



USER INSTRUCTIONS

T-series Thrust Bearing Pot

Thrust bearing pots for vertical wet pit pumps

PCN=26999907 01-2013 (E). Original instructions.

***Installation
Operation
Maintenance***



***These instructions must be read prior to installing,
operating, using and maintaining this equipment.***

Experience In Motion

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1 INTRODUCTION AND SAFETY

1.1 General



These Instructions must always be kept close to the product's operating location or directly with the product.

Flowserve products are designed, developed and manufactured with state-of-the-art technologies in modern facilities. The unit is produced with great care and commitment to continuous quality control, utilising sophisticated quality techniques and safety requirements.

Flowserve is committed to continuous quality improvement and being at service for any further information about the product in its installation and operation or about its support products, repair and diagnostic services.

These instructions are intended to facilitate familiarization with the product and its permitted use. Operating the product in compliance with these instructions is important to help ensure reliability in service and avoid risks. The instructions may not take into account local regulations; ensure such regulations are observed by all, including those installing the product. Always coordinate repair activity with operations personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.



These instructions must be read prior to installing, operating, using and maintaining the equipment in any region worldwide. The equipment must not be put into service until all the conditions relating to safety, noted in the instructions, have been met. Failure to follow and apply the present user instructions is considered to be misuse. Personal injury, product damage, delay or failure caused by misuse are not covered by the Flowserve warranty.

1.2 CE marking and approvals

It is a legal requirement that machinery and equipment put into service within certain regions of the world shall conform with the applicable CE Marking Directives covering Machinery and, where applicable, Low Voltage Equipment, Electromagnetic Compatibility (EMC), Pressure Equipment Directive (PED) and Equipment for Potentially Explosive Atmospheres (ATEX).

Where applicable, the Directives and any additional Approvals, cover important safety aspects relating to machinery and equipment and the satisfactory provision of technical documents and safety instructions. Where applicable this document incorporates information relevant to these Directives and Approvals.

To confirm the Approvals applying and if the product is CE marked, check the serial number plate markings and the Certification. (See section 9, *Certification*.)

1.3 Disclaimer

Information in these User Instructions is believed to be complete and reliable. However, in spite of all of the efforts of Flowserve Corporation to provide comprehensive instructions, good engineering and safety practice should always be used.

Flowserve manufactures products to exacting International Quality Management System Standards as certified and audited by external Quality Assurance organisations. Genuine parts and accessories have been designed, tested and incorporated into the products to help ensure their continued product quality and performance in use. As Flowserve cannot test parts and accessories sourced from other vendors the incorrect incorporation of such parts and accessories may adversely affect the performance and safety features of the products. The failure to properly select, install or use authorised Flowserve parts and accessories is considered to be misuse. Damage or failure caused by misuse is not covered by the Flowserve warranty. In addition, any modification of Flowserve products or removal of original components may impair the safety of these products in their use.

1.4 Copyright

All rights reserved. No part of these instructions may be reproduced, stored in a retrieval system or transmitted in any form or by any means without prior permission of Flowserve.

1.5 Duty conditions

This product has been selected to meet the specifications of your purchaser order. The acknowledgement of these conditions has been sent separately to the Purchaser. A copy should be kept with these instructions.



The product must not be operated beyond the parameters specified for the application. If there is any doubt as to the suitability of the

product for the application intended, contact Flowserve for advice, quoting the serial number.

If the conditions of service on your purchase order are going to be changed (for example liquid pumped, temperature or duty) it is requested that the user seeks the written agreement of Flowserve before start up.

1.6 Safety

1.6.1 Summary of safety markings

These User Instructions contain specific safety markings where non-observance of an instruction would cause hazards. The specific safety markings are:



DANGER This symbol indicates electrical safety instructions where non-compliance will involve a high risk to personal safety or the loss of life.



This symbol indicates safety instructions where non-compliance would affect personal safety and could result in loss of life.



This symbol indicates "hazardous and toxic fluid" safety instructions where non-compliance would affect personal safety and could result in loss of life.



CAUTION This symbol indicates safety instructions where non-compliance will involve some risk to safe operation and personal safety and would damage the equipment or property.



This symbol indicates explosive atmosphere zone marking according to ATEX. It is used in safety instructions where non-compliance in the hazardous area would cause the risk of an explosion.



This symbol is used in safety instructions to remind not to rub non-metallic surfaces with a dry cloth; ensure the cloth is damp. It is used in safety instructions where non-compliance in the hazardous area would cause the risk of an explosion.



Note: This sign is not a safety symbol but indicates an important instruction in the assembly process.

1.6.2 Personnel qualification and training

All personnel involved in the operation, installation, inspection and maintenance of the unit must be qualified to carry out the work involved. If the

personnel in question do not already possess the necessary knowledge and skill, appropriate training and instruction must be provided. If required the operator may commission the manufacturer/supplier to provide applicable training.

Always coordinate repair activity with operations and health and safety personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

1.6.3 Safety action

This is a summary of conditions and actions to help prevent injury to personnel and damage to the environment and to equipment. For products used in potentially explosive atmospheres section 1.6.4 also applies.



DANGER NEVER DO MAINTENANCE WORK WHEN THE UNIT IS CONNECTED TO POWER



GUARDS MUST NOT BE REMOVED WHILE THE UNIT IS OPERATIONAL



DRAIN THE UNIT AND ISOLATE PIPEWORK BEFORE DISMANTLING THE UNIT
The appropriate safety precautions should be taken where the pumped liquids are hazardous.



FLUORO-ELASTOMERS (When fitted.)
When a unit has experienced temperatures over 250 °C (482 °F), partial decomposition of fluoro-elastomers (example: Viton) will occur. In this condition these are extremely dangerous and skin contact must be avoided.



HANDLING COMPONENTS
Many precision parts have sharp corners and the wearing of appropriate safety gloves and equipment is required when handling these components. To lift heavy pieces above 25 kg (55 lb) use a crane appropriate for the mass and in accordance with current local regulations.



THERMAL SHOCK
Rapid changes in the temperature of the liquid within the unit can cause thermal shock, which can result in damage or breakage of components and should be avoided.



HOT (and cold) PARTS
If hot or freezing components or auxiliary heating supplies can present a danger to operators and persons entering the immediate area action must be taken to avoid accidental contact. If complete protection is not possible, the machine access must

be limited to maintenance staff only, with clear visual warnings and indicators to those entering the immediate area. Note: bearing housings must not be insulated and drive motors and bearings may be hot.

If the temperature is greater than 80 °C (175 °F) or below -5 °C (23 °F) in a restricted zone, or exceeds local regulations, action as above shall be taken.



HAZARDOUS LIQUIDS

When the pump is handling hazardous liquids care must be taken to avoid exposure to the liquid by appropriate siting of the pump, limiting personnel access and by operator training. If the liquid is flammable and/or explosive, strict safety procedures must be applied.



CAUTION ENSURE CORRECT

LUBRICATION

(See section 5, *Commissioning, startup, operation and shutdown.*)

1.6.4 Products used in potentially explosive atmospheres



Measures are required to:

- Avoid excess temperature
- Prevent build up of explosive mixtures
- Prevent the generation of sparks
- Prevent leakages
- Maintain the unit to avoid hazard

The following instructions for pump units when installed in potentially explosive atmospheres must be followed to help ensure explosion protection. For ATEX, both electrical and non-electrical equipment must meet the requirements of European Directive 94/9/EC. Always observe the regional legal Ex requirements eg Ex electrical items outside the EU may be required certified to other than ATEX eg IECEx, UL.

1.6.4.1 Scope of compliance



Use equipment only in the zone for which it is appropriate. Always check that the driver, drive coupling assembly, seal and pump equipment are suitably rated and/or certified for the classification of the specific atmosphere in which they are to be installed.

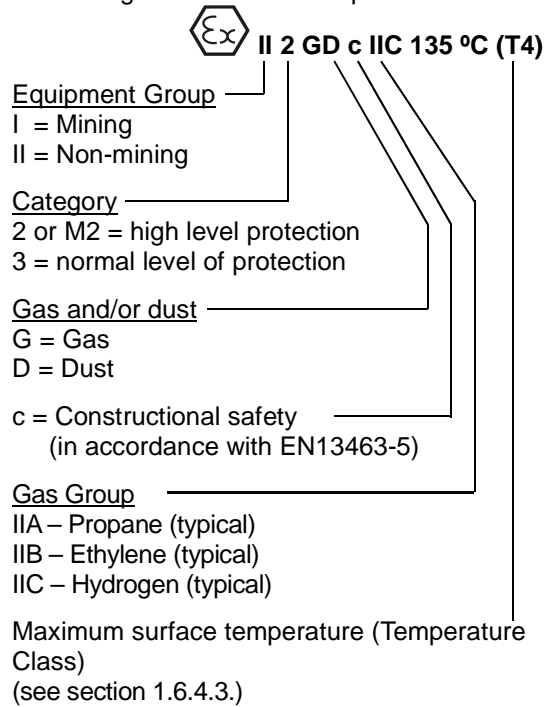
Where Flowserve has supplied only the bare shaft pump unit, the Ex rating applies only to the pump

unit. The party responsible for assembling the ATEX pump set shall select the coupling, driver and any additional equipment, with the necessary CE Certificate/ Declaration of Conformity establishing it is suitable for the area in which it is to be installed.

