FILE NO.:	43d.86L
DATE:	Dec. 10, 2009
SUPERSEDES:	43d.86L
DATE:	Nov. 10, 2009

INSTALLATION AND OPERATING INSTRUCTIONS

COMMERCIAL PUMPS
Series 4392 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 Series 4392 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 

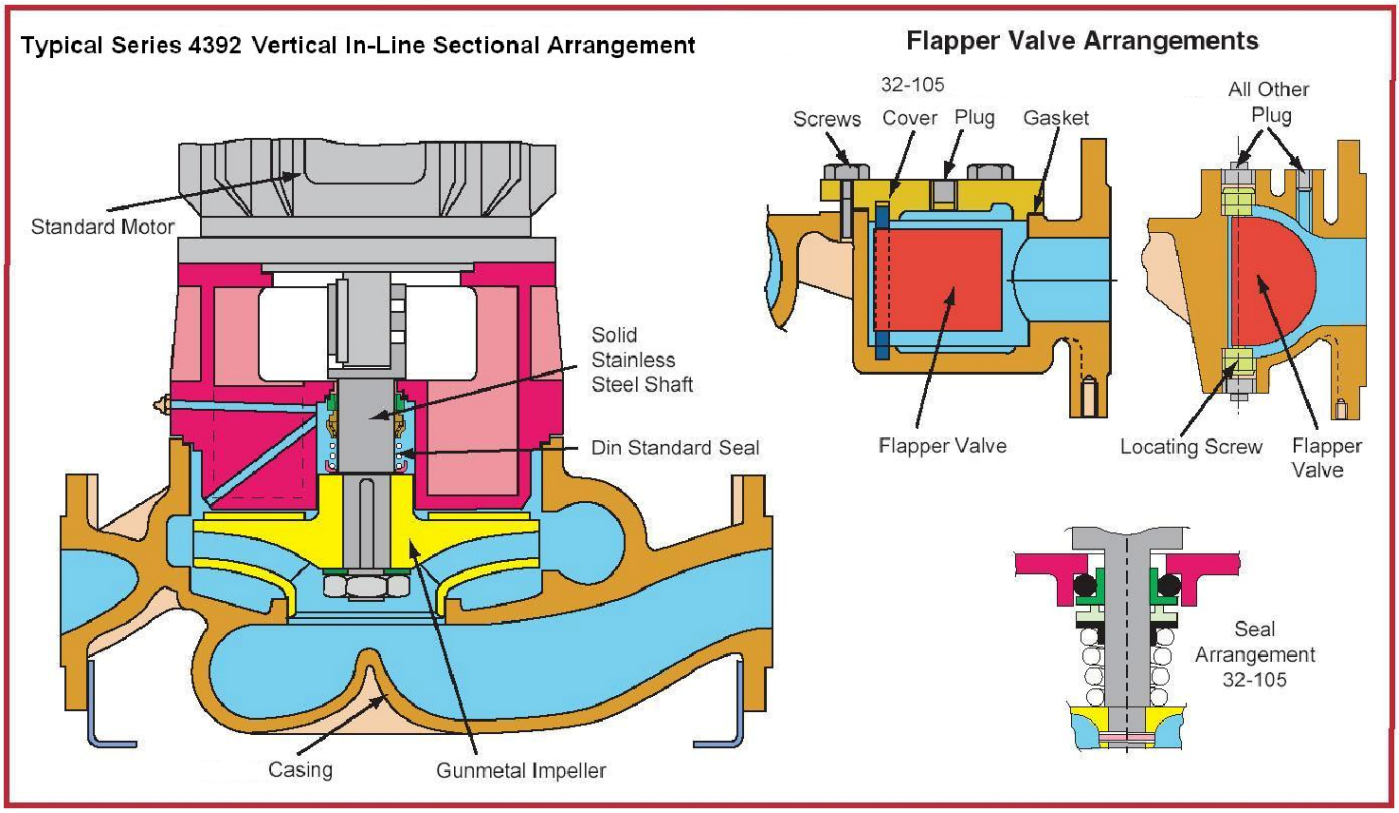
No installation of this equipment should take place unless this document has been studied and understood. Handling, transportation and installation of this equipment should only undertaken by trained personnel with proper use of lifting equipment. See later diagrams for lifting advice. Refer to the pump 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 

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



STORAGE

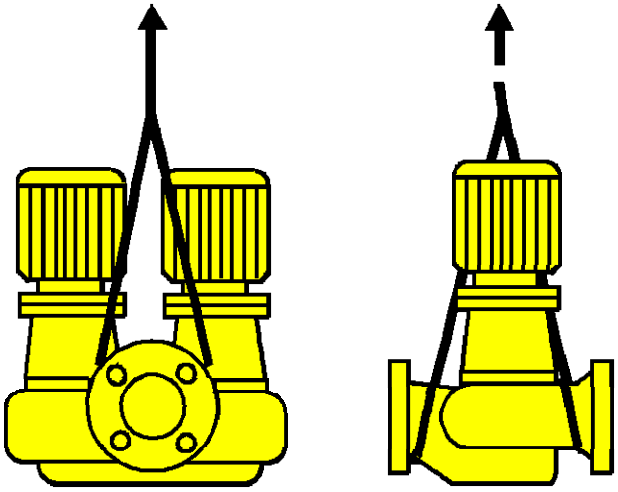
Pumps not immediately placed into service, or removed from service and stored, must be properly prepared to prevent excessive rusting. Pump port protection plates must not be removed until the pump is ready to connect to the piping. Rotate the shafts periodically (At least monthly) to keep rotating elements 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 Series 4392 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.

