Instruction Manual

SCPP 1 Circumferential Piston Pump



ESE01681-EN2 2013-01

Original manual

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The information herein is correct at the time of issue but may be subject to change without prior notice

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EC Declaration of Conformity

The designating company

Alfa Laval Eastbourne, Alfa Laval Ltd
Company Name

Birch Road, Eastbourne, East Sussex BN23 6PQ
Address

+44 (0) 1323 412555
Phone No.

hereby declares that:

- Circumferential piston pumps within “SCPP” range

from serial number 150000 are in conformity with the provisions of the Machinery Directive 2006/42/EC and with the national implementing legalization and EC regulation 1935/2004 relating to materials and articles intended to come into contact with food

and furthermore declares that:

If motorised the following (parts/clauses of) applicable directives have been used
- Directive 2006/95/EC on low voltage
- Electro Magnetic Compatibility Directive 2004/108/EC

The technical construction file for this machinery is retained at the above address.

Signed  Date 2009-12-29
(Authorised Person)

Name Bjarne Søndergaard Position Vice President R&D Equipment Division

2 General description

To ensure the best possible service, read and understand this manual prior to installation, operation or maintaining this pump. For questions regarding installation, operation or maintenance, contact your distributor or Alfa Laval

2.1 General description

Each Pump product is shipped completely assembled and ready for use. Normal maintenance as outlined in this manual will provide long, trouble free service when the pumps is incorporated in a properly designed system.

Inspection at receipt: ports are covered at the factory to prevent dirt and foreign objects from entering the pump head. If port covers are damaged or missing remove the pump cover to ensure the pump is clean and free of foreign objects or materials before rotating the shaft. If the pump is damaged in transit file a claim with the carrier right away. The carrier has a Bill of Lading showing that the shipment was received from us in good condition.

Returns: when necessary to return product under warranty or for any other reason first contact Alfa Laval to receive a Return Goods Authorization number to facilitate getting the product back to you as soon as possible.

Normal operation

Normal operation of the Pump products is within a range of 0 to 600 rpm, and a pressure range of 0 to 1379 kPa (0 to 200 psi). Standard rotors operate within a temperature range of -40°C to 93°C (-40°F to 200°F). Hot clearance rotors operate at 93°C to 149°C (200°F to 300°F). Consult factory for operation at other values.

Noise Levels

Under certain operating conditions pumps and/or drives and/or the systems within which they are installed can produce sound pressure levels in excess of 80dB[A]. When necessary, protection against noise should be taken.

Weight for bare shaft pump

	Model								
	006	015	018	030	045	060	130	220	320
Weight kg	24	24	24	45	132	132	142	252	477
Weight lb	53	53	53	99	290	290	312	555	1050

Typical weight for motor and baseplates

	kW											
	0.37	0.55	0.75	1.10	1.50	2.20	3.00	4.00	5.50	7.50	11.00	15.00
Weight kg	42	45	49	60	64	81	91	114	157	200	293	387
Weight lb	93	99	108	132	141	179	201	251	346	441	646	853

Incorrect installation, operation or maintenance of equipment may cause severe personal injury or death and/or equipment damage and may invalidate the warranty. This information must be read fully before beginning installation, operation or maintenance and must be kept with the pump. All installation and maintenance must be undertaken by suitably trained or qualified persons only.

3.1 Important information

Safety instructions are identified in this manual with the symbol 

Where electrical safety is involved with the symbol 

The symbol Attention is used to call attention to instructions important to protection of equipment. ATTENTION

WARNING:
Hazards or unsafe practices that could result in severe personal injury or death, and how to avoid them.

CAUTION:
Hazards or unsafe practices that could result in minor personal injury or damage to product or property.

WARNING ! To avoid serious injury or death, do not install or service pump unless power is off and locked out.

WARNING ! WARNING ! Before servicing pump, refer to Material Safety Data Sheet (MSDS) for safe handling of the material being pumped.

WARNING ! Do not operate pump without guards in place.

WARNING ! Stay clear of motor shaft and coupling when jogging motor.

WARNING ! Do not operate pump under power with cover removed.

CAUTION ! Handle all parts with care to avoid nicks and scratches which may affect pump operation.

CAUTION ! Pump components have very close clearances. Do not permit foreign objects to enter the pump.

WARNING ! Electrical connections must be made by a registered electrician in accordance with local codes and standards.

WARNING ! Do not operate pump unless over- pressure protection is installed in discharge piping.

WARNING ! Do not put fingers in ports or near rotating members.

WARNING ! Relieve system pressure before removing cover or port connections.

CAUTION ! Operation of the pump with inlet and/or outlet valves in the closed position can cause damage to the pump.

CAUTION ! Before operating pump under power, make sure system is clean and free of foreign objects. Do not use pump to remove foreign objects.

3.2 Recycling information

Recycling information.

• Unpacking

- Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.
- Wood and cardboard boxes can be reused, recycled or used for energy recovery.
- Plastics should be recycled or burnt at a licensed waste incineration plant.
- Metal straps should be sent for material recycling.

• Maintenance

- During maintenance oil and wear parts in the machine are replaced.
- All metal parts should be sent for material recycling.
- Worn out or defective electronic parts should be sent to a licensed handler for material recycling.
- Oil and all non metal wear parts must be taken care of in agreement with local regulations.