The output from a variable frequency drive (VFD) can cause additional heating affects in the motor and so, for pumps sets with a VFD, the ATEX Certification for the motor must state that it covers the situation where electrical supply is from the VFD. This particular requirement still applies even if the VFD is in a safe area.

1.6.4.2 Marking

An example of ATEX equipment marking is shown below. The actual classification of the pump unit will be engraved on the nameplate.



1.6.4.3 Avoiding excessive surface temperatures



ENSURE THE EQUIPMENT TEMPERATURE CLASS IS SUITABLE FOR THE HAZARD ZONE

Units have a temperature class as stated in the ATEX Ex rating on the nameplate. These are based on a maximum ambient of 40 °C (104 °F); refer to Flowserve for higher ambient temperatures.

The surface temperature on the unit is influenced by the temperature of the liquid handled. The

maximum permissible liquid temperature depends on the temperature class and must not exceed the values in the table that follows.

Temperature class to EN13463-1	Maximum surface temperature permitted	Temperature limit of liquid handled *
T6	85 °C (185 °F)	65 °C (149 °F) *
T5	100 °C (212 °F)	80 °C (176 °F) *
T4	135 °C (275 °F)	115 °C (239 °F)
T3	200 °C (392 °F)	180 °C (356 °F)
T2	300 °C (572 °F)	275 °C (527 °F)
T1	450 °C (842 °F)	400 °C (752 °F)

* The table only takes the ATEX temperature class into consideration. Unit design or material, as well as component design or material, may further limit the maximum working temperature of the liquid.

The temperature rise at the seals and bearings and due to the minimum permitted flow rate is taken into account in the temperatures stated.

The responsibility for compliance with the specified maximum liquid temperature is with the plant operator.

Temperature classification “Tx” is used when the liquid temperature varies and the unit could be installed in different hazardous atmospheres. In this case the user is responsible for ensuring that the unit surface temperature does not exceed that permitted in the particular hazardous atmosphere.

If an explosive atmosphere exists during the installation, do not attempt to check the direction of rotation by starting the unit unfilled. Even a short run time may give a high temperature resulting from contact between rotating and stationary components.

Avoid mechanical, hydraulic or electrical overload by using motor overload trips, temperature monitor or a power monitor and make routine vibration monitoring checks.

In dirty or dusty environments, make regular checks and remove dirt from areas around close clearances, bearing housings and motors.

1.6.4.4 Preventing the build up of explosive mixtures



ENSURE THE UNIT IS PROPERLY FILLED AND VENTED AND DOES NOT RUN DRY

It is essential to make sure that seal chambers, auxiliary shaft seal systems and any heating and cooling systems are properly filled.

1.6.4.5 Preventing sparks



To prevent a potential hazard from mechanical contact, the coupling guard must be non-sparking.

To avoid the potential hazard from random induced current generating a spark, the baseplate must be properly grounded.



Avoid electrostatic charge: do not rub non-metallic surfaces with a dry cloth; ensure cloth is damp.

For ATEX applications the coupling must be selected to comply with 94/9/EC. Correct coupling alignment must be maintained.

Additional requirement for metallic pumps on non-metallic baseplates

When metallic components are fitted on a non-metallic base they must be individually earthed.

1.6.4.6 Preventing leakage

Bursting of liquid containing parts due to freezing must be avoided by draining or protecting the unit and ancillary systems.

Where there is the potential hazard of a loss of a seal barrier fluid or external flush, the fluid must be monitored.

If leakage of liquid to atmosphere can result in a hazard, install a liquid detection device.

1.6.4.7 Maintenance to avoid the hazard



CORRECT MAINTENANCE IS REQUIRED TO AVOID POTENTIAL HAZARDS WHICH GIVE A RISK OF EXPLOSION

The responsibility for compliance with maintenance instructions is with the plant operator.

To avoid potential explosion hazards during maintenance, the tools, cleaning and painting materials used must not give rise to sparking or adversely affect the ambient conditions. Where there is a risk from such tools or materials, maintenance must be conducted in a safe area.

It is recommended that a maintenance plan and schedule is adopted. (See section 6, *Maintenance*.)

2 TRANSPORT AND STORAGE

2.1 **Consignment receipt and unpacking**

Immediately after receipt of the equipment it must be checked against the delivery/shipping documents for its completeness and that there has been no damage in transportation. Any shortage and/or damage must be reported immediately to Flowserve Pump Division and must be received in writing within one month of receipt of the equipment. Later claims cannot be accepted.

Check any crate, boxes or wrappings for any accessories or spare parts that may be packed separately with the equipment or attached to side walls of the box or equipment.

Each product has a unique serial number. Check that this number corresponds with that advised and always quote this number in correspondence as well as when ordering spare parts or further accessories.

2.2 **Handling**

Boxes, crates, pallets or cartons may be unloaded using fork lift vehicles or slings dependent on their size and construction.

2.3 **Lifting**



A crane must be used for all pump sets and components in excess of 25 kg (55 lb.). Fully trained personnel must carry out lifting, in accordance with local regulations.

Before lifting the driver alone, refer to the manufacturer's instructions.

2.4 **Storage**



Store the unit in a clean, dry location away from vibration. Leave protective covers and plugs in place to keep dirt and other foreign material out of the unit. Turn shaft at intervals to prevent brinelling of the bearings and the seal faces, if fitted, from sticking.

The unit may be stored as above for up to 6 months. Consult Flowserve for preservative actions when a longer storage period is needed.

2.5 **Recycling and end of product life**

At the end of the service life of the product or its parts, the relevant materials and parts should be

recycled or disposed of using an environmentally acceptable method and local requirements. If the product contains substances that are harmful to the environment, these should be removed and disposed of in accordance with current regulations. This also includes the liquids and/or gases that may be used in the "seal system" or other utilities.



Make sure that hazardous substances are disposed of safely and that the correct personal protective equipment is used. The safety specifications must be in accordance with the current regulations at all times.

3 DESCRIPTION

3.1 **Configurations**

These instructions cover only rolling element type bearing thrust pots, without fan cooling, with different rolling element bearing sizes available as shown in the drawings. (See section 8.)

Thrust bearing pots are designed for vertical centrifugal pumps driven by solid shaft electric motor which have very limited capacity for taking the pump vertical thrusts without a thrust bearing pot fitted to the pump.

Installation is between the pump discharge head and the motor/pump coupling. Sufficient room should be provided between the pump discharge head and the driver, normally by a driver stool, to allow the necessary span for the installation of the thrust bearing pot and the pump/motor coupling.

Pump hydraulic thrusts, producing energy, are not transmitted to the pump foundation but are converted into heat that is absorbed by the lubrication oil for the bearings.

3.2 **Name nomenclature**

The thrust bearing pot size will be on the General Arrangement drawing for the pump.

3.3 **Design of major parts**

3.3.1 **Bearing housing**

The bearing housing [3200] allows the installation in the pump and takes the bearings themselves. It acts as the sump for the lubrication oil for the bearings and the larger sizes incorporate an integral water cooling jacket that must be used to allow adequate cooling of the bearings lubrication oil where fitted with a cooling jacket. The bearing housing incorporates ports to allow the internal

recirculation of the oil lubrication and includes an oil level gage to check the lubricant oil level.

3.3.2 Bearings

The bearings [3010 and 3011] are hydrodynamic rolling element type ball or roller bearings sized to absorb the pump vertical thrust and pump rotor weight from the centering sleeve [2470].

The thrust bearing [3010] absorbs the pump hydraulic down thrust and the pump rotor weight.

The line bearing [3011] guides the rotating components and absorbs the pump up-thrust produced at start-up in most vertical pumps.

3.3.3 Centering sleeve

The centering sleeve [2470] connects mechanically with an axial setting adjusting nut [2909], the pump rotor and the bearings.

3.3.4 Bearing cover

The Bearing cover [3260] and upper bearing housing [3210] provide sealing to the bearing housing [3200] against the atmosphere. It incorporates the oil filling connection and holds the line bearing [3011] in position.

3.3.5 Thrust axial setting adjusting nut

The axial setting control adjusting nut [2909] connects mechanically with the centering sleeve [2470], the pump rotor and the bearings. This allows control of the pump rotor axial regulation play.

3.3.6 Accessories

Accessories may be fitted when specified.

Fan cooling is not available for these designs of thrust bearing pot as a default; available designs for special requirements or applications must be consulted with Flowserve representative.

