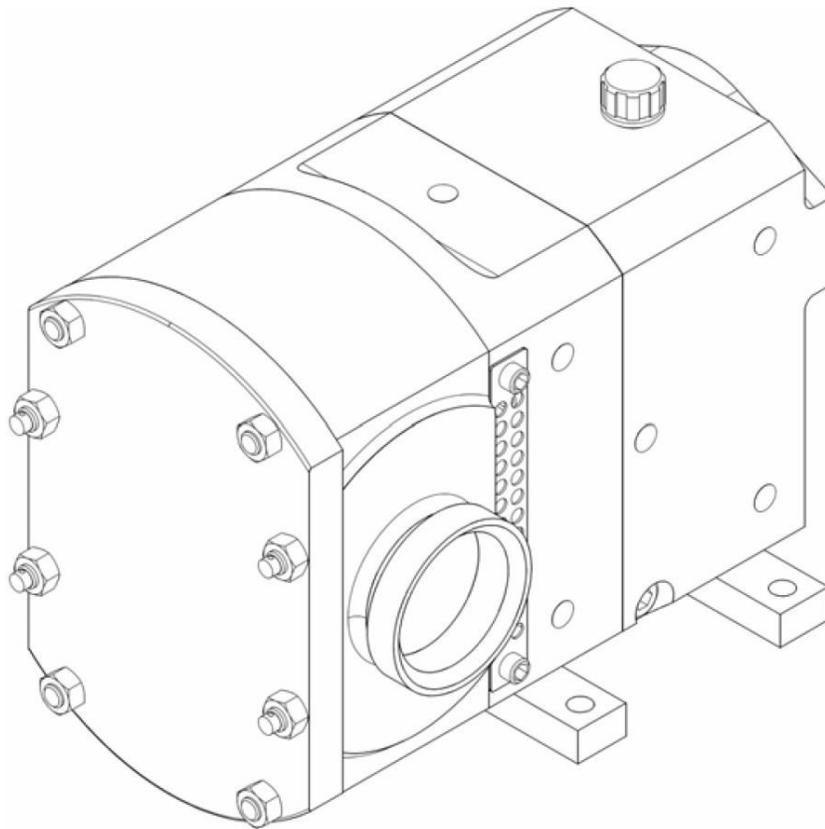


## OPERATION, MAINTENANCE and INSTALLATION MANUAL and PARTS LIST



ROTARY  
LOBE  
PUMP

STP 125

STP125  
VERSION: 03  
February 3, 2015



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# Operation Manual

## 1.0 General

### 1.1 Pump limits of application or use

This pump has been designed for pumping a range of viscosities from water to semi-solid, suitable for both homogeneous liquids and liquids with non abrasive particles/solids in suspension.

Speeds to 1000rpm and temperatures to 158°F can be accommodated on this pump. These conditions cannot always be accommodated simultaneously.

The STP125 has been designed to operate at a maximum continuous discharge pressure of 145 psi. However the STP125 is capable of withstanding discharge pressures up to a maximum of 160 psi intermittently. At pressures above 145 psi there is the possibility of leakage from the primary seal, if this occurs and the seal continues to leak at pressures below 145 psi it is an indication that the primary seal may have been permanently damaged and should be replaced at the earliest opportunity. Continuous operation at pressures above 145 psi will result in premature failure of the pump.

If the user has not specified the pumping application or needs to change it, it is important to confirm that the materials of construction and product seals are compatible with the pumping application and that adequate NPSH is available.

For specific guidelines contact your supplier quoting pump serial number, system and duty details. (e.g. media, pressure(s), flowrate, pumping temperatures etc).

### 1.2 Duty conditions

The pump should only be used for the duty for which it has been specified. The operating pressure, speed and temperature limits have been selected at the time of order and **MUST NOT** be exceeded.

These details are stated on the original documentation and if not available may be obtained from your supplier quoting pump serial number.

### 1.3 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 85dBA. When necessary personal protection against noise should be taken to safeguard the hearing of persons who are likely to be in close proximity to the equipment.