• Scrapping

- At end of use, the equipment shall be recycled according to relevant, local regulations. Beside the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact the local Alfa Laval sales company.

3.3 Safety precautions

Section installation.

Some pump configurations could tip if inclined at a 10° angle or more. Ensure lifting equipment is used or pump is supported before unbolting from base plates, packaging or other.

Section Operation.

Under certain conditions surface temperatures on the gear box could be in excess of 80°C and caution must be taken.

Section Maintenance.

Hazardous fluid could be trapped in some rotorcase orientations and/or seal housings and caution must be taken. When disposing of harmful substances or substances above 60°C please be aware that in some orientations the rotor case and/or seal housings are not fully drainable. If requested at the time of order the equipment can be supplied with means of safe removal of any hazardous and/or hot , drained or leaked fluid.

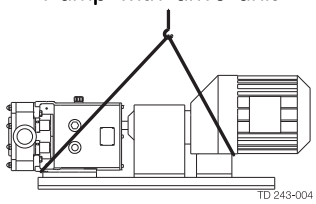
Always secure that the pump can not turbine due to backflow caused by discharge head in the system.

4.1 Unpacking, handling and storage

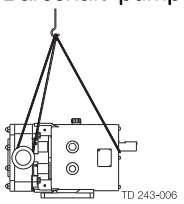
Step 1

Refer to the pump weights guide (8.1 Troubleshooting guide) before selecting and using any lifting gear. The drawings show how the pump should be lifted.
Ensure that lifting equipment is correctly rated and used within these limits.

Pump with drive unit



Bareshaft pump



4.2 Installation

Consideration must be given to the following in order to achieve proper installation

Step 1
Pumps of this type are usually mounted on a base plate common with the drive unit. Bases may be permanently mounted, be self-leveling and with vibration isolation pads, have adjustable legs or be portable. Bases should be level during pump operation.

Step 2
Provide power as required by the motor and controls as needed for system operation.

WARNING !
Electrical connections must be made by a registered electrician in accordance with local codes and standards.

WARNING !
To avoid serious injury or death, do not install or service pump unless power is off and locked out.

Step 3
Piping should be supported independently of the pump to prevent mis-alignment of pump parts that will cause excessive wear to rotors, bearings and shafts. Use of thermal expansion (flexible) joints will also minimize forces exerted on the pump. Inlet and outlet valves permit servicing of the pump without emptying the entire system. Inlet piping must not slope toward the pump in such a way as to cause formation of an air pocket ahead of the pump. An inlet valve will serve to keep the inlet line full. This is particularly important with low viscosity fluids and with frequent starts and stops. With low absolute inlet pressure a check on the outlet side of the pump prevents backflow and minimizes start-up differential pressure.

CAUTION
Operation of the pump with inlet and/or outlet valves in the closed position can cause damage to the pump.

Step 4
Welding of fittings is not recommended since warpage can occur which may affect pump operation and performance.

Step 5
Overpressure protection must be provided for this pump. An external/bypass pressure relief valve, a torque limiting device on the drive or a rupture disc in the discharge piping are examples. If pump rotation is to be reversed, pressure protection must be provided on both sides of the pump.

WARNING !
Do not operate pump unless over- pressure protection is installed in discharge piping.

4 Installation

Installation should follow good practice to provide the best performance and installation must meet local code requirements. All system components must be correctly sized to provide satisfactory operation of your Alfa Laval product.

Step 6
Inlet side strainers or traps can be used to prevent foreign objects from entering and damaging the pump. Selection should be made based on viscosity to prevent clogging and restricting the inlet thus causing cavitation and reduction of flow from the pump.

Step 7
Installation of pressure and/or vacuum gauges at inlet and/or outlet provide a convenient way to assess pump operation. Such gauges can indicate if pressure is normal or not, show changes in pump or system conditions, and provide indications of flow and changes in viscosity.

Step 8
Pumps and drives ordered from the factory on a common base plate have been supplied with a flexible coupling and aligned before shipping. This alignment should be rechecked after the pump is installed and piping is complete.
Using feeler gages check angular alignment in four places around the coupling. The alignment and space between the couplings should be set to the manufacturer's recommended distance. Shim as needed. Refer to Figure 2.
Using a straight edge check parallel alignment as shown in Figure 3. Shim height as needed.

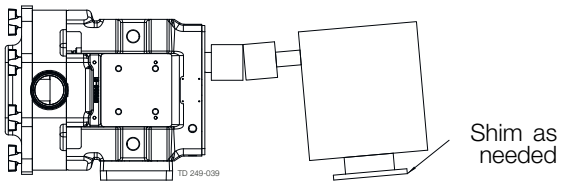


figure 2

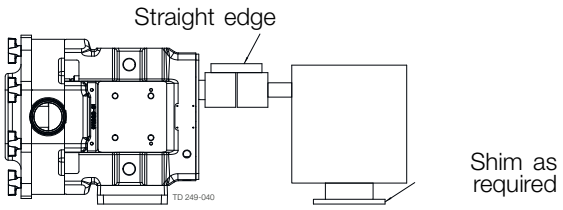


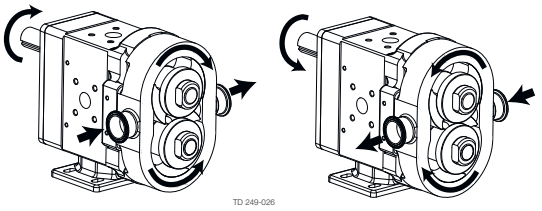
figure 3

Step 9
Turn shaft manually to make sure that the pump turns freely.