3.4 Performance and operating limits

3.4.1 Load capacity

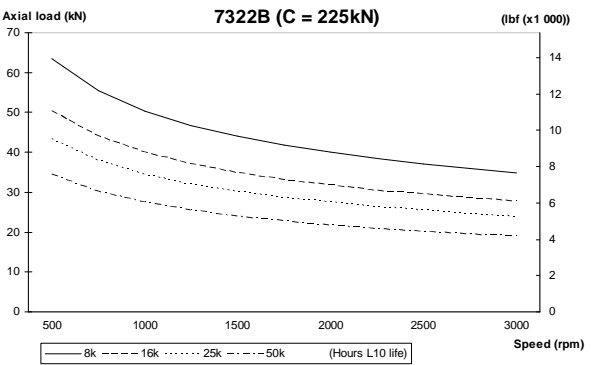
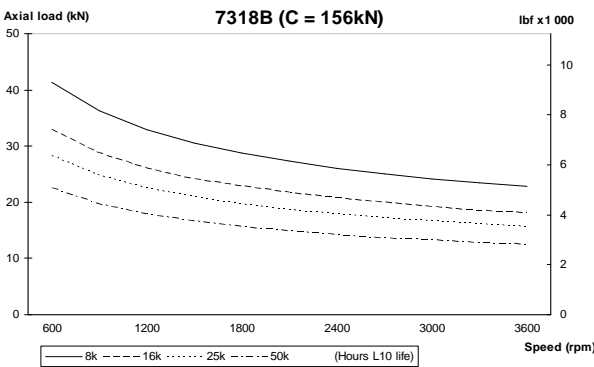
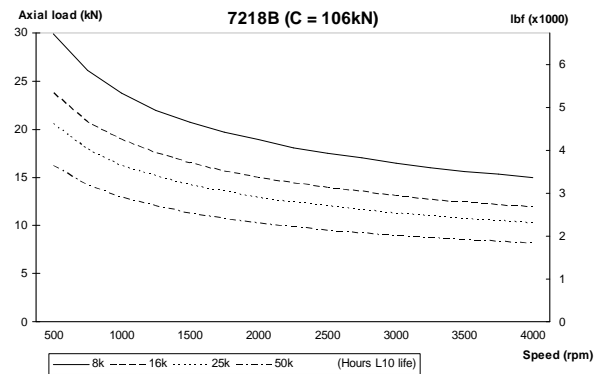
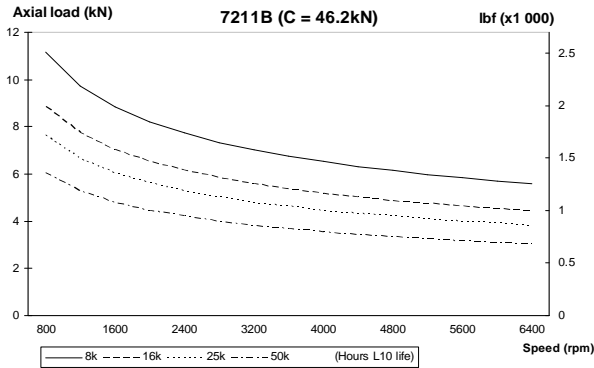
Size	Description	Load capacity		Max. speed rpm	Max. shaft dia mm (in.)	Max. torque (11 – 13 % Cr. Shaft) kNm (lbf·ft (x1 000))
		Dynamic (C)	Static (C ₀)			
		kN (lbf (x1 000))				
7211B	Single row angular contact bearing	46.2 (10.4)	28.5 (6.4)	6 450	31.8 (1.25)	0.29 (0.21)
7218B		106 (23.8)	73.5 (16.5)	4 000	57.2 (2.25)	3.48 (2.57)
7318B		156 (35.1)	114 (25.6)	3 570	57.2 (2.25)	3.48 (2.57)
7322B		225 (50.6)	193 (43.4)	2 850	69.9 (2.75)	6.90 (5.09)
7211B + 6013	Single row angular contact and radial ball bearing	46.2 (10.4)	28.5 (6.4)	6 060	31.8 (1.25)	0.29 (0.21)
7218B + 6020		106 (23.8)	73.5 (16.5)	4 000	57.2 (2.25)	3.48 (2.57)
7318B + 6022		156 (35.1)	114 (25.6)	3 570	57.2 (2.25)	3.48 (2.57)
7322B + 6028		225 (50.6)	193 (43.4)	2 850	69.9 (2.75)	6.90 (5.09)
29417 + 22217	Spherical thrust and spherical roller bearing	633 (142)	900 (202)	1 900	57.2 (2.25)	3.48 (2.57)
29420 + 22220		863 (194)	1 250 (281)	1 600	69.9 (2.75)	6.90 (5.09)
29424 + 22224		1 170 (263)	1 760 (395)	1 300	76.2 (3.0)	9.60 (7.08)

3.4.2 Maximum down thrust

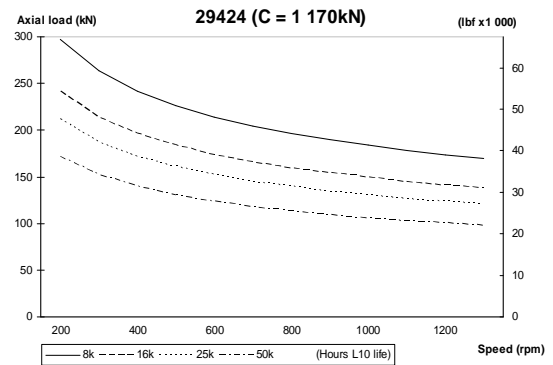
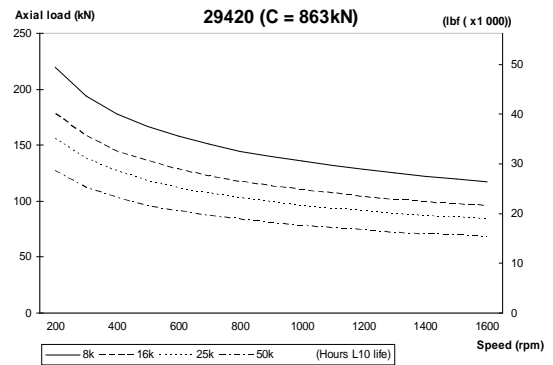
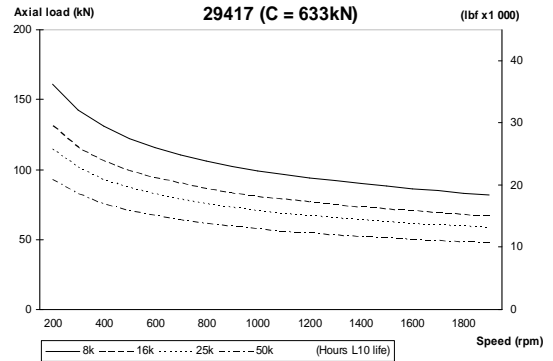
Size	Max. instant up-thrust kN (lbf (x1000))	Max down thrust for L _{10h} = 16 000 hours kN (lbf (x1 000)) @ rpm						Nett weight kg (lb)
		3 500	2 900	1 750	1 460	1 170	880	
7211B	N/A	5.4 (1.2)	5.7 (1.3)	6.8 (1.5)	7.2 (1.6)	7.8 (1.8)	8.6 (1.9)	20 (44)
7218B		12.4 (2.8)	13.2 (2.9)	15.6 (3.5)	16.6 (3.7)	17.9 (4)	19.7 (4.4)	40 (88)
7318B		18.2 (4.1)	19.4 (4.3)	23.0 (5.2)	24.4 (5.5)	26.3 (5.9)	29 (6.5)	48 (106)
7322B		28.0 (6.3)	33.2 (7.4)	35.2 (7.9)	38 (8.5)	41.8 (9.4)	50 (132)	
7211B + 6013	13.5 (3.0)	5.4 (1.2)	5.7 (1.3)	6.8 (1.5)	7.2 (1.6)	7.8 (1.8)	8.6 (1.9)	22 (49)
7218B + 6020		12.4 (2.8)	13.2 (2.9)	15.6 (3.5)	16.6 (3.7)	17.9 (4)	19.7 (4.4)	58 (128)
7318B + 6022		18.2 (4.1)	19.4 (4.3)	23.0 (5.2)	24.4 (5.5)	26.3 (5.9)	29 (6.5)	67 (148)
7322B + 6028		28.0 (6.3)	33.2 (7.4)	35.2 (7.9)	38 (8.5)	41.8 (9.4)	110 (243)	
29417 + 22217	37.4 (8.4)			68 (15)	72 (16)	77 (17)	84 (19)	86 (190)
29420 + 22220					98 (22)	105 (23)	114 (26)	276 (608)
29424 + 22224						142 (32)	155 (35)	276 (608)

3.4.3 Down-thrust ratings

3.4.3.1 7000s and 7000s + 6000s series



3.4.3.2 29000s + 22000s series



4 INSTALLATION



Equipment operated in hazardous locations must comply with the relevant explosion protection regulations. See section 1.6.4, *Products used in potentially explosive atmospheres*.

4.1 Thrust bearing pot installation

Pots are either delivered to the customer fully assembled except for the oil/cooling piping extension, or pre-installed in the pump.

Before installation remove all items from the pump discharge head.