LIFTING METHOD

Use slings as shown in the diagram below to lift the pump. Do not use the motor eye bolts to lift the pumpset, the motor eye bolts 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 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

- *The pump set shall be mounted on a flat and level foundation capable of supporting the unit without distortion when the set is operating. Install as follows:*

2.1. The pump should be secured to a concrete base using the four tapped holes in the base of the body or the supplied bracket.

2.2. Series 4392 Pumps, with upto a 90 Frame motor, may be installed with the shaft in the horizontal position. However, any air vents fitted in the adaptor should be at the top. To achieve this the head may have to be removed from the body casing and rotated through 90º or 180º.

3. PUMP PIPING - GENERAL

- Pipework to be free of dirt and foreign bodies of any kind.
- Never connect a pump to piping unless extra care is taken to measure and align the piping flanges well.
- Always start the piping from the pump and use as few bends as possible and preferably long radius elbows.
- Only use flexible connectors on the suction or discharge of a Series 4392 pump, if 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 is essential with a long suction line or static lift.
- Install, at the pump suction, a straight pipe of a length 4 or 6 times its diameter; this is essential when handling liquids above 49°C (120°F). Armstrong suction guides may be used in place of a 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 the 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: A

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 Series 4392 close-coupled pumps, as there is no shaft coupling.

5. ELECTRICAL

- The motor shall be connected and operated in accordance with the motor manufacturers instructions. It shall be earthed efficiently to the requirements of BS 7671:1992 and be equipped with suitable starter gear.
- 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).

OPERATION A

6. STARTING PUMP

- Ensure that 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 with liquid and rotate the shaft by hand to remove any air.
- Energize the motor momentarily and check 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)
- 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: A

Check the direction of rotation against the rotation arrow prior to operating the unit.

7. GENERAL CARE

- Series 4392 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 40ºC/100ºF).

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.

8. LUBRICATION

Pump

- Lubrication is not required. There are no bearings in the pump that need external lubrication service.

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.
- 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.

9. SYSTEM CLEANLINESS

- Before starting pump the 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: A

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.

ARMSTRONG

FAULT FINDING CHART

Symptoms	Reasons
Pump fails to deliver	• Pump not primed. • Suction line not filled. • Air or vapour pocket in suction line. • Inlet of suction pipe insufficiently submerged. • N.P.S.H. available too low. • Suction lift too high. • Air leaks in suction line, seal or pump joints. • Blocked suction. • Incorrect rotation. • Speed too low. • Total system head higher than that of the pump.
Pump vibrates	• Misalignment. • Air or vapour pocket in suction line. • Inlet of suction pipe insufficiently submerged. • N.P.S.H. available too low. • Suction lift too high. • Blocked suction. • Impeller damaged. • Misalignment of pipework. • Operation at low capacity. • Rotating element out of balance. • Shaft bent. • Poor foundations.
Seal leaks or fails	• Misalignment. • Impurities in water. • Entrained air. • Cavitation. • Water treatment not allowed for.
Low delivery rate	• Air or vapour pocket in suction line. • Inlet of suction pipe insufficiently submerged. • N.P.S.H. available too low. • Suction lift too high. • Air leaks in suction line, seal or pump joints. • Blocked suction. • Incorrect rotation. • Speed too low. • Excessive system friction. • Impeller damaged.
Insufficient pressure	• Incorrect rotation. • Speed too low. • Excessive system friction. • Impeller damaged.
Pump delivery fails after start	• Suction line not filled. • Air or vapour pocket in suction line. • Inlet of suction pipe insufficiently submerged. • N.P.S.H. available too low. • Suction lift too high. • Air leaks in suction line, seal or pump joints. • Blocked suction. • Impeller damaged.
Pump seized	• Pump not primed. • Misalignment of pipework. • Operation at low capacity.
Pump does not prime	• Pump not primed. • Inlet of suction pipe insufficiently submerged. • Suction lift too high. • Blocked suction. • Incorrect rotation.
Pump noisy	• Misalignment. • Air or vapour pocket in suction line. • Inlet of suction pipe insufficiently submerged. • N.P.S.H. available too low. • Air leaks in suction line, seal or pump joints. • Blocked suction. • Impeller damaged. • Operation at low capacity. • Rotating element out of balance. • Shaft bent. Poor foundations. • Operation at high capacity.
Motor overloading Motor overheating	• Misalignment. • Speed too high. • Low system friction. • Pumped liquid density is greater than anticipated..

Armstrong Holden Brooke Pullen
Wenlock Way
Manchester
United Kingdom, M12 5JL
T: +44 (0) 161 223 2223
F: +44 (0) 161 220 9660

Sales & Service Office
21 Ormside Way
Holmethorpe Industrial Estate
Redhill, Surrey, RH1 2NT
T: +44 (0)173 737 8100
F: +44 (0)173 737 8140

S. A. Armstrong Limited
Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
T: (416) 755-2291
F: (416) 759-9101