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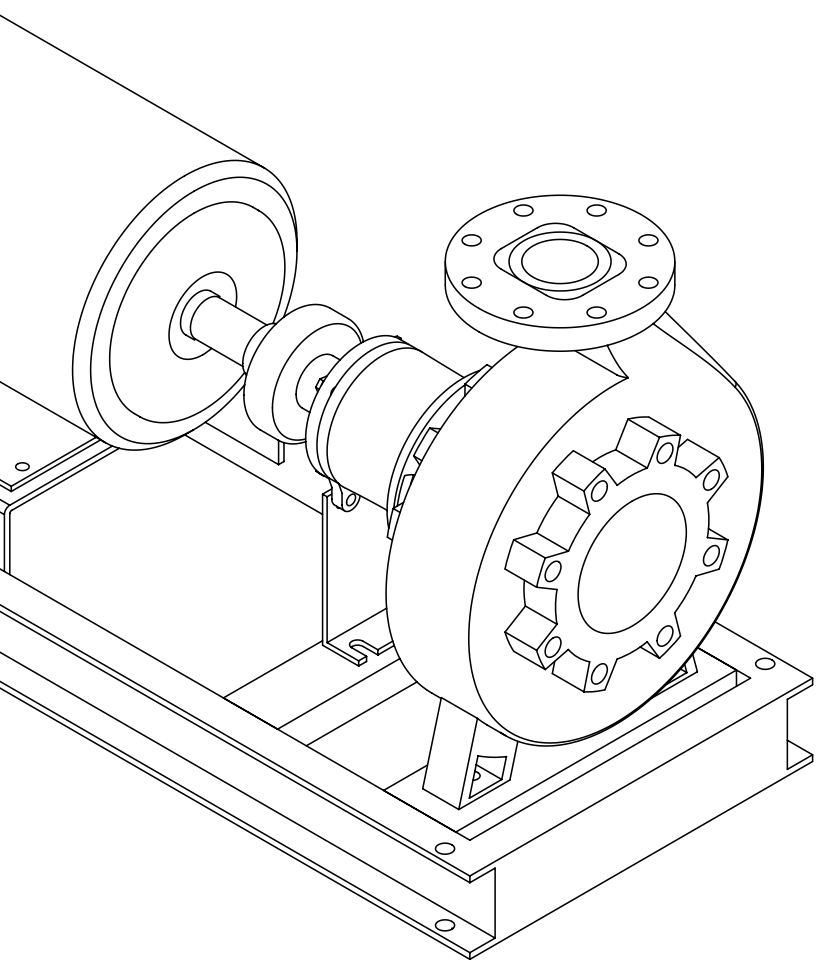

Series 4030

Base mounted pump

Installation and operating instructions

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CONTENTS

GENERAL

Armstrong Centrifugal Pumps, properly installed and given reasonable care and maintenance, will perform satisfactorily for a long period of time. These instructions describe the procedures which should be followed to ensure trouble-free operation. All work should be performed by qualified personnel.

INSPECTION

Armstrong series 4030 Base Mounted pumps are thoroughly tested and inspected before shipment to assure they meet with your order requirements. All units must be carefully examined upon arrival for possible damage during transit. Any evidence of mishandling should be reported immediately to the carrier and noted on the freight bill.

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 - SERIES 4030 BASE MOUNTED PUMP

1.0 LOCATION

Locate the unit as close as practical to the liquid being pumped, with a short, direct suction pipe. Ensure adequate space is left around the unit for operation, maintenance, service and inspection of parts.

Electric motor driven pumps should not be located in damp or dusty location without special protection.

2.0 STORAGE

Pumps not immediately placed into service, or removed from service and stored, must be properly prepared to prevent rusting and bearing damage.

Bearings protected by oil or grease must be rotated every two to three months to return the lubricant to the upper half of the bearing and prevent ball damage. Do not leave shaft in same position each time.

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.