- a) Remove any debris and thoroughly clean the surface receiving the pot with solvent. Apply a thin film of mineral oil to the surface.
- b) Remove the screws [6570.2] from the pot, the adjusting nut [2909] and the oil flinger, oil thrower [2540].
- c) Remove the key [6700.1] from the pump shaft. Thoroughly clean, with solvent if necessary, the exposed surface of the shaft and apply a thin film of mineral oil to it.
- d) Install the pot and the rest of the assembly in the pump. Take care not to damage the pump shaft during the pot installation and to properly match the alignment fits of the pump and pot.
- e) Rotate the pot assembly on its receiving surface to match up the holding holes.
- f) Install the key [6700.1]. The keyway position is reached by turning the centering sleeve [2470].
- g) Re-install the pot holding bolts.
- h) Re-install the oil flinger, oil thrower [2540].
- i) Re-install the adjusting nut [2909].
- j) Regulate the pump rotor axial play by turning, as necessary, the adjusting nut [2909].
- k) Re-install the screws [6570.2].
- l) Re-install the items removed from the discharge head and the pot piping extensions. Use Heldite or similar proprietary pipe thread sealant to seal the piping extensions, where customer practices permit PTFE based pipe sealants or PTFE tape these can also be utilized.
- m) Fill the pot with lubricant up to the required level. Open the vent plug [6521] while filling.

Note:

For 7000s and 7000s + 6000s series the oil level is the centre of the oil level sight glass; for 29000s + 22000s series the oil level is indicated in the sectional drawing.

- n) Check the oil level before operation. Also, when specified, check that the piping system is ready to provide proper cooling to the pot.

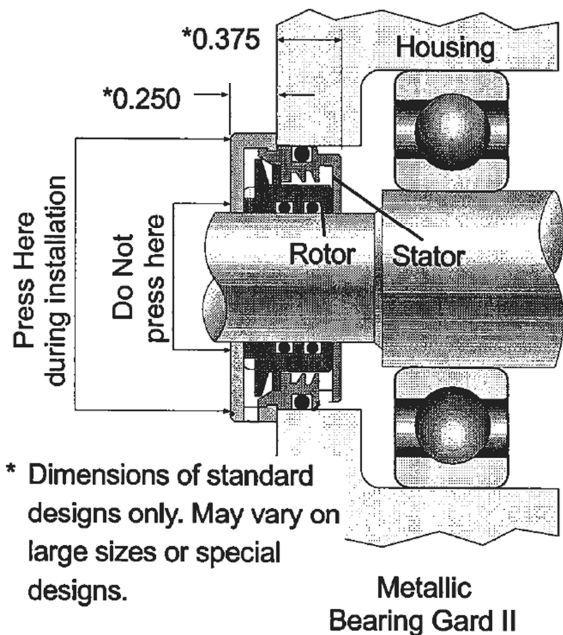
4.2 Optional Bearing Gard™ installation

4.2.1 Preparation before installation

- a) Remove the oil seal from the housing.
- b) Check to ensure the housing bore is free from contaminants, nicks and burrs or sharp edges.
- c) Check the shaft and remove any burrs or sharp edges on the shaft keyway and trademark stamps on the shaft.
- d) Thoroughly clean the shaft and housing bore.
- e) Concentricity of the housing bore to the shaft is to be maintained within 0.13 mm (0.005 in.) TIR.

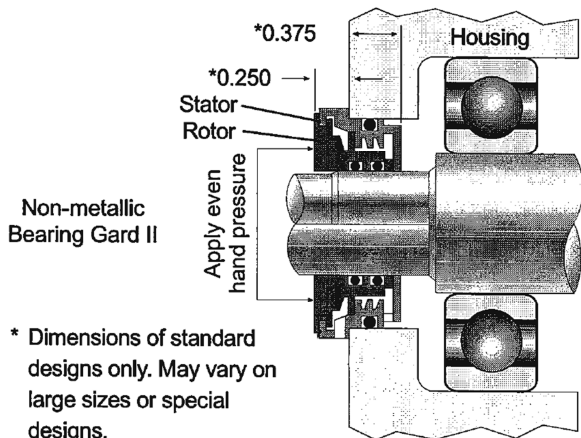
4.2.2 Bearing Gard™ installation

- a) Do not disassemble the Bearing Gard™ [4330.2]: it is designed to be installed as a unit.
- b) Lubricate the O-rings, the shaft and housing bore with the lubricant provided.
- c) Align the Bearing Gard™ [4330.2] in the housing so the drain slot is located on the bottom.
- d) Install the Bearing Gard™ [4330.2].
Original-style Bearing Gard™ and Metallic Bearing Gard™ II. Use an arbour press to push on the outer portion of the stator. **Do not** use a hammer.
Non-metallic Bearing Gard™ II. Install using hand pressure only.



* Dimensions of standard designs only. May vary on large sizes or special designs.

Metallic Bearing Gard™ II



* Dimensions of standard designs only. May vary on large sizes or special designs.

Non-metallic Bearing Gard™ II

- e) During installation, simply discard any O-ring material pinched or sheared by the bore. Make sure the face is perpendicular to the shaft.
- f) Once a Bearing Gard™ is in place you may remove and plug the bearing housing vent. Bearing Gard™ is self-venting and will not allow pressure build up in the housing. Plugging the bearing housing vent will reduce the entry of contamination into the housing.
- g) Refill the bearing housing to the correct oil level.

4.2.3 General tolerance information

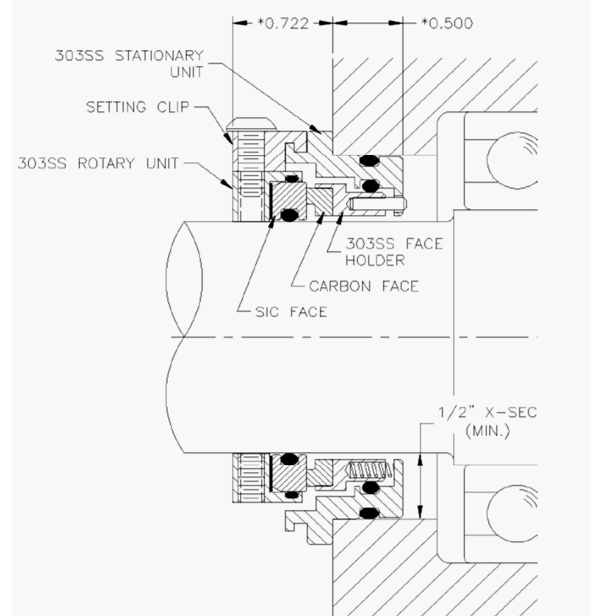
Shaft tolerance: ± 0.05 mm (± 0.002 in.)
 Axial run-out: ± 0.075 mm (± 0.003 in.)
 Bore tolerance: ± 0.025 mm (± 0.001 in.)
 Radial run-out: ± 0.13 mm (± 0.005 in.)

4.3 Optional Lifeseal™ installation

4.3.1 Preparation before installation

- a) Check to ensure the housing bore is free from contaminants, nicks and burrs or sharp edges.
- b) Check the shaft and remove any burrs or sharp edges that may damage the rotary O-ring as the Lifeseal™ [4330.1] slides over the shaft.
- c) Concentricity of the housing bore to the shaft is to be maintained within 0.13 mm (0.005 in.) T.I.R.

4.3.2 Lifeseal™ installation



- a) Using the water-soluble lubricant provided, lubricate the stationary unit outside diameter O-ring and the rotary unit inside diameter O-ring.
- b) Slide the Lifeseal™ [4330.1] along the shaft and evenly press the unit into the housing bore until the shoulder on the stationary unit bottoms out on the face of the housing. During installation, simply discard any O-ring material pinched or sheared by the bore. Make sure the face is perpendicular to the shaft.
- c) Evenly tighten the six set screws in the rotary unit to secure the seal to the shaft.
- d) Remove the bronze setting clips and clip bolts from the Lifeseal™ [4330.1].

4.3.3 General tolerance information

Shaft tolerance: ± 0.05 mm (± 0.002 in.)
 Axial run-out: ± 0.075 mm (± 0.003 in.)
 Bore tolerance: ± 0.025 mm (± 0.001 in.)
 Radial run-out: ± 0.13 mm (± 0.005 in.)

4.4 Thrust bearing pot installation with optional Bearing Gard™/Lifeseal™ sealing

Pots are either delivered to the customer fully assembled except for the oil/cooling piping extension, or pre-installed in the pump.

Before installation remove all items from the pump discharge head.

- a) Remove any debris and thoroughly clean the surface receiving the pot and the exposed

surfaces of the shaft with solvent. Check to ensure the shaft is free from contaminants, nicks and burrs, or any sharp edges. If necessary remove them.

- b) Remove the screws [6570.2] from the pot and remove the adjusting nut [2909].
 - c) Remove the key [6700.1] from the pump shaft.
 - d) Apply a thin film of mineral oil to the shaft exposed area and the pot mounting surface.
 - e) Rest the pot assembly in the pump taking special care not to damage the pump shaft, the Lifeseal™ [4330.1] and the Bearing Gard™ [4330.2] during the pot installation and to properly match the pump and pot alignment fits.
 - f) Rotate the pot assembly on its receiving surface to match up the holding holes.
 - g) Install the key [6700.1]. The keyway position is reached by turning the centering sleeve [2470].
 - h) Re-install the pot holding bolts.
 - i) Re-install the adjusting nut [2909].
 - j) Regulate the pump rotor axial play by turning the adjusting nut [2909] as necessary.
 - k) Re-install the screws [6570.2].
 - l) Tighten the Lifeseal™ [4330.1] rotary unit set screws and remove the setting clips and bolts. (See section 4.3.2, *Lifeseal™ installation*.)
 - m) Re-install the items removed from the discharge head and the pot piping extension. Use Heldite or similar proprietary pipe thread sealant to seal the piping extensions, where customer practices permit PTFE based pipe sealants or PTFE tape these can also be utilized..
 - n) Fill the pot with lubricant up to the required level.
- Note:** For 7000s and 7000s + 6000s series the oil level is the centre of the oil level sight glass; for 29000s + 22000s series the oil level is indicated in the sectional drawing.
- o) Check the oil level before operation. Also, when specified, check that the piping system is ready to provide proper cooling to the pot

4.5 Pump vertical axial play adjustment

The pump vertical axial play adjustment depends on the length of the shaft, which, in turn, depends

on the axial hydraulic thrust or force that tends to elongate the shaft. It is also dependent on the shaft diameter. The adjustment figure is indicated in the pump User Instruction manual.