## Page 3 Utility requirements

### Electrical supply:-

This pump may be supplied bare shaft or coupled to an electric motor.

### Hydraulic supply:-

This pump may be coupled to a hydraulic motor.

### Temperature control:-

Temperature control jackets will require appropriate hot or cold media supply i.e. oil/water/steam.

## 1.5 Safety precautions

All warnings in this manual are summarised on this page.

Pay special attention to the instructions below so that severe personal injury or damage to the pump can be avoided.

Personnel performing installation, operation and maintenance of the pump must have the relevant experience required.

### Warning Signs



General safety instructions are preceded by this symbol.



Electrical safety instructions are preceded by this symbol.



Take great care when using caustic agents.

### Installation



**Always** observe the technical data.



The pump **must** be electrically connected by authorised personnel. (See the motor instructions supplied with the drive unit).



**Never** start in the wrong direction of rotation with liquid in the pump.



**Never** put your hands or fingers inside the port connections

### Operation



**Always** observe the technical data.



**Never** touch the pump or the pipelines when pumping hot liquids or when sterilising.



**Never** stand on the pump or pipelines.



**Never** run the pump with the suction side and/or the pressure side blocked.



**Always** handle toxic and acidic liquids with great care.



**Never** put your hands or fingers inside the pump or port connections.

### Maintenance



**Always** observe the technical data.



**Always** secure the pump during maintenance and transportation.



**Always** disconnect the pump from the drive unit and power supply when servicing the pump.



The pump must **never** be hot when servicing it.



The pump and pipelines must **never** be pressurised when servicing the pump.



**Never** put your hands or fingers inside the port connections.

**Study this manual carefully**

# Operation Manual

## 1.6 Health and safety information

### Potential safety hazards

The following section gives information on handling, storage and disposal of parts and materials used in the pumps which may be considered hazardous to health.

Please pass this information on to your Safety Officer, he may need it to comply with Health and Safety, and COSHH regulations.

### General first aid

If potentially hazardous substances are accidentally inhaled, or skin or eyes contaminated, then the following basic precautions should be taken

- Inhalation - Move to fresh air
- Skin - Wash with soap and water
- Eyes - Flush with water, seek medical attention

In all cases, if symptoms persist, seek medical attention.

Material	Use	Major hazard
SILICONE SEALANT	GEARBOX SEAL RETAINERS, GENERAL SEALANT.	RELEASES VAPOUR AT ROOM TEMPERATURE.
ANTI-SEIZE COMPOUNDS	BEARINGS	APPLIED FROM AEROSOL. RELEASES VAPOUR. DISPOSE OF CONTAINER AS IF PRESSURISED.
OIL AND GREASE	OIL - GENERAL LUBRICATION GREASE - PRODUCT SEALS, TIMING GEARS, GENERAL LUBRICATION.	SKIN AND EYE IRRITANT.
PLASTIC COMPOUNDS (PTFE, POLYPROPYLENE, PVC)	PTFE - 'O' RINGS, LIP SEALS	RELEASES FUMES WHEN HEATED.
ELASTOMERIC COMPOUNDS (EP, VITON, NITRILES, PTFE)	'O' RINGS, LIP SEALS	RELEASES FUMES WHEN HEATED.
PAINT	EXTERNAL PUMP SURFACES.	RELEASES DUST AND FUMES IF MACHINED. TREAT AS A FIRE HAZARD.