3.0 FOUNDATION AND MOUNTING

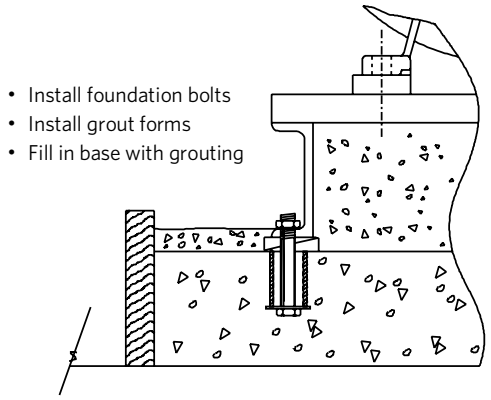
- The following text and illustrations are offered as general suggestions for the preparation of a satisfactory foundation.
- Foundation should be sufficiently substantial to absorb any vibration and permanently support the baseplate at all points. This is essential in maintaining the alignment of a direct coupled unit.
- The most satisfactory foundations are made of reinforced concrete and should be at least 2.5 times the shipping weight of the pumping unit. The foundation should be poured well in advance of the installation to allow proper time for drying and curing.
- Foundation bolts of suitable size should be embedded in the concrete located by a drawing or template. Pipe sleeves, 2.5 times the size of the anchor bolts, should be embedded in the concrete, to permit adjustment of the bolts after the concrete has been poured.
- If the unit is to be mounted on fabricated steel work or similar structure, the unit should be set over, or as near as possible to, the supporting beams or walls and to be so supported that the baseplate cannot be distorted nor the alignment disturbed by any yielding or springing of the structure or base.
- When lifting any base mounted pumping unit ensure the unit is **Not** lifted by straps placed under the coupling, pump or motor. The (4) corner holes should be used as a minimum. All (6) holes can be used on larger bases. Secure evenly spaced straps placed under the baseplate is also acceptable for lifting the entire unit.
- When the unit has been placed on the foundation, disconnect the coupling. Do not re-connect the coupling until after the unit has been piped, finally aligned and checked for correct direction of rotation.
- Place pumping unit on the foundation and insert metal wedges on either side of the foundation bolts under base plate. Leave approximately ¾" (19mm) space if grouting.
- Carefully level the unit by adjusting the wedges until shafts of pump and driver are leveled.
- With the proper gauge, check coupling faces and suction and discharge flanges of the pump for vertical position.
- Slight misalignment at this point may be corrected by adjusting the wedges.

- When the baseplate is completely level, the foundation bolts should be tightened evenly and firmly.
- After unit has been in operation for about a week, check the leveling. Any misalignment may be corrected by placing shims between base and driver or pump feet.

4.0 GROUTING

Armstrong's fabricated steel base plate is manufactured to ANSI/HI 1.3.5 rigidity standards for free-standing base plates. As such, no grouting in place is necessary for the base plate to hold shaft alignment. The following instructions are for installers who wish to also secure the base in place with grout:

- Construct a dam around the foundation with grout forms, as shown in the illustration.
- Use a good mixture of non-shrinking grout. The grout should be the consistency of heavy cream.
- Spaces are provided in the base plate to permit pouring of the cement and stirring. Fill under the base completely, stirring to assure proper distribution of the grout. Check to see that the grout flows under the base plate evenly.
- When the grout has hardened thoroughly, usually after 48 hours, final tighten the anchor bolts and remove the grout forms.



5.0 PUMP PIPING - GENERAL

Never connect a pump to piping, always start piping from pump.

Use as few bends as possible and preferably long radius elbows.

Install good supports under suction and discharge piping with anchors near but independent of the pump.

Make sure piping exerts no strain on pump as this would distort the casing and cause pump misalignment.

Suction and discharge pipes may be increased at pump nozzle to suit pump capacity and particular conditions of installation. Use eccentric reducers on suction connection.

Lay out 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.

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. ⅛"(3mm) diameter perforations in the strainer are typical.

Test suction line for air leaks before starting; this becomes essential with long suction line or static lift.

Install, at 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 isolation valve(s) in both suction and discharge lines on flooded suction application; this is used mainly to isolate the pump for inspection or repair

Install a non-slam 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. Armstrong Flo-Trex valve may be used in place of check valve and isolation valve on pump discharge.

CAUTION

Discharge valve only must be used to reduce the 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.

6.0 ALIGNMENT

The pumping unit is accurately aligned at the factory prior to being shipped. All baseplates are flexible to some extent and should not be relied upon to maintain factory alignment.

NOTE: Shipping, handling, uneven foundations, and pipe loads may disrupt the factory alignment.

Alignment should be checked as follows:

A After the unit has been set level on the foundation.

B After the pipes have been connected.