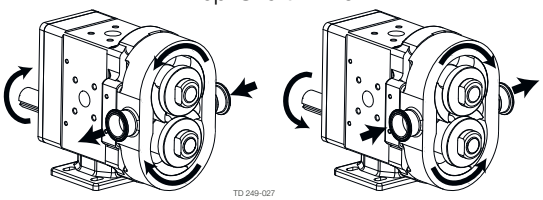
WARNING !
Do not put fingers in ports or near rotating members.

Step 10
Jog motor and observe motor coupling to make sure pump will turn in the right direction. Refer to Figure 4.

WARNING !
Stay clear of motor shaft and coupling when jogging motor.



Top Shaft Drive



Bottom Shaft Drive
figure 4

Step 11
Lock out power to pump.

WARNING !
To avoid serious injury or death, do not install or service pump unless power is off and locked out.

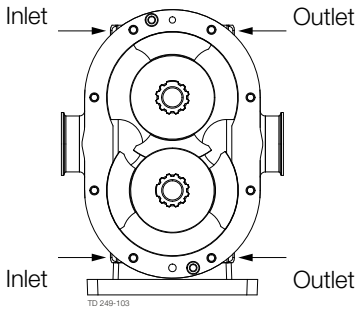
Installation should follow good practice to provide the best performance and installation must meet local code requirements. All system components must be correctly sized to provide satisfactory operation of your Alfa Laval product.

Step 12
Connect coupling halves and install coupling guard.

⚠
WARNING !
Do not operate pump without guards in place.

⚠
WARNING !
Do not put fingers in ports or near rotating members.

Step 13
Make sure inlet and outlet connections are tightened. If pump has double seals connect seal flushing piping. These connections are normally 3.18 mm (1/8") female pipe threads. Liquid used for flushing is thereby connected to the seals and discharged to drain on the opposite side. Flow should be about 0.92 l/h (1/4 GPM), but may be increased for high temperature applications, but should be kept as near to 0.92 l/h (1/4 GPM) as possible to avoid seal damage.



Step 14
Lubrication

Gears are lubricated with Micro-Plate #140 oil for top or bottom shaft mounting position and oil is added at the factory.
Oil Capacity

Model	Top or Bottom Shaft Mount	Side Mount
006	1.3 oz (40 ml)	3.3 oz (100 ml)
015	1.3 oz (40 ml)	3.3 oz (100 ml)
030	2.0 oz (60 ml)	4.0 oz (120 ml)
045	6.0 oz (170 ml)	9.5 oz (280 ml)
060	6.0 oz (170 ml)	9.5 oz (280 ml)
130	6.0 oz (170 ml)	9.5 oz (280 ml)
220	11.0 oz (320 ml)	20.0 oz (600 ml)

table 1

Bearings are greased with Micro-Plate Moly grease. Grease bearings after every 250 hours of operation; change oil every 500 hours. Where moisture and/or condensation are heavy change oil and grease more frequently. If temperature is -15°C (5°F) or below, bearings should be greased with silicon grease.

4.3 System design and installation

Pipework:
All pipework must be supported. The pump must not be allowed to support any of the pipework weight beyond the limits set as shown in the following table.

Remember:
Pipework supports must also support the weight of the product being pumped.

- Design short straight suction lines to reduce friction losses in the pipework thereby improving the NPSH available from the system.
- Avoid bends, tees and any restrictions close to either suction or discharge side of pump. Use long radius bends wherever possible.
- Provide isolating valves on each side of the pump when necessary.
- Keep pipework horizontal where applicable to reduce air locks. Include eccentric reducers on suction lines.

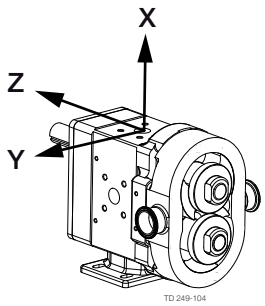


Table of Maximum Forces and Moments

Pipe dia. (mm)	$F_{(x,\ y\ or\ z)}$ max. (N)	$F_{(total)}$ max. (N)	$M_{(x,\ y\ or\ z)}$ max. (Nm)	$M_{(total)}$ max. (Nm)
25	190	270	85	125
40	255	360	115	170
50	295	420	145	210
80	425	600	215	315
100	505	720	260	385
125	610	870	325	480
150	720	1020	385	565

4.4 Startup checklist

- Has protection from high pressure been considered? See page 9.
- Are pump and all piping clean and free of foreign material, gaskets, weld slag, bolts etc.? **Do not use pump to clean system.**
- Are connections tightened and leak free?
- Is gear drive properly lubricated? See item 14 above.
- Are all guards in place and secure?
- Have seals requiring flushing been supplied with an adequate supply of clean flushing fluid?
- Are all valves open on the discharge side of the pump?
- Are all valves open on the inlet side of the pump, and is the material to be pumped reaching the pump?
- Is direction of rotation correct? See item 10 above.
- Jog or start pump at low speed when possible.

Check to see that pump is performing properly within several minutes. If problems are detected, see Troubleshooting Guide on page 23.

5.1 Cleaning and maintenance

Pump products are designed for easy removal of the cover, rotors and seals for cleaning when necessary. Disassembly and assembly of the pump head and seals starts on page 16.