Adjustment is performed, once the pump and motor are completely installed, by tightening or loosening the adjusting nuts [2909] of the thrust bearing pot. Further adjustment details are provided in the pump User Instruction manual. Also refer to the lubrication table in section 5.1.

4.6 Lubrication and cooling requirements

Refer to the lubrication chart in section 5.2.

4.7 Motor stand and flexible coupling

After the thrust pot installation, install the motor stand, the flexible coupling and the driver.

5 COMMISSIONING, START-UP, OPERATION AND SHUTDOWN

CAUTION *These operations must be carried out by fully qualified personnel.*

5.1 Pre-commissioning procedure

5.1.1 Lubrication

Determine the mode of lubrication of the unit, eg grease, oil, product lubrication etc.

CAUTION For oil lubricated units, fill the bearing housing with correct grade of oil to the correct level, ie sight glass or constant level oiler bottle.



When fitted with a constant level oiler, the bearing housing should be filled by unscrewing or hinging back the transparent bottle and filling the bottle with oil.

5.2 Lubrication

Size	Description	Cooling data	Lubrication data									
			Oil pan nominal capacity Litre (US pint)	Oil temp ° C (° F)	Oil requirements							
					Viscosity ISO VG @ min ⁻¹							
				3 600	3 000	1 800	1 500	1 200	1 000			
7211 7218 7318 7322	Single row angular contact bearing	Not applicable	0.13 (0.26)	60 (140)	22		32		46			
				70 (158)	32		46		68			
				80 (176)	32	46	68	100				
			0.35 (0.74)	60 (140)	15		22		32			
				70 (158)	22		32		46			
				80 (176)	32		46		68			
			0.6 (1.27)	60 (140)	15		22		32		46	
				70 (158)	15	22	32		46			
				80 (176)	22	32	46	68	68			
0.9 (0.90)	60 (140)			15		22		32				
	70 (158)			15	22	32		46				
	80 (176)			22	32	46	68					
7211 & 6013	Single row angular contact and radial ball bearings	CAUTION Maximum Pressure 3.0 barg (43 psig) Temperature 30 °C (86 °F) Flow 0.25 m³/h (1.10 Usgpm)	0.35 (0.74)	60 (140)	22		32		46			
				70 (158)	32		46		68			
				80 (176)	32	46	68	100				
1.0 (2.1)			60 (140)	15		22		32		46		
			70 (158)	22		32		46		68		
			80 (176)	32		46		68				
0.9 (1.90)			60 (140)	15		22		32		46		
			70 (158)	15	22	32		46		68		
			80 (176)	22	32	46	68	68				
1.3 (2.75)	60 (140)			15		22		32				
	70 (158)			15	22	32		46				
	80 (176)			22	32	46						
1.2 (2.54)	60 (140)					22		32				
	70 (158)					32		46				
	80 (176)					46		68				
5.75 (12.2)	60 (140)					22		32				
	70 (158)					32		46				
	80 (176)					46		68				
29417 + 22217	Spherical roller thrust and spherical roller bearings		0.35 (0.74)	60 (140)			22		32			
				70 (158)			32		46			
				80 (176)			46		68			
29420 + 22220			60 (140)					22		32		
			70 (158)					32		46		
			80 (176)					46		68		
29424 + 22224			60 (140)							22		
			70 (158)							32		
			80 (176)							46		

- For oil changes a dewaxed mineral oil with anti-oxidants, corrosion protection and anti-foaming additives should be used.
- The first oil change should be after 100 hours operation. Subsequent oil changes after every 2 000 hours operation.
- Oil consumption is negligible.

6 MAINTENANCE

6.1 General

It is the plant operator's responsibility to ensure that all maintenance, inspection and assembly work is carried out by authorized and qualified personnel who have adequately familiarized themselves with the subject matter by studying this manual in detail. (See also section 1.6.)

Any work on the machine must be performed when it is at a standstill

On completion of work all guards and safety devices must be re-installed and made operative again.

Before restarting the machine, the relevant instructions listed in section 5, *Commissioning, start up, operation and shut down* must be observed.

Oil and grease leaks may make the ground slippery. Machine maintenance must always begin and finish by cleaning the ground and the exterior of the machine.

If platforms, stairs and guard rails are required for maintenance, they must be placed for easy access to areas where maintenance and inspection are to be carried out. The positioning of these accessories must not limit access or hinder the lifting of the part to be serviced.

When air or compressed inert gas is used in the maintenance process, the operator and anyone in

the vicinity must be careful and have the appropriate protection.
Do not spray air or compressed inert gas on skin.

Do not direct an air or gas jet towards other people.

Never use air or compressed inert gas to clean clothes.

Before working on the unit, take measures to prevent an uncontrolled start. Put a warning board on the starting device with the words:

"Machine under repair: do not start".

With electric drive equipment, lock the main switch open and withdraw any fuses. Put a warning board on the fuse box or main switch with the words:

"Machine under repair: do not connect".

Never clean equipment with inflammable solvents or carbon tetrachloride. Protect yourself against toxic fumes when using cleaning agents.

6.2 Maintenance schedule



It is recommended that a maintenance plan and schedule is adopted, in line with these User Instructions, to include the following:

- a) Any auxiliary systems installed must be monitored, if necessary, to ensure they function correctly.
- b) Check for any leaks from gaskets and seals.
- c) Check bearing lubricant level, and if the hours run show a lubricant change is required.
- d) Check vibration, noise level and surface temperature at the bearings to confirm satisfactory operation.
- e) Check dirt and dust is removed from areas around close clearances, bearing housings and motors.
- f) Check coupling alignment and re-align if necessary.

Our specialist service personnel can help with preventative maintenance records and provide condition monitoring for temperature and vibration to identify the onset of potential problems.

If any problems are found the following sequence of actions should take place:

- a) Refer to section 7, *Faults; causes and remedies*, for fault diagnosis.
- b) Ensure equipment complies with the recommendations in this manual.
- c) Contact Flowserve if the problem persists.

6.2.1 Routine inspection (daily/weekly)



The following checks should be made and the appropriate action taken to remedy any deviations:

- a) Check operating behaviour. Ensure noise, vibration and bearing temperatures are normal
- b) Check the level and condition of oil lubricant.
- c) Check any auxiliary supplies eg. heating/cooling, if fitted, are functioning correctly.



Refer to the manuals of any associated equipment for routine checks needed.

6.2.2 Periodic inspection (six monthly)

- a) The coupling should be checked for correct alignment and worn driving elements.



Refer to the manuals of any associated equipment for periodic checks needed.

6.2.3 Re-lubrication

Lubricant and bearing temperature analysis can be useful in optimizing lubricant change intervals. In general however, the following is recommended.

6.3 Spare parts

6.3.1 Ordering of spares

Flowserve keeps records of all pumps that have been supplied. When ordering spares the following information should be quoted.

- 1) Pump serial number.
- 2) Pump size.
- 3) Part name – taken from section 8.
- 4) Part number – taken from section 8.
- 5) Number of parts required.

The pump size and serial number are shown on the pump nameplate.

To ensure continued satisfactory operation, replacement parts to the original design specification should be obtained from Flowserve. Any change to the original design specification (modification or use of a non-standard part) will invalidate the pump's safety certification.

6.3.2 Storage of spares

Spares should be stored in a clean dry area away from vibration. Inspection and re-treatment of metallic surfaces (if necessary) with preservative is recommended at 6 monthly intervals.

6.4 Tools required

Standard tools needed to maintain this pump are follows.