Accurate alignment is absolutely essential. Proper mechanical operation of the equipment cannot be guaranteed unless the factory alignment is reproduced in the field. All alignment should be made by moving or shimming the motor.

6.1 SUREFLEX COUPLING

The below instructions should be following to put back the coupling during the alignment process:

- Position the hubs on the shafts to approximately achieve the G1 dimension shown in **TABLE 1** , with an equal length of shaft extending into each flange. Note: minimum shaft engagement is 0.85 * shaft diameter. Tighten set screw(s) of one flange to values in **TABLE 2** using a torque wrench.
- Slide back the unfastened flange and install the sleeve. The sleeve should be seated against both flanges but not compressed. When using a two-piece sleeve, do not install the wire ring yet but let it hang loosely in the groove adjacent to the teeth. Tighten set screw(s) of the second flange to values in **TABLE 2** using a torque wrench.

FIGURE 1

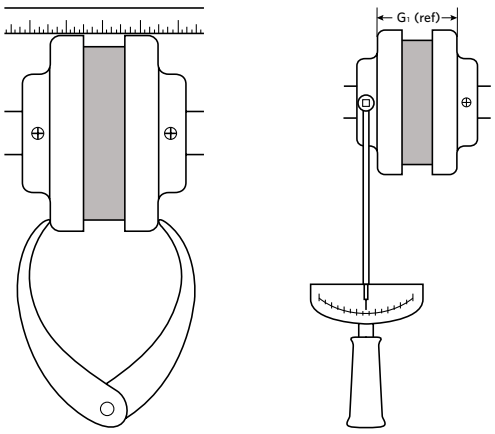


TABLE 1: Maximum Allowable Misalignment

MATERIAL	SLEEVE SIZE - TYPE	G1 (REF)		PARALLEL		ANGULAR	
		in	mm	in	mm	in	mm
EPDM	3-JE	1.2	30	0.010	0.25	0.035	0.89
	4-JE	1.5	38	0.010	0.25	0.043	1.09
	5-JE	1.9	49	0.015	0.38	0.056	1.42
	6-JE	2.4	60	0.015	0.38	0.070	1.78
	7-JE	2.6	65	0.020	0.51	0.081	2.06
	8-JE	2.9	75	0.020	0.51	0.094	2.39
	9-E	3.5	89	0.025	0.64	0.109	2.80
	10-E	4.1	103	0.025	0.64	0.128	3.21
	11-E	4.9	124	0.032	0.81	0.151	3.89
	12-E	5.7	145	0.032	0.81	0.175	4.44
	13-E	6.6	170	0.040	1.02	0.195	4.95
Hytrel	8-HS	2.9	75	0.015	0.38	0.025	0.64
	9-HS	3.5	89	0.017	0.43	0.028	0.71
	10-HS	4.1	103	0.020	0.51	0.032	0.81

*HS sleeves should not be used as replacements for EPDM Sleeves

NOTE: When using a VFD with a centrifugal pump or fan, reduce allowable parallel and angular alignment values by half

Parallel Alignment: Without rotating the coupling, run a straight-edge around the outside of the coupling flanges – see **FIGURE 1.** Find the maximum offset with feeler gauges; this measurement must not exceed the figure shown under **Parallel** in **TABLE 1**. If necessary, realign the shafts.

Angular Alignment: Without rotating the coupling, run a caliper around the outside of the flange faces just inboard of the OD – see **FIGURE 1**. Set the caliper to the widest point. Find the narrowest point with the caliper and feeler gauges; this measurement must not exceed the figure given under **Angular** in **TABLE 1**. If a correction is necessary, recheck parallel alignment.

TABLE 2: Fastener Torque Values
(Highligted cells are flange sizes used by Armstrong)

Size	Type J		Type S		Type SC*				Type B	
	Set Screws		Set Screws		Cap Screws Flange to Hub		Set Screws		Set Screws	
	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm
3	3	4	–	–	–	–	–	–	–	–
4	3	4	–	–	5.5**	8**	7	10	–	–
5	7	10	7	10	4	6	13	18	–	–
6	13	18	13	18	9	12	13	18	5	7
7	–	–	13	18	9	12	13	18	5	7
8	–	–	23	31	18	24	23	31	9	12
9	–	–	23	31	31	42	23	31	9	12
10	–	–	23	31	50	68	50	68	15	20
11	–	–	23	31	75	102	50	68	30	41
12	–	–	50	68	150	203	100	136	60	81
13	–	–	100	136	150	203	165	226	75	102