## 2.0 Unpacking, handling and storage

To avoid any problems, on receipt of your pump always use the following procedure:-

### 2.1 Documents

1. Check the delivery note against the goods received.

### 2.2 Unpacking

Care must be taken when unpacking the pump, and the following stages must be completed:-

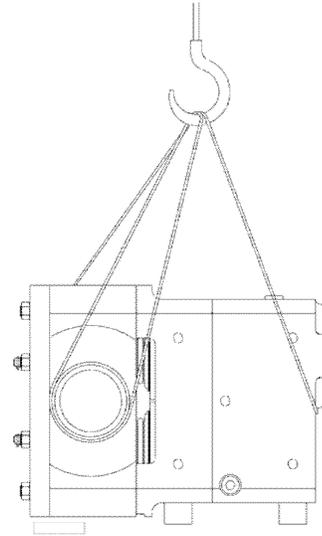
1. Inspect the packing for any possible signs of damage in transit.
2. Carefully remove the packing.
3. Inspect the pump for any visible signs of damage.
4. Remove packing from the pump port connections.
5. Ensure that any additional equipment such as seal flushing pipework is not damaged.

### 2.3 Handling

Refer to the pump weights guide, prior to using any lifting gear. Use the correct lifting slings for the pump weight.

An M10 x 15 tapping has been provided suitable for the fitting of an eyebolt to enable the pump to be lifted either with or without the hydraulic drive fitted. Alternatively slings should be wrapped around the ports and the hydraulic drive flange.

**Note :** To stop the slings slipping always cross the slings at the lifting hooks.



**Bareshaft pump**

### 2.4 Pump storage

After receipt and inspection if the pump is not to be installed immediately the pump should be repacked and placed in suitable storage. The following points should be noted:-

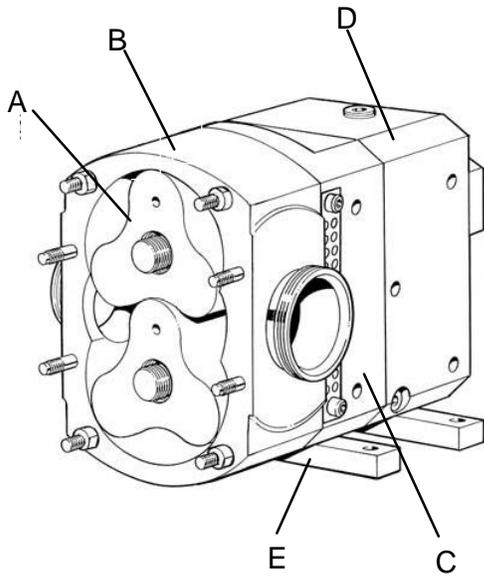
1. Plastic or gasket type port covers should be left in place.
2. Pumps received wrapped with corrosion inhibiting treatment material should be re-wrapped.
3. A clean, dry storage location, free from vibration should be selected. When a moist dusty atmosphere must be used for storage, further protect the pump or unit with a moisture repellent cover until it is to be installed.
4. Rotate pump by hand, weekly, to prevent bearing damage.
5. All associated ancillary equipment should be treated similarly.

# Operation Manual

## 3.0 Description of pump or pump unit

### 3.1 General pump description

The pump supplied is a positive displacement pump, which may be supplied bare shaft (see below) or with a drive unit . The drawing below indicates various parts of the pump.