- Open ended spanners / wrenches (standard size range)
- Socket spanners / wrenches (standard size range)
- Allen keys / wrenches
- Standard range of screw drivers
- Soft mallet

Note: Other tools may be required depending on the accessories/ special parts used per contract. Flowserve in general is not obligated to ship the tools with any pump shipped

6.5 Fastener torques

Diameter mm (in.)	Tightening torques Nm (lbf•ft)			
	Carbon steel	High tensile steel	Martensitic stainless steel	Austenitic stainless steel
7 (0.28)	2 (2)	10 (7)	7 (5)	5 (4)
8 (0.31)				
9 (0.35)	5 (4)	19 (14)	15 (11)	10 (7)
10 (0.39)	9 (6)	28 (21)	22 (16)	15 (11)
12 (0.47)	13 (10)	48 (35)	37 (27)	24 (18)
14 (0.55)	20 (14)	70 (50)	55 (40)	37 (27)
16 (0.63)				
18 (0.71)	40 (30)	142 (104)	110 (70)	70 (50)
20 (0.79)				
22 (0.87)	67 (50)	238 (176)	183 (135)	122 (90)
24 (0.94)	110 (80)	378 (279)	293 (216)	195 (144)
27 (1.06)	160(120)	580 (428)	452 (33)	299 (221)
30 (1.18)	260 (190)	920 (680)	710 (530)	470 (350)
33 (1.30)	360 (270)	1 300 (940)	1 000 (740)	660 (490)
36 (1.42)	480 (360)	1 700 (1 260)	1 340 (990)	890 (650)
39 (1.54)	580 (430)	2 080 (1 530)	1 600 (1 180)	1 070 (790)
42 (1.65)	800 (590)	2 200 (1 600)	2 200 (1 600)	1 400 (1 080)
45 (1.77)	970 (720)	2 800 (2 000)	2 800 (2 000)	1 900 (1 400)
48 (1.89)	1 400(1 000)	3 800 (2 800)	3 800 (2 800)	2 500 (1 800)
52 (2.05)	1 500 (1 100)	4 150 (3 000)	4 100 (3 000)	2 700 (2 000)

6.6 Disassembly

Refer to *Safety (1.6)* section before dismantling the unit.

CAUTION Before dismantling the Thrust bearing pot for overhaul, ensure genuine Flowserve replacement parts are available.

Refer to sectional drawings for part numbers and identification. See section 8, *Parts lists and drawings*.

Disassembly is generally the reverse process to those described below in section 6.8, *Assembly*.

6.7 Examination of parts

CAUTION Used parts must be inspected before assembly to ensure the unit will subsequently run properly. In particular, fault diagnosis is essential to enhance unit and plant reliability.

6.8 Assembly

To assemble consult the sectional drawings. See section 8, *Parts lists and drawings*.

Ensure threads, gasket and O-ring mating faces are clean. Apply thread sealant to non-face sealing pipe thread fittings.

In all cases and whenever an overhaul is made, the pot will have to be assembled again. The assembly procedures are described below.

6.8.1 Thrust bearing pot assembly - 7000s series

- Press the bearing [3010] onto the centering sleeve [2470] using a hydraulic press.
- Thoroughly clean the bearing housing [3200]. Install the oil retaining sleeve [3860]. Use an oil and heat resistant sealing compound (LOCTITE 641 or equivalent) to seal the bearing housing [3200] and oil retaining sleeve [3860].
- Install the oil level sight glass [3858].
- Install the washer [2905] and screws [6570.1a].
- Install the assembly [3010 and 2470], from a) above, into the bearing housing [3200]. Leave some clearance between the bearing housing [3200] and the outer race of the bearing [3010].
- Apply mineral oil in the bearing cover groove [3260] and install the felt ring [4320].
- Install the assembly [3260 and 4320] from step f) in the bearing housing [3200].
- Install the holding screws [6570.1] in the bearing housing/bearing cover.
- Install the vent plug [6521].

Assembly of the pot is now completed. For installation onto the pump proceed as in section 4, *Installation*.

6.8.2 Thrust bearing pot assembly - 7000s series with optional Bearing Gard™/Lifeseal™ sealing

- Press the bearing [3010] onto the centering sleeve [2470] using a hydraulic press.
- Install the oil level sight glass [3858].
- Install the washer [2905] and screws [6570.1a].

- d) Install the assembly [3010 and 2470], from step a), into the bearing housing [3200]. Leave some clearance between the bearing housing [3200] and the outer race of the bearing [3010].
- e) Work the gasket [4590] by hand and install it onto the bearing housing [3200]. Apply a thin film of mineral oil on the gasket.
- f) Install the bearing cover [3260] on the bearing housing [3200].
- g) Install the bearing housing/Bearing cover holding screws [6570.1].
- h) Install the Bearing Gard™ seal [4330.2] and the Lifeseal™ [4330.1] as described in section 4.2 and 4.3.
- i) Assemble the cooling water pipes [6552]. Use Heldite or similar proprietary pipe thread sealant to seal between the different components.
- j) Install the piping assembly from step i) in the bearing housing [3200]. Use Heldite or similar proprietary pipe thread sealant to seal the assembly to the bearing housing [3200].

Note:

Tightening of the Lifeseal™ [4330.1] rotary unit set screws and removal of the setting clips and bolts (see Lifeseal™ installation , section 4.3) must only be done after the installation of the pot on the pump and the regulation of the pump rotor, (see section 4.4).

Note:

Depending on the motor stool configuration, the installation is made at pot assembly stage or after the pot and motor stand installation onto the pump discharge head.

Assembly of the pot is now completed. For installation onto the pump proceed as in section 4.4, *Optional Bearing Gard™/Lifeseal™ installation.*

6.8.3 Thrust bearing pot assembly - 7000s + 6000s series

- a) Press the bearings [3010 and 3011] onto the centering sleeve [2470] using a hydraulic press.
- b) Lock the thrust bearing [3010] in place with the lock washer [6541] and bearing nut [3712].
- c) Thoroughly clean the bearing housing [3200].
- d) Install the oil retaining sleeve [3860]. Use an oil and heat resistant sealing compound (LOCTITE 641 or equivalent) to seal the bearing housing [3200] and oil retaining sleeve [3860].
- e) Install the oil level sight glass [3858].

- f) Install the bearing preload springs [2460] in the bearing housing [3200].
- g) Install the assembly [3010, 3011, 2470, 6541 and 3712], from a) and b) above, in the bearing housing [3200]. Leave some clearance between the bearing housing [3200] and the outer race of the thrust bearing [3010].
- h) Apply mineral oil in the bearing cover [3260] groove and install the felt ring [4320]
- i) Work the gasket [4590] by hand and install it on the bearing housing [3200]. Apply a thin film of mineral oil on the gasket.
- j) Install the assembly [3260 and 4320] from step h) onto the bearing housing [3200]. Pay attention to the position of the gasket [4590] and to the adjustment of the line bearing [3011].
- k) Install the holding screws [6570.1] in the bearing housing/Bearing cover.
- l) Install the vent plug [6521].

Assembly of the pot is now completed. For installation onto the pump proceed as in section 4, *Installation.*

6.8.4 Thrust bearing pot assembly - 7000s + 6000s series with optional Bearing Gard™/Lifeseal™ sealing

- a) Press the bearings [3010 and 3011] onto the centering sleeve [2470] using a hydraulic press.
- b) Lock the thrust bearing [3010] in place with the lock washer [6541] and bearing nut [3712].
- c) Install the (3858) oil level sight glass [3858].
- d) Install the bearing preload springs [4260] into the bearing housing [3200].
- e) Install the assembly [3010, 3011, 2470, 6541 and 3712], from steps a) and b) above, into the bearing housing [3200]. Leave some clearance between the bearing housing [3200] and the outer race of the thrust bearing [3010].
- f) Work the gasket [4590] by hand and install it onto the bearing housing [3200]. Apply a thin film of mineral oil to the gasket.
- g) Install the bearing cover [3260] onto the bearing housing [3200].
- h) Install the bearing housing/Bearing cover holding screws [6570.1].
- i) Install the Bearing Gard™ seal [4330.2] and the Lifeseal™ [4330.1] as described in section 4.2 and 4.3.

Note:

Tightening of the Lifeseal™ [4330.1] rotary unit set screws and removal of the setting clips and bolts (see Lifeseal™ installation , section 4.3) must only be done

after the installation of the pot on the pump and the regulation of the pump rotor, (see section 4.4).

- j) Assemble the cooling water pipes [6552]. Use Heldite or similar proprietary pipe thread sealant to seal between the different components.
- k) Install the piping assembly from step j) in the bearing housing [3200]. Use Heldite or similar proprietary pipe thread sealant to seal the assembly to the bearing housing [3200].

Note:

Depending on the motor stool configuration, the installation is made at pot assembly stage or after the pot and motor stand installation onto the pump discharge head.

Assembly of the pot is now completed. For installation onto the pump proceed as in section 4.4, *Optional Bearing Gard™/Lifeseal™ installation.*

6.8.5 Thrust bearing pot assembly - 29000s + 22000s series

- a) Press the bearing [3011] and bearing inner race [3010] onto the centering sleeve [2470] using a hydraulic press.
- b) Thoroughly clean the bearing housing [3200].
- c) Install the oil retaining sleeve [3860]. Use an oil and heat resistant sealing compound (LOCTITE 641 or equivalent) to seal the bearing housing [3200] and oil retaining sleeve [3860].
- d) Install the bearing preload springs [4260] into the bearing housing [3200].
- e) Install the outer race [3010] and rollers assembly into the bearing housing [3200].
- f) Install the assembly [3010, 3011 and 2470], from a) above, in the bearing housing [3200].
- g) Work the gasket [4590.1] by hand and install it on the bearing housing [3200]. Apply a thin film of mineral oil on the gasket.
- h) Install the upper bearing housing [3210]. Pay attention to the position of the gasket [4950.1] and to the adjustment of the bearing [3011].
- i) Install the holding screws [6570.1].
- j) Work the gasket [4590.2] by hand and install it on the upper bearing housing [3210]. Apply a thin film of mineral oil on the gasket.
- k) Install the housing cover [3260]. Pay attention to the position of the gasket [1300a].
- l) Install screws [6570.2].
- m) Install the vent plug [6521].