* Torque values apply to hub size when different than flange size
** Values for socket head clamping screw

6.2 DURAFLEX COUPLING

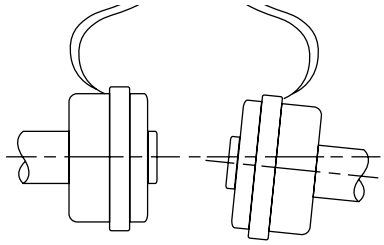
The below instructions should be following to put back the coupling during the alignment process:

1. Inspect all coupling components and remove any protective coatings, lubricants, paint or rust from bores, mating surfaces and fasteners. Remove any existing burrs, etc. from the shafts.
2. Slide one hub onto each shaft using keys where required. (When using QD or Taper-Lock hubs, follow the instructions furnished with the Sure- Grip or Taper-Lock bushings.)
3. When high speed rings are to be used for spacer couplings, loosely install one ring on each half element.
4. Hold one half element on the hubs to determine the appropriate hub spacing. If using spacer elements with high speed rings, hold both half elements on hubs to make sure that the hubs do not interfere with the rings. The hub may be installed with the hub extension facing in or out. Make sure that the shaft extends into the hubs at least 0.8 times the shaft diameter.

5 Lightly fasten hubs to shafts to prevent them from moving during alignment.

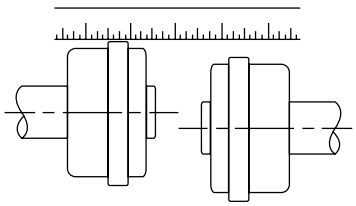
6 **Angular Alignment:** Without rotating the coupling, run a caliper around the hub and set the caliper to the widest point. Find the narrowest point with the caliper and feeler gauges. Reposition equipment until this value is as small as possible; reference **TABLE 3** for maximum value/degree.

ANGULAR ALIGNMENT



7 **Parallel Alignment:** Using the misalignment value from the previous step, look up the maximum allowable parallel misalignment using **TABLE 3** and **FIGURE 2**. Without rotating the shafts, run a straight-edge around the hub and find the maximum offset with feeler gauges. If necessary, realign the shafts. Recheck parallel alignment.

PARALLEL ALIGNMENT



8 Tighten motor and driven equipment fasteners to manufacturer specifications; recheck parallel and angular alignment.

9 When parallel and angular alignment values are within service ratings, verify that all set screws, cap screws and other fasteners are tightened to values in **TABLE 4**. Recheck parallel and angular alignment after tightening.

10 Install coupling guard per applicable safety regulations.

11 Periodically check alignment, as settling will often change equipment position.

FIGURE 2

PARALLEL GAP

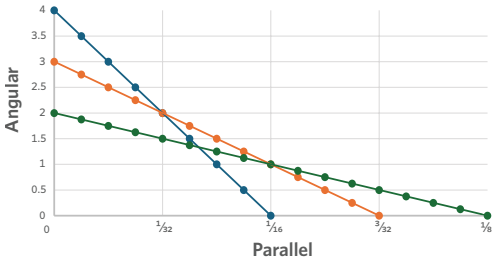


TABLE 3: Angular Misalignment

Hub Size		Degrees			
		1°	2°	3°	4°
WE2/WES2	in	0.03	0.07	0.10	0.13
	mm	0.80	1.70	2.50	3.30
WE3/WES3	in	0.04	0.08	0.12	0.16
	mm	1.00	2.10	3.10	4.10
WE4/WES4	in	0.05	0.09	0.14	0.18
	mm	1.10	2.30	3.50	4.60
WE5/WES5	in	0.06	0.11	0.16	0.22
	mm	1.40	2.80	4.20	5.50
WE10/WES10	in	0.06	0.13	0.19	0.22
	mm	1.60	3.20	4.90	5.50
WE20/WES20	in	0.08	0.16	0.23	
	mm	2.00	4.00	5.90	
WE30/WES30	in	0.10	0.19	0.28	
	mm	2.40	4.80	7.20	
WE40/WES40	in	0.12	0.23	0.35	
	mm	2.90	5.90	8.80	
WE50/WES50	in	0.14	0.28	0.43	
	mm	3.60	7.20	10.80	
WE60/WES60	in	0.15	0.31		
	mm	3.90	7.70		
WE70/WES70	in	0.16	0.32		
	mm	4.10	8.20		
WE80/WES80	in	0.20	0.39		
	mm	5.00	10.00		