WARNING !
To avoid serious injury or death, do not install or service pump unless power is off and locked out.



WARNING !
Relieve system pressure before removing cover or port connections.

CAUTION ATTENTION

Handle all parts with care to avoid nicks and scratches which may affect pump operation.



WARNING !
Installation and operation of the pump must always comply with health and safety regulations. Any hazardous and/or hot drained, or leaked liquid shall be disposed of in compliance with health and safety regulations.
If requested at the time of order, the equipment can be supplied with means of safe removal of any hazardous and/or hot, drained or leaked fluid.

5.2 Cleaning

Clean per established procedures. Be aware of the cleaning solution used (see MSDS), and of cleaning solution temperature. Make sure no residual cleaning solution stays in the pump.

Note that acidic cleaners have a high metal corrosion rate, so pump parts should be exposed to these cleaners no longer than necessary and be completely rinsed.

6 Maintenance

6.1 Preventive maintenance

Simple inspection during cleaning will often detect signs of a problem before it becomes serious so that it can be corrected at minimal cost and down-time.

Remove rotors. Use rotor nut wrench and soft faced hammer. Visually inspect rotor wing tips for signs of metal-to-metal contact. If present the pump should be repaired or replaced.

Possible causes:	
Worn shaft keyway	replace shaft.
Worn rotor keyway	replace rotor (usually both parts wear, often due to running a loose rotor).
Loose or worn gears, key, keyway shaft	inspect and replace as needed.

Visually inspect the rotor hub where it contacts the shoulder on the shaft for wear.

Possible cause:	
Running loose rotor	replace rotor and correctly tighten or re-shim shaft to maintain back-face clearance.

Inspect shoulder on shaft for wear.

Possible cause:	
Running loose rotor	replace or re-shim shaft.

Check gear backlash. Replace nuts and turn shaft with wrench. There should be no free movement of either shaft.

Possible causes:	
Worn gear teeth	replace gear
Gear loose on shaft	remove gear, inspect key, keyways and shaft. Replace worn parts and retighten.

Check condition of bearings. Hand load (about 30 lbs.) each shaft. There should be no detectable movement.

Cause of movement:	
Bearings worn due to lack of lubrication or overload	replace bearings and ensure adequate lubrication, reduce hydraulic load.

If gear box disassembly is required see instructions starting on page 19.
See page 19 for rotor installation. When pump is assembled, there must be equal clearance as shown in Figure 5.

Follow lubrication intervals as shown on page 11.

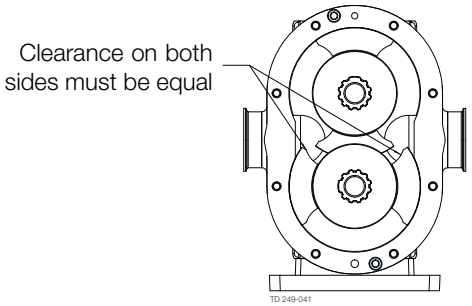


figure 5

6.2 Annual maintenance

Conduct the same checks as above, and in addition do the following:

Step 1
Check bearings for radial play using a dial indicator as shown. If indicator reading is equal or greater than the rotor-to-body clearance in the table on page 21, replace bearings. Refer to Figure 6.

Step 2
Drain oil, remove gear box cover and inspect gears for wear, backlash, and looseness. Retighten as needed.

Step 3
Carefully inspect rotors visually for worn splines, bearing shoulder wear, and for stress cracks. Replace worn or cracked rotors. Refer to Figure 7.

Step 4
Refer to Reference Table on page 21 and check radial and back face clearance to determine wear.

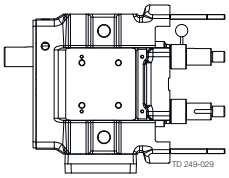


figure 6

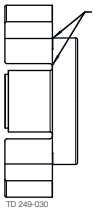


figure 7

See instructions under Pump Head and Seal Assembly and Disassembly below for disassembly and assembly. When replacing bearings or shafts in the field care must be taken to properly shim the shaft to provide the correct clearances between the rotors, body and cover.

Operating speed adjustment can compensate for wear in some applications. When performance is no longer acceptable you may take advantage of the Alfa Laval remanufacturing plan, as follows.

Remanufacturing program:

This series of Alfa Laval pumps may be remanufactured up to four times depending on use and wear. Remanufactured pumps are backed with the same warranty as a new pump. Factory remanufacturing involves body and cover remachining, new rotors, and replacement of all worn parts such as shafts, bearings, gears etc.

To facilitate the remanufacturing process contact the factory to discuss the particular pump(s) to be remanufactured and obtain return goods authorization. It may be possible to supply a remanufactured pump in advance of returning a pump to the factory although not all sizes may be available at any one time. Be sure to clean and flush pump before returning it to the factory.

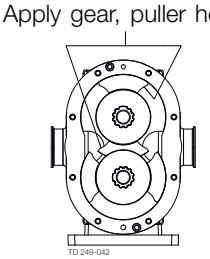


figure 8

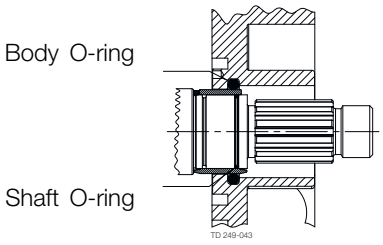


figure 9

7 Disassembly and assembly

7.1 Pump head and seal assembly and disassembly

Before disassembly, lock out power and release pressure from pump



WARNING !
To avoid serious injury or death, do not install or service pump unless power is off and locked out.