Assembly of the pot is now completed. For installation onto the pump proceed as in section 4, *Installation.*

6.8.6 Thrust bearing pot assembly - 29000s + 22000s series with optional Bearing Gard™/Lifeseal™ Sealing

- a) Press the bearing [3011] and thrust bearing inner race [3010] onto the centering sleeve [2470] using a hydraulic press.
- b) Thoroughly clean the bearing housing [3200].
- c) Install the bearing preload springs [4260] in the bearing housing [3200].
- d) Install the outer race bearing [3010] and roller assembly into the bearing housing [3200].
- e) Install the assembly [3010, 3011 and 2470] from step a) into the bearing housing [3200].
- f) Work the gasket [4590.1] by hand and install it on the bearing housing [3200]. Apply a thin film of mineral oil on the gasket.
- g) Install the upper bearing housing [3210]. Pay attention to the position of the gasket [4590.1] and to the adjustment of the bearing [3011].
- h) Install the holding screws [6570.1].
- i) Work the gasket [4590.2] by hand and install it on the upper bearing housing. [3210] Apply a thin film of mineral oil on the gasket.
- j) Install the housing cover [3260]. Pay attention to the position of the gasket [4590.2].
- k) Install the Bearing Gard™ seal [4330.2] and the Lifeseal™ [4330.1] as described in section 4.2 and 4.3.

Note:

Tightening of the Lifeseal™ [4330.1] rotary unit set screws and removal of the setting clips and bolts (see Lifeseal™ installation, section 4.3) must only be done after the installation of the pot on the pump and the regulation of the pump rotor, (see section 4.4).

- l) Assemble the cooling water pipes [6552], pipe reducer [2042] and oil level sight glass [3856]. Use Heldite or similar proprietary pipe thread sealant to seal between the different components.
- m) Install the assembly [6552, 2042 and 3856] from step l) in the bearing housing [3200]. Use Heldite or similar proprietary pipe thread sealant to seal the assembly to the bearing housing [3200].

Note:

Depending on the motor stool configuration, the installation is made at pot assembly stage or after the pot and motor stand installation onto the pump discharge head

Assembly of the pot is now completed. For installation onto the pump proceed as in section 4.4, *Installation.*

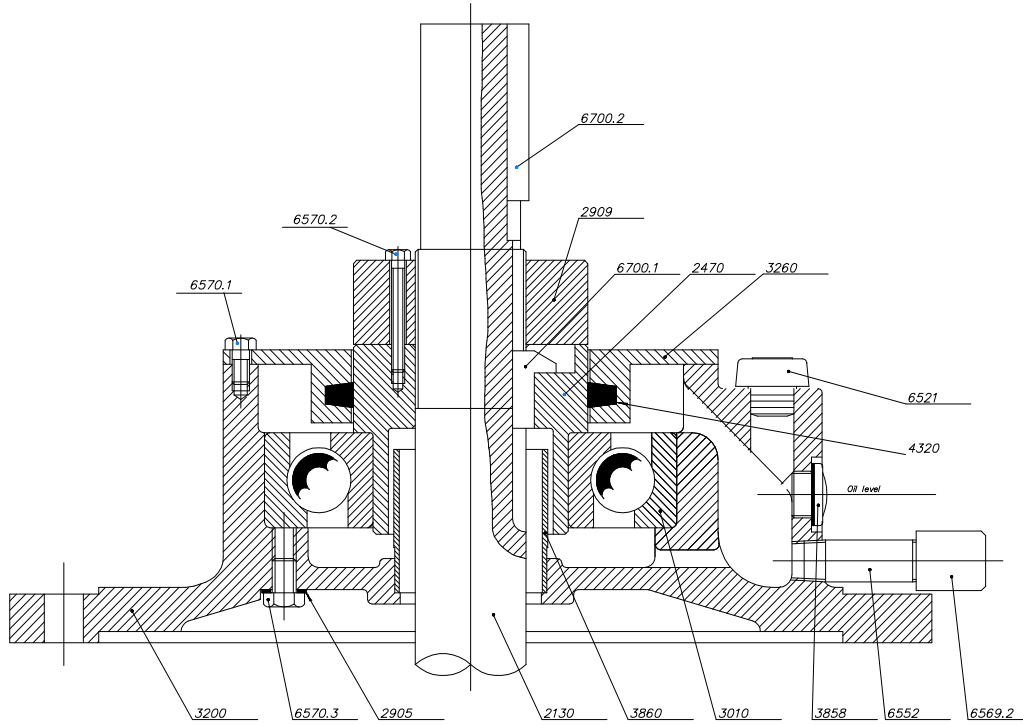
7 FAULTS; CAUSES AND REMEDIES

FAULT SYMPTOM

Bearings overheating																	
Bearings have short life or are damaged																	
↓	↓	↓	↓	↓	↓	↓	↓	POSSIBLE CAUSES				POSSIBLE REMEDIES					
							A. SYSTEM TROUBLES										
						•	•							Incorrect oil level	Check and correct level after renewing damaged bearings		
					•	•							Worn bearings	Replace bearings.			
				•	•							Water or foreign materials entering oil	Conduct oil analysis and CONSULT FLOWSERVE, if necessary				
			•	•							Shaft running off center because of worn bearings or misalignment.	Check misalignment and correct if necessary. If alignment satisfactory check bearings for excessive wear					
		•	•							Misalignment due to pipe strain	Check the flange connection and eliminate strains using method permitted						
	•	•							Oil film too thin or too thick	Check correct oil viscosity used for the temperature							
•	•							Rotating part rubbing on stationary part internally	Check and CONSULT FLOWSERVE, if necessary								
•	•							Impeller out of balance resulting in vibration and or creating excessive loading to the thrust bearing	Check and CONSULT FLOWSERVE								

8 PARTS LISTS AND DRAWINGS

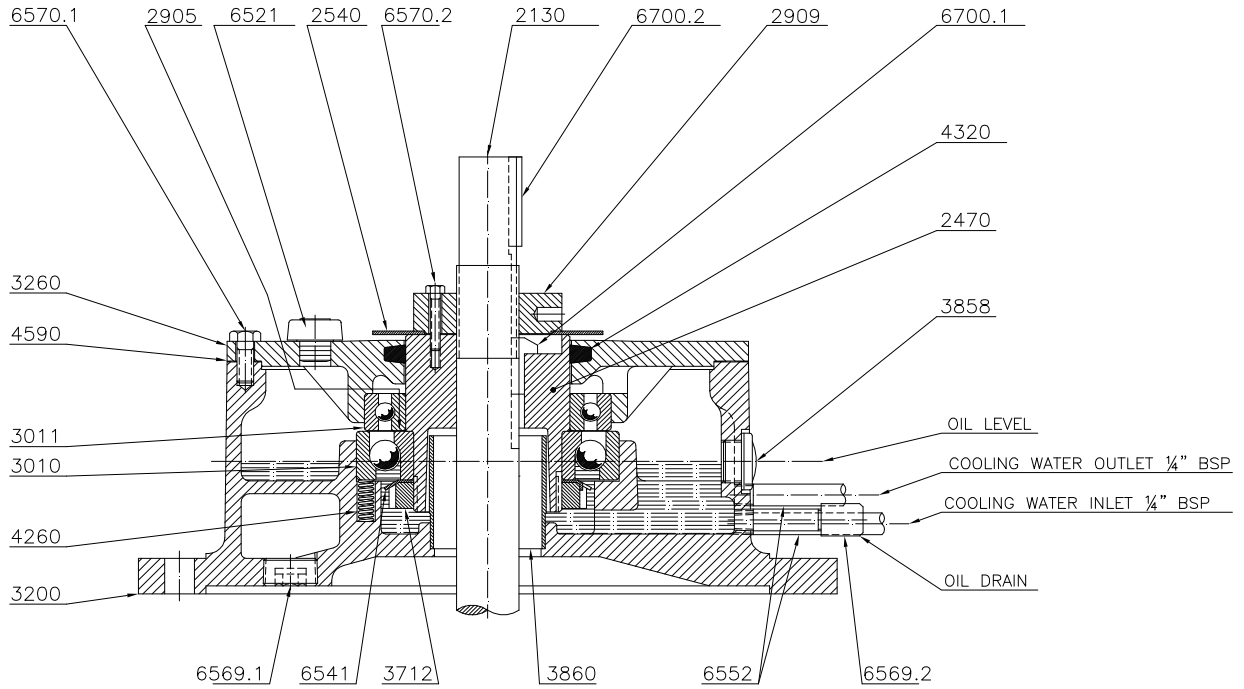
8.1 7000s series



Drawing taken from X081145E

Item	Description
2130	Pump top shaft
2470	Centering sleeve
2905	Washer
2909	Adjusting nut
3010	Bearing
3200	Bearing housing
3260	Bearing cover
3858	Oil level sight glass
3860	Oil retaining sleeve
4320	Felt ring
6521	Vent plug
6552	Cooling water pipe
6569.2	Plug
6570.1	Screw
6570.2	Screw
6570.3	Screw
6700.1	Key
6700.2	Key (Coupling)