TABLE 4: Fastener Torque Values

Size	Tightening Torque -Dry			Screw Size
	(lb-in)	(lb-ft)	Nm	(in)
WE2/WES2	204	17	23	¼–20
WE3/WES3	204	17	23	¼–20
WE4/WES4	204	17	23	¼–20
WE5/WES5	204	17	23	¼–20
WE10/WES10	204	17	23	¼–20
WE20/WES20	360	30	40	⅜–16
WE30/WES30	360	30	40	⅜–16
WE40/WES40	360	30	40	⅜–16
WE50/WES50	360	30	40	⅜–16
WE60/WES30	900	75	100	½–13
WE70/WES70	900	75	100	½–13
WE80/WES80	900	75	100	½–13

6.3 OMEGA COUPLING

The below instructions should be following to put back the coupling during the alignment process:

STEP 1

1 Clean dirt and burrs from shafts and hub bores.

2 Be sure the keys fit shafts properly.

3 Position both hubs on the shaft without tightening the set screws.
4 Use a half element to set proper hub spacing.
5 When the hubs are properly spaced, tighten the set screws.
6 When using tapered bushings, follow bushing manufacturer's instructions.

STEP 2

7 Mount first half element to the hubs using cap screws provided.
8 Rotate the shaft 180° and secure second half element.
9 If shaft cannot be rotated, mount half elements at 90°.

STEP 3

10 Tighten all cap screws to the torques specified in **TABLE 6**.
11 Align equipment.
12 Install proper guarding prior to equipment start-up.

CAUTION

When installing the element, first snug all the cap screws with a light torque, then tighten all cap screws to proper torque using a torque wrench.

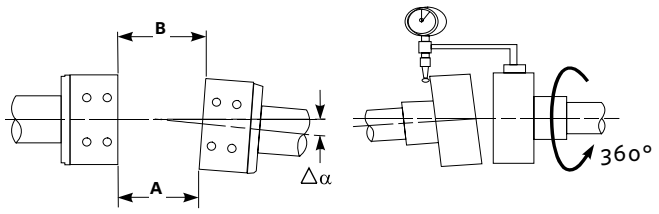
FIGURE 3

DRIVE ALIGNMENT

DANGER

Stop the motor and lock it out to prevent start-up during installation of coupling.

STEP 1



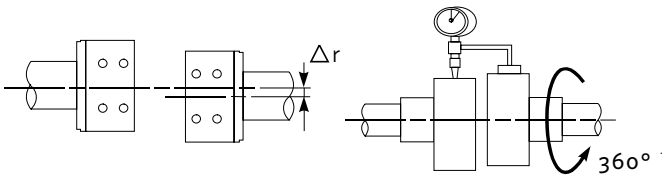
b (max) _____ in

a (min) _____ in

ΔKa = (b-a)

ΔKa = _____

STEP 2



ΔKr _____ in

CAUTION

Improper alignment of the equipment or hubs may result in hub contact and sparking.

STEP 3

$$\frac{\Delta Ka}{\Delta Ka\ max} + \frac{\Delta Kr}{\Delta Kr\ max} \leq 1$$

ΔKa — refer to **STEP 1**
ΔKr — refer to **STEP 2**
ΔKa max & ΔKr max — refer to **TABLE 5**

TABLE 5: Maximum allowable misalignment

Coupling Size (E & ES)	Parallel (ΔKr max)	Angular (ΔKa max)
2	0.06	0.13
3	0.06	0.16
4	0.06	0.18
5	0.06	0.22
10	0.06	0.25
20	0.09	0.23
30	0.09	0.28
40	0.09	0.35
50	0.09	0.42
60	0.13	0.31
70	0.13	0.32
80	0.13	0.39

Cap Screw Torque

1 Do not lubricate cap screw threads.
2 Cap screws must have a thread-locking adhesive applied.
3 Tighten cap screws by using torque wrench.

CAUTION

Do not lubricate cap screw threads.