WARNING !
Relieve system pressure before removing cover or port connections.

CAUTION ATTENTION

Handle all parts with care to avoid nicks and scratches which may affect pump operation.

Step 1
Pump head disassembly
Remove wing nuts using a soft hammer. Remove cover.
If necessary, tap cover with soft hammer to loosen. Remove and discard cover O-ring.
Use wrench supplied to remove rotor nuts. Nuts remove in a counter clock-wise direction. Hit wrench sharply with soft hammer to loosen nuts.
Orient rotors perpendicular to each other, then remove rotor with both wings exposed first. If necessary use gear puller or hardwood lever to remove rotor from spline.
If fitted with Allen head hold down bolts in the body remove them, then remove pump body by pulling it straight off studs. Note that the pump body must be assembled to the same bearing housing from which it was removed.

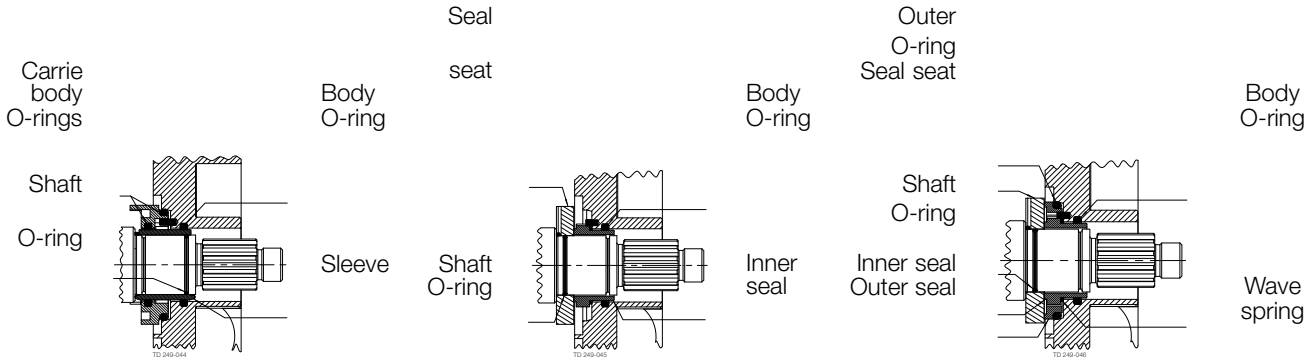
Step 2
Seal disassembly

Single O-ring
Remove and discard body and shaft O-rings. Use O-ring removal tool furnished with pump.

Double O-Ring
Remove O-ring carriers; remove and discard rings from both carriers and body. Use O-ring removal tool furnished.

Single Mechanical Seal
Inner seal:
Remove seal from body. If chipped, scratched or evidence of cracks, discard seal. Make sure shoulder is clean; remove burrs if present; remove and discard O-rings.

Seal seat:
Remove seal seat from shaft. If chipped, scratched or evidence of cracks, discard seal. Make sure shoulder is clean; remove burrs if present; remove and discard O-rings.



Double Mechanical Seal
Inner Seal:
Remove seal from body. If chipped, scratched or evidence of cracks, discard seal. Make sure shoulder is clean; remove burrs if present; remove and discard O-rings.

Seal Seat:
Remove seal seat from shaft. If chipped, scratched or evidence of cracks, discard seal. Make sure shoulder is clean; remove burrs if present; remove and discard O-rings.

Outer Seal:
Remove seal from body. If chipped, scratched or evidence of cracks, discard seal. Remove and discard O-rings.

Step 3
Seal Assembly
Prior to reassembling the pump head inspect all parts to make sure they are free from damage. Nicks, scratches and cracks in mechanical seal components may cause seal leakage, and nicks, scratches and burrs on any pump part may cause leakage or performance problems. Refer to sketches with disassembly instructions.

Single O-ring
Apply a suitable O-ring lubricant to new O-rings and insert them into the body and shaft grooves. O-rings on shafts should be installed in the groove closest to the spline.
Assemble shaft sleeves against shaft shoulder. If sleeve is slotted, assemble with slot over drive pin in shaft. If sleeve has prongs assemble with prongs on either side of drive pin.

Double O-ring
Apply a suitable O-ring lubricant to new O-rings and insert them into the body, carrier and shaft grooves. O-rings on shafts should be installed in the groove closest to the spline when using O-ring seats. Assemble carriers into body so carrier notch engages pin in body.
Assemble shaft sleeves against shaft shoulder. If sleeve is slotted, assemble with slot over drive pin in shaft. If sleeve has prongs assemble with prongs on either side of drive pin.

Single Mechanical Seal
Seal Seat:
Apply a suitable O-ring lubricant to new O-rings and insert them into shaft grooves furthest from spline.
Install seal seats lining up groove on rear face with shaft drive pin.

Inner Seal:
Apply a suitable O-ring lubricant to new O-rings and insert them into body grooves.
Assemble wave spring on seal and install into body with notch engaging pin in body.
Lubricate seal faces.

Double Mechanical Seal
Seal Seat:
Apply a suitable O-ring lubricant to new O-ring and insert into shaft groove furthest from spline.
Install seal seat lining up groove on rear face with shaft drive pin.