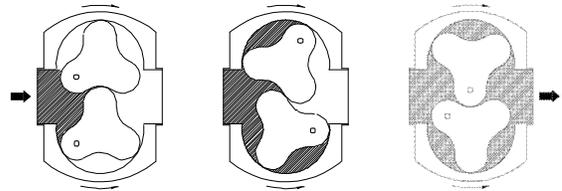


**Bareshaft pump**

### 3.2 Principle of operation

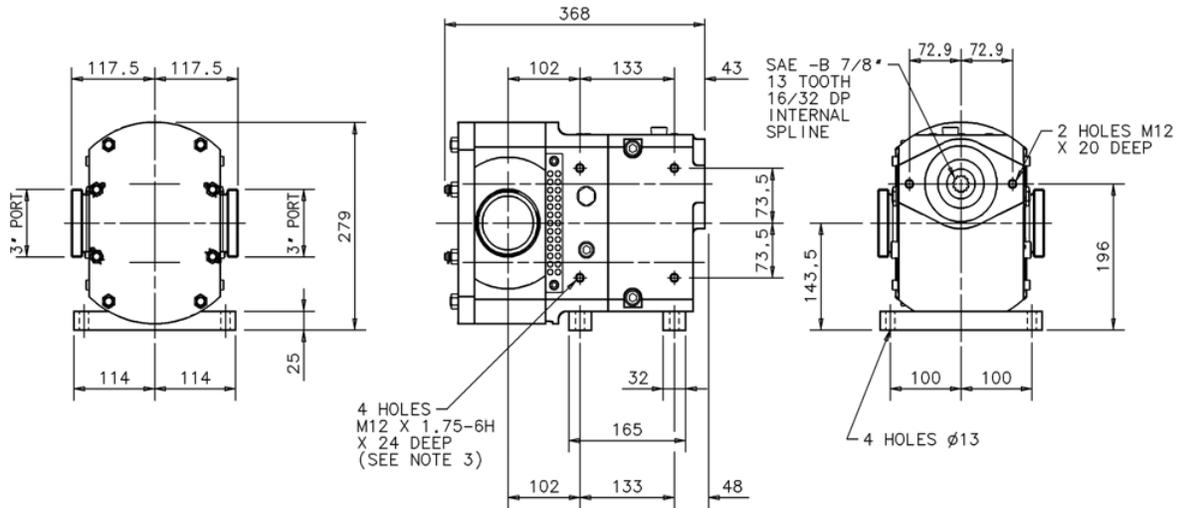
The pumps are of the positive displacement rotary type with trilobe rotors. The direction of flow is reversed by changing the direction of rotation of the pump's drive shaft. The pumping principle is as follows.

The volume at the inlet increases when the rotors rotate and the product is drawn into the pump. It is then transported in the space between the lobes and the periphery of the rotorcase to the discharge side, where volume between the rotors is reduced and the product is discharged.



Item	Description
A	Rotors
B	Rotorcase
C	Bearing Housing
D	Gear Housing
E	Feet

**3.3 Pump dimensions - horizontally ported pump**



The above dimensions are for guidance only and should not be used for installation purposes. Certified dimensions are available upon request.

**3.4 Pump weight**

Pump weight (dry) with plain cover 139 lb.  
 Pump weight (dry) with relief valve 147 lb.

**The above weights are for guidance only and will vary depending upon the specification of the pump.**

**3.5 Pump displacement**

Pump displacement per revolution is 0.28 US gall.

**3.6 Pump information chart**

Pump	Max flowrate (US gall/min)	Max pressure (psi)	Max speed (rev/min)	Max Pressure at max CIP Temp of 266°F (psi)
STP125	280	145	1000	45

**3.7 Pressure relief valve**

A integral relief valve is available. It can be used regardless of the direction of rotation. A manual override is also available.

The relief valve is designed to partially protect the pump from damage caused by over-pressurisation. The relief valve is preset at 145 psi.

Over pressurisation can occur if :-

1. A valve is closed against the pump discharge.
2. The product viscosity in the system is significantly increased.
3. The pump speed is increased.

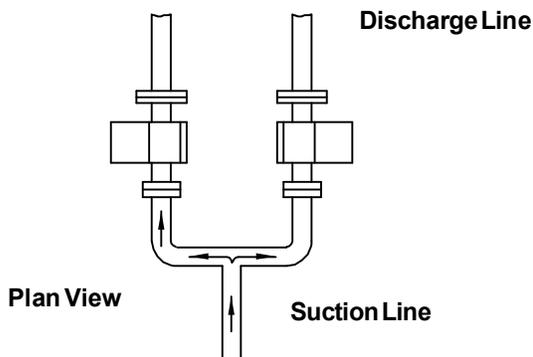
# Operation Manual

## 4.0 System design and installation

### 4.1 System design advice

When designing the pumping system :-

- Do** - Confirm with the supplier the Net Positive Suction Head (NPSH) requirements for the system, as this is crucial for ensuring the smooth operation of the pump and preventing cavitation.
- Do** - Avoid suction lifts and manifold/common suction lines for two pumps running in parallel, as this may cause vibration or cavitation.