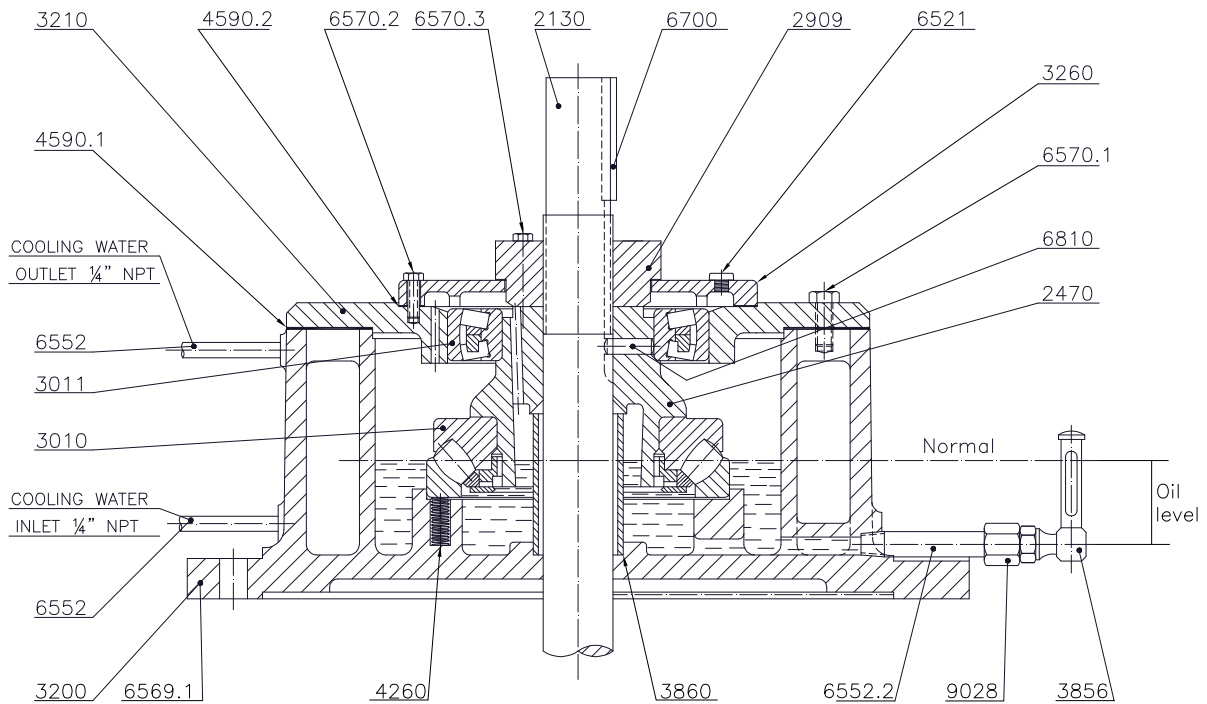
8.2 7000s + 6000s series



Drawing taken from X092052

Item	Description
2130	Top shaft
2470	Centering sleeve
2540	Oil flinger, oil deflector
2905	Washer
2909	Adjusting nut
3010	Bearing
3011	Bearing
3200	Bearing housing
3260	Bearing cover
3712	Bearing nut
3858	Oil level sight glass
3860	Oil retaining sleeve
4260	Spring
4320	Felt ring
4590	Gasket
5652	Cooling water pipe
6521	Vent plug
6541	Lock washer
6569.1	Plug
6569.2	Plug
6570.1	Screw
6570.2	Screw
6700.1	Key
6700.2	Key (coupling)

8.3 29000s + 22000s series

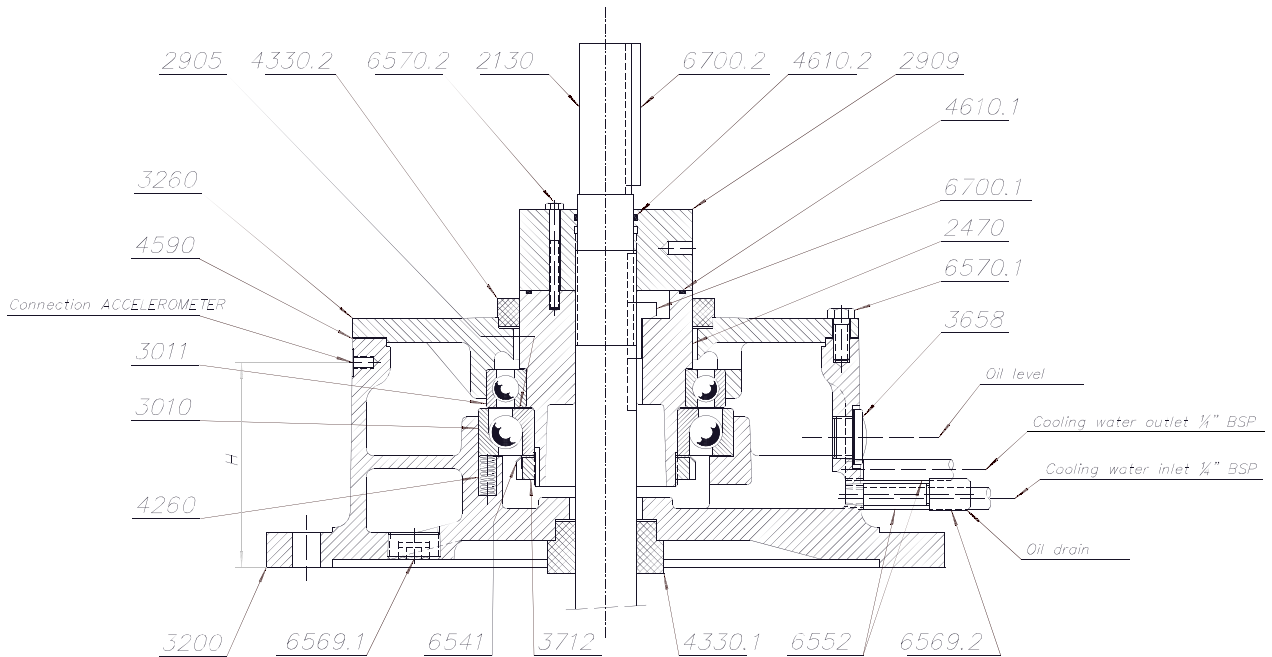


Drawing taken from X092817

Item	Description
2130	Pump top shaft
2470	Centering sleeve
2909	Adjusting nut
3010	Bearing
3011	Bearing
3200	Bearing housing
3210	Upper bearing housing
3260	Bearing cover
3856	Oil level sight glass
3860	Oil retaining sleeve
4260	Spring
4590.1	Gasket
4590.2	Gasket
6521	Vent plug
6552	Cooling water pipe
6569.1	Plug
6569.2	Plug
6570.1	Screw
6570.2	Screw
6570.3	Screw
6700.1	Key
6700.2	Key (coupling)
6810	Pin
9028	Pipe reducer

Oil level	
Size	Normal
	mm (in.)
29417 + 22217	55.5 (2.2)
29420 + 22220	60 (2.4)
29424 + 22224	65 (2.6)

8.4 7000s + 6000s series with Bearing Gard™ seal and Lifeseal™



Drawing taken from X100349

Item	Description
2130	Pump top shaft
2470	Centering sleeve
2905	Washer
2909	Adjusting nut
3010	Bearing
3011	Bearing
3200	Bearing housing
3260	Bearing cover
3712	Bearing nut
3858	Oil level sight glass
4260	Spring
4330.1	Lifeseal™
4330.2	Bearing Gard™ seal
4590	Gasket
4610.1	O-ring
4610.2	O-ring
6541	Lock washer
6552	Cooling water pipe
6569.1	Plug
6569.2	Plug
6570.1	Screw
6570.2	Screw
6700.1	Key
6700.2	Key (Coupling)

8.5 General arrangement drawing

The typical general arrangement drawing and any specific drawings required by the contract will be sent to the Purchaser separately unless the contract specifically calls for these to be included into the User Instructions. If required, copies of other drawings sent separately to the Purchaser should be obtained from the Purchaser and retained with these User Instructions.

9 CERTIFICATION

Certificates determined from the Contract requirements are provided with these Instructions where applicable. Examples are certificates for CE marking, ATEX marking etc. If required, copies of other certificates sent separately to the Purchaser should be obtained from the Purchaser for retention with these User Instructions.

10 OTHER RELEVANT DOCUMENTATION AND MANUALS

10.1 Supplementary User Instruction manuals

Supplementary instruction determined from the contract requirements for inclusion into User Instructions such as for a driver, instrumentation, controller, sub-driver, seals, sealant system, mounting component, etc. are included under this section. If further copies of these are required they should be obtained from the purchaser for retention with these User Instructions.

Where any pre-printed set of User Instructions are used, and satisfactory quality can be maintained only by avoiding copying these, they are included at the end of these User Instructions such as within a standard clear polymer software protection envelope.

10.2 Change notes

If any changes, agreed with Flowserve Pump Division, are made to the product after its supply, a record of the details should be maintained with these User Instructions.

10.3 Additional sources of information

Reference 1:
Pump Handbook, 2nd edition, Igor J. Karassik et al, McGraw-Hill Inc., New York, 1993.



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