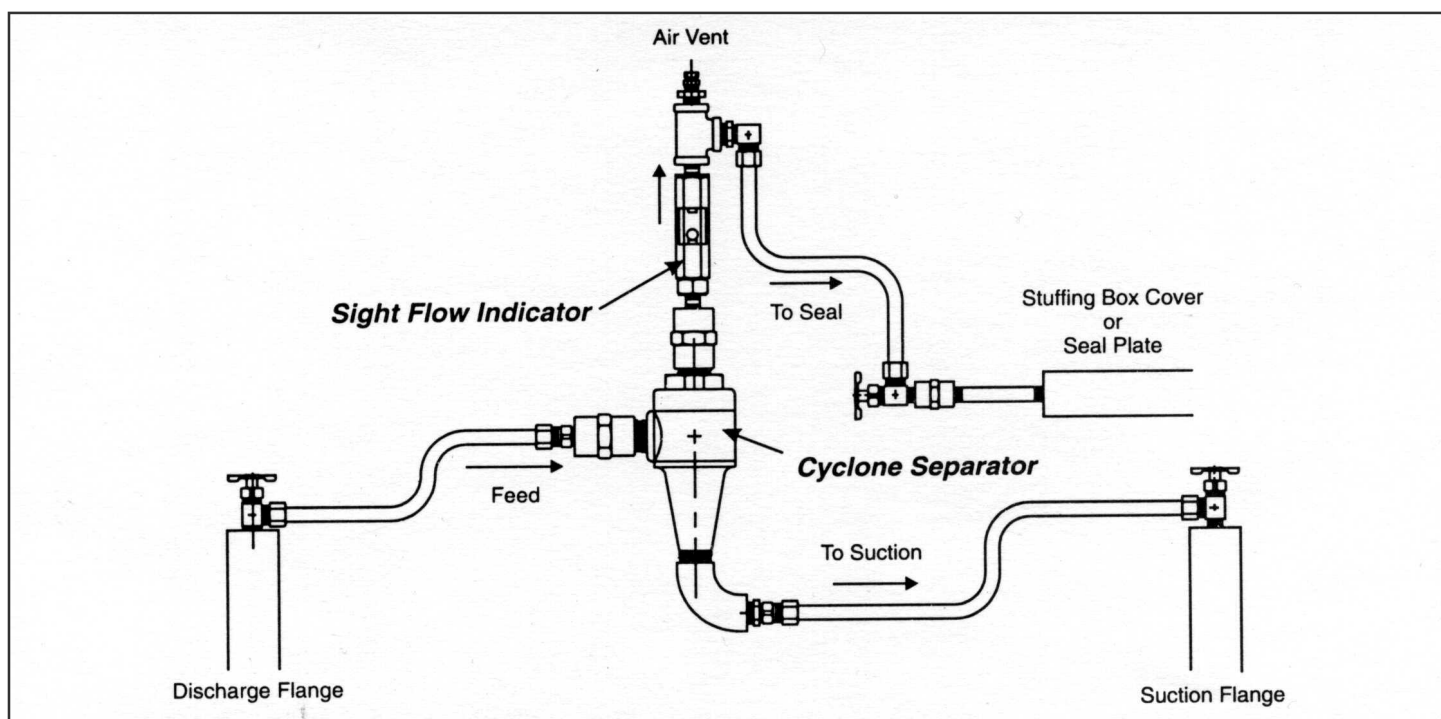
ARMSTRONG® Cyclone Separator

FILE NO:	43.86
DATE:	DECEMBER 1, 1995
SUPERSEDES:	NEW
DATE:	NEW

INSTALLATION AND PIPING INSTRUCTIONS

Cyclone Separator and Sight Flow Indicator

The cyclone separator and sight flow indicator are seal environmental accessories, factory installed on the flushline. The separator removes abrasives from the flushing liquid to extend the life of the mechanical seal. This arrangement is maintenance free. A differential pressure of 30 psig or greater across the pump is required for suitable separator operation.



Typical Piping Arrangement

Principle of Operation

Liquid piped from the pump discharge enters the separator feed connection and is rotated inside the cone shaped bore at a velocity dependant on the pressure differential. The particles in the liquid, being of greater density than the liquid remain close to the tapered wall of the cone and course downward to the discharge outlet at the bottom of the separator. From there they are Piped with a small amount of liquid to the suction flange. The clean liquid rises up through the outlet at the top of the separator and is then piped to the gland plate for flushing of the seal.

Note: No maintenance is required, however the sight flow indicator should be checked periodically for fluid flow.

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