Inner Seal:
Apply a suitable O-ring lubricant to new O-ring and insert into body groove.
Assemble wave spring on seal and install into body with notch engaging pin in body.

Outer Seal:
Apply a suitable O-ring lubricant to new O-rings and install on outer diameter of seal.
Insert seal assembly into body engaging notch with pin and pushing from opposite side, over and in, to seat O-ring.
Apply lubricant to seal faces.

Step 4
Pump head assembly
Slide body over shafts and studs taking care not to damage seal parts. Press body firmly against gear case engaging dowels.
Install Allen Head bolts, where furnished.
Assemble rotor to its shaft engaging the large spline tooth with large groove in rotor. Rotate shaft until rotor wings are on a vertical centerline, then install second rotor. Secure with rotor retaining nuts: tighten first nut on shaft by striking nut wrench with soft faced hammer, then tighten second nut against first in the same way to jam nuts together.
Place cover O-ring in groove, push cover over studs making sure O-ring remains in groove.
Attach wing nuts and tighten by striking with a soft hammer.
Sterilize pump in accordance with accepted sterilization procedures. Make sure no residual solution remains in the pump.

7.2 Gear box disassembly and assembly

Gear box disassembly

Step 1
Remove pump head as shown starting on page 16 and drain oil from gear box.

Step 2
Remove cap screws. Remove cover using soft hammer to loosen.

Step 3
Scrape sealant from gear box and cover.

Step 4
Remove oil seal from cover using an arbor press. Discard seal.

Step 5
Using hammer and drift pin straighten locking tab on lock washers.

Step 6
Prevent shafts from turning by wedging a wooden block between the gears.

Step 7
Use a spanner wrench or drift pin to remove the gear lock nuts.

Step 8
Wrap splines and ends of shafts with tape to protect them.

Step 9
Remove front bearing retainer bolts and retainers. Remove sealant from retainers and gear box. (Retainer will press out when shaft is removed if it is stuck in place.)

Step 10
Place gear box on arbor press with pump head end down. Protect shaft ends with a wooden block and press shafts out of gear box.

Step 11
Remove sealant from bearing retainers, press out and discard grease seals.

Step 12
Remove shims. If they will be reused identify the shaft on which they were used. Press out and discard rear grease seals. Refer to Figure 9.

Step 13
Use hydraulic press and V blocks to remove bearings and spacer.

7 Disassembly and assembly

Gear box assembly

Step 1
Coat front bearing area of shaft with Micro-Plate grease and position shaft in hydraulic press with spline down.

Step 2
Place front bearing over shaft with shield side up. Press onto shaft until bearing is seated against shoulder. Place bearing spacer over shaft to seat on front bearing.

Step 3
Coat rear bearing area on shaft with Micro-Plate grease. Slide rear bearing over shaft with shield side down. Press bearing onto shaft until it seats against spacer.

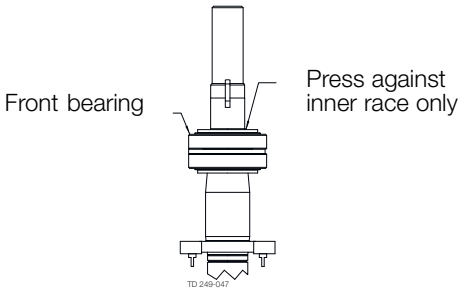


figure 15

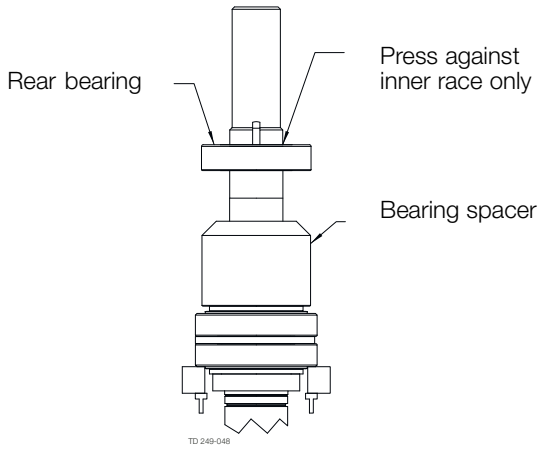


figure 16

Step 4
The pumps have close running tolerances to provide efficient operation. The position of the rotors is controlled by the use of shims behind the front bearing in the gear box . These shims control both the backface clearance between the rotors and the bottom of the rotor pocket in the housing and the clearance between the rotors and the cover. See page 21 for these dimensions. Clearance for both rotors should be equal to avoid rotor-to-rotor contact. To establish the correct shim thickness, make the following measurements in 0.025 mm (0.001 inches):

A. Measure body width.
B. Measure depth of rotor bore.
C. Measure distance from gear box face to bottom of front bearing pocket in gear box.
D. Slide rotor onto shaft and measure from back of rotor to back of front bearing.

Do calculations for shim thickness:

A – B = X
C + X = Y
(Y – D) + required backface clearance (from Reference Table, page 21) = shim thickness.

Repeat measurements for second rotor.

Step 5
Place shim stock in the required thickness against shoulder in the bearing bore.

Step 6
Place gearbox on arbor press with front (pump) end up. Place shaft assemblies in gear box with spline end up and with shafts in the correct location to provide top or bottom drive as required. Press shafts into housing until bearing is seated against shims.