TABLE 6: Cap Screw Torque

Size	Qty	Tightening Torque -Dry			Size (in)	Wrench Size
		(lb-in)	(lb-ft)	Nm		
2	8 + 8*	204	17	23	¼–20 × ⅜"	7/16"
3	8 + 8**	204	17	23	¼–20 × ½"	
4	8 + 8**	204	17	23	¼–20 × ½"	
5	8 + 8**	204	17	23	¼–20 × ½"	
10	12 + 12**	204	17	23	¼–20 × ½"	
20	12	360	30	40	⅜–16 × ⅝"	9/16"
30	12	360	30	40	⅜–16 × ⅝"	
40	16	360	30	40	⅜–16 × ⅝"	
50	16	360	30	40	⅜–16 × ⅝"	
60	16	900	75	100	½–13 × ⅞"	¾"
70	16	900	75	100	½–13 × ⅞"	
80	16	900	75	100	½–13 × ⅞"	

NOTE:

* Cap screws have self-locking patches which should not be lubricated or reused more than twice.

** Extra cap screws provided for spacer couplings with rings.

The flexible coupling compensates for temperature changes and permits end movement of shafts without them interfering with each other; it will not compensate for misalignment. Faulty alignment will result in noisy pump operation, reduced bearing life, excessive coupling wear and wasted power.

CAUTION

Be sure to reinstall any temporarily removed coupling guards, prior to starting the pumping unit.

OPERATION - SERIES 4030 BASE MOUNTED PUMP

7.0 STARTING PUMP

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. Air trapped in the casing is automatically vented through the top centre line discharge.

When the piping is connected correctly and the final alignment completed, re-connect the coupling and reinstall the coupling guard.

'Bump' or energize the motor for a fraction of a second 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.

CAUTION

Centrifugal pump rotation is generally 'clockwise' when viewing from the drive end.

Check rotation arrow prior to operating the unit.

8.0 GENERAL CARE

Base Mounted pumps are built to operate without periodic maintenance with the exception of lubrication of motor bearings, if required. A systematic inspection made at regular intervals, giving special attention to the following, will ensure years of trouble-free operation.

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. Generally (Above 100°F(40°C)).

If mechanical seal environmental accessories are installed, ensure water is flowing through the sight flow indicator and that filter cartridges are replaced as recommended.

WARNING

Whenever any service work is to be performed on pumping unit, disconnect power source to driver.

Any possibility of the unit starting while being worked on, must be eliminated.

9.0 LUBRICATION

PUMP

Series 4030 pumps are supplied, as standard, with maintenance free, sealed for life, grease lubricated bearings. Site regreasing is not required.

If re-greasable bearing were ordered: Grease lubricated bearings require very little attention. More trouble can be caused by overcharging than undercharging with grease.

Approximately every four months, inject a small quantity of grease (while the pump is running) EXXON MP type H or equal lithium based petroleum grease as follows:

A Remove relief hole plug.

B Inject grease at grease fitting.

C Fill until new grease is visible at relief hole.

If Oil lubricated bearings were ordered: Use non-detergent ISO viscosity grade 150 oil, similar to Teresso/Teresstic 150 or Morlina/Tellus 150. Before start-up, check to make sure the oil level is within 0.125"(3mm) of the top of the oil sight glass. Under normal operating conditions, the oil should be changed every six months as follows:

A Drain the old oil from the bearing bracket through the drain hole at the bottom of the housing.

B Thoroughly flush the bearing bracket with kerosene.

C Refill the clean oil through the vent on the top of the bracket until the oil level reaches within 0.125" (3mm) of the top of the oil sight glass.

CAUTION

Oil lube pumps are not shipped with oil (unless Certified test specified) and must be filled prior to Operation

Do not oil bearing assembly while the pump is Running.

MOTOR

Follow the lubrication procedures recommended by the motor manufacturer. Many small and medium sized motors are permanently lubricated, particularly at the coupling end bearing.

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. Seal environmental controls, installed in the flush lines, such as filters and separators, 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.

10.0 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 any of these conditions are allowed to exist.

NOTE

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

A Coupling guard installed?

B Pump primed?

C Alignment correct?

D Rotation OK?

E Lubrication OK?

F Pipe work properly supported?

G Voltage supply OK?

H Overload protection OK?

I Is the system clean?

J Is the area around the pump clean?

WARRANTY

Refer to Armstrong General Terms and Warranty sheet. Contact your local Armstrong representative for full information.

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