Step 7
Place body on gear box, making sure it is firmly seated. Install rotors on shafts. Secure with rotor retaining nuts: tighten first nut on shaft by striking nut wrench with soft faced hammer, then tighten second nut against first in the same way to jam nuts together. Check back face clearance against value on page 21. If necessary remove rotors, then remove shafts to adjust shim thickness.

Step 8
When back face clearance has been established in accordance with the value shown on page 21, remove body and secure shaft assemblies in the gear box with bearing retainers. Do not apply sealant at this time. Retainers must seat firmly against the bearing and leave 1.27-1.52 mm (0.050-0.060") clearance between retainer and gear box.
Use shims if needed to obtain this clearance. Refer to Figure 12.

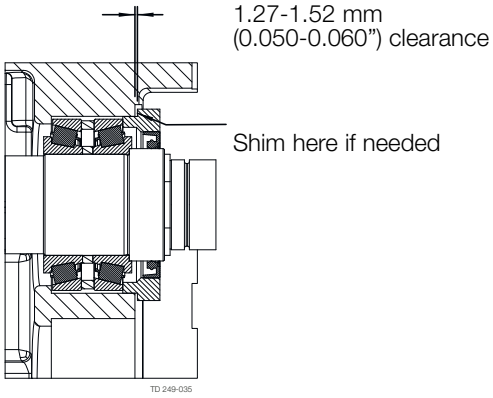
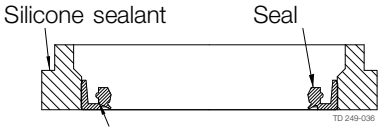


figure 12



Coat with micro-plate #555
figure 13

Step 9
Make sure backface clearance is correct. Remove bearing retainers and grease both front and rear bearings through grease fittings until grease is visible around ball assemblies.

Step 10
Install grease seals in bearing retainers. Coat seal lips with Micro-Plate #555 grease. Coat retainer flanges with silicone sealant. Install retainers. Refer to Figure 13.

Step 11
Install rear oil seals and rear gear spacers.

Step 12
Please keys into shaft key slots. Slide gear with single punch mark onto drive shaft. Slide gear with two punch marks onto short shaft, with punch marks aligned on each side of single mark on drive gear.

Step 13
Install lock washers and lock nuts onto shafts. Tighten locknut with spanner wrench. Bend locking tab on lockwasher to secure.

Step 14
Press in rear seal with lip facing inward. Refer to Figure 14.

Step 15
Place silicone sealant on back of gear case and mount cover assembly on case.

Step 16
Fill gear case with oil as specified on page 11.

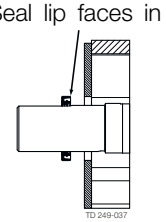


figure 14

Reference table

Model application	Standard Clearances					
	Back face		Rotor to body		Front face	
	mm	in	mm	in	mm	in
006	0.038/0.051	0.0015 / 0.0020	0.051/0.076	0.0020 / 0.0030	0.102/0.152	0.0040 / 0.0060
015	0.038/0.051	0.0015 / 0.0020	0.051/0.076	0.0020 / 0.0030	0.089/0.152	0.0035 / 0.0060
018 & 024	0.038/0.051	0.0015 / 0.0020	0.051/0.076	0.0020 / 0.0030	0.102/0.118	0.0040 / 0.0065
030 & 034	0.051/0.064	0.0020 / 0.0025	0.0584/0.097	0.0023 / 0.0038	0.089/0.152	0.0035 / 0.0060
060 & 064	0.076/0.089	0.0030 / 0.0035	0.097/0.145	0.0038 / 0.0057	0.139/0.229	0.0055 / 0.0090
130 & 134	0.076/0.089	0.0030 / 0.0035	0.109/0.160	0.0043 / 0.0063	0.127/0.191	0.0050 / 0.0075
220 & 224	0.102/0.127	0.0040 / 0.0050	0.114/0.118	0.0045 / 0.0065	0.127/0.191	0.0050 / 0.0090

Model application	Standard Clearances					
	Back face		Rotor to body		Front face	
	mm	in	mm	in	mm	in
006	0.038/0.051	0.0015 / 0.0020	0.084/0.076	0.0033 / 0.0030	0.102/0.152	0.0040 / 0.0060
015	0.038/0.051	0.0015 / 0.0020	0.091/0.076	0.0036 / 0.0030	0.089/0.152	0.0035 / 0.0060
018 & 024	0.038/0.051	0.0015 / 0.0020	0.086/0.076	0.0034 / 0.0030	0.102/0.118	0.0040 / 0.0065
030 & 034	0.051/0.064	0.0020 / 0.0025	0.102/0.097	0.0040 / 0.0038	0.089/0.152	0.0035 / 0.0060
060 & 064	0.076/0.089	0.0030 / 0.0035	0.160/0.145	0.0063 / 0.0057	0.139/0.229	0.0055 / 0.0090
130 & 134	0.076/0.089	0.0030 / 0.0035	0.173/0.160	0.0068 / 0.0063	0.127/0.191	0.0050 / 0.0075
220 & 224	0.102/0.127	0.0040 / 0.0050	0.201/0.118	0.0079 / 0.0065	0.127/0.191	0.0050 / 0.0090

Model application	Standard Clearances					
	Back face		Rotor to body		Front face	
	mm	in	mm	in	mm	in
006	0.089/0.051	0.0035 / 0.0020	0.127/0.152	0.0050 / 0.0060	0.178/0.241	0.0070 / 0.0095
015	0.114/0.051	0.0045 / 0.0020	0.127/0.152	0.0050 / 0.0060	0.165/0.254	0.0065 / 0.0100
018 & 024	0.114/0.051	0.0045 / 0.0020	0.109/0.132	0.0043 / 0.0052	0.191/0.279	0.0075 / 0.0110
030 & 034	0.127/0.064	0.0050 / 0.0025	0.109/0.145	0.0043 / 0.0057	0.178/0.267	0.0070 / 0.0105
060 & 064	0.152/0.089	0.0060 / 0.0035	0.191/0.241	0.0075 / 0.0095	0.254/0.356	0.0100 / 0.0140
130 & 134	0.152/0.089	0.0060 / 0.0035	0.191/0.241	0.0075 / 0.0095	0.254/0.356	0.0100 / 0.0140
220 & 224	0.191/0.127	0.0075 / 0.0050	0.191/0.279	0.0090 / 0.0110	0.241/0.343	0.0095 / 0.0135

8.1 Troubleshooting guide

A properly sized and installed pump should provide trouble- free operation; however, problems in pumping systems may occur over time. The following information may help in identifying and resolving such problems:

Problem	Possible cause(s)	Solution(s)
Pump not turning	Drive motor not running	Check circuit breakers, fuses
	Keys sheared or missing	Replace keys
	Drive belts, etc. slipping or broken	Adjust or replace
	Shaft or gears sheared	Replace
No flow, pump turning	Rotation in wrong direction	Reverse rotation
No flow, pump not priming	Inlet valve closed	Open valve
	Inlet line clogged	Clean line and filters
	Air leaks because of bad seals and/or pipe connections	Replace seals, pressurize lines to check for leakage
	Speed of pump too slow	Increase speed, fill inlet lines, install foot valve
	Liquid drains or siphons	Install foot or check valves
	Air lock due to fluids that may vaporize or allow gas to come out of solution	Install air bleed in lines near pump
	Excess clearance between rotors, body and cover	Increase pump speed, install foot valve, have pump rebuilt
	Net inlet pressure too low	Check Net Inlet Pressure Available at Pump and Net Inlet Pressure Required by Pump. Calculate system and modify inlet system as needed.
	With vacuum inlet system, atmospheric “blow back” prevents pump from starting flow	Install check valve in discharge line
No flow	Relief valve not properly adjusted or held open by foreign material	Adjust or clear valve
Fluid vaporization (starved Pump inlet)	Filters, valves, inlet filters or lines clogged	Clean
	Inlet line too small or too long, too many valves or fittings, filter too small	Make necessary changes
	Net Inlet Pressure Available at Pump too low	Increase level in source tank or pressurize tank Select larger pump with less inlet pressure required
	Viscosity of pump fluid higher than anticipated	Reduce pump speed (lower flow will result) or modify system
	Temperature of fluid higher than anticipated	Provide cooling, reduce speed, modify system to increase available inlet pressure
Insufficient flow	Speed too low	Increase speed
	Air leaks because of bad seals and/or pipe connections	Replace seals, pressurize lines to check for leakage
Relief valve not adjusted or held	Adjust/clean	Open
	Flow diverted in system	Check system valves and controls
	Hot clearance rotors used with “cold” or low viscosity fluid	Replace with standard rotors
	Worn pump	Increase speed, recondition pump
	Pressure too high	Modify system
Noisy operation	Cavitation due to high fluid Viscosity, high vapor pressure or high temperature	Reduce speed and/or temperature, modify system
	Inlet Pressure Available less than Inlet Press Required	Modify System
	Air or gas in system due to system leaks	Fix leaks
	Dissolved gas or naturally aerated products	Reduce discharge pressure, reduce speed and/or temperature, modify system
	Rotor to body contact	Check back face and rotor to cover clearances and reshim as necessary Check for distortion of pump due to Installation of piping. Reassemble pump and/or re-install piping
	Pressure higher than pump is Rated	Reduce pressure
	Worn bearings or gears	Replace as needed, ensure regular lubrication
	Rotor to rotor contact noise due to twisted shaft, sheared keys, loose or mistimed gears, worn splines	Rebuild with new parts as needed
	Relief valve chattering	Readjust, repair or replace valve
	Drain train components	Lubricate, repair or replace as needed
Pump overheats, stalls, draws excessive current (trips breaker, blows fuses)	Higher viscous losses than anticipated	If pump is within rating, increase drive size
	Pressure higher than anticipated	Reduce speed, increase line size
	Fluid colder than anticipated, high viscosity	Heat fluid/insulate and heat lines, increase running clearances
	Fluid sets up during shutdown	Insulate or heat lines, install recirculating or “soft start” drive, flush with different fluid
	Fluids such as chocolate, latex build up on internal pump surfaces	Increase running clearances
Pump service life not as long as expected	Misalignment of drive and piping, excessive pump overhang	Align piping and drive
	Abrasive fluid	Use larger pump at slower speed
	Bearings and gears lack lubrication	Establish and follow lubrication schedule
	Speeds and pressures higher than pump is rated	Reduce speed and pressures by system modification
	Pump corrodes	Upgrade material used in pump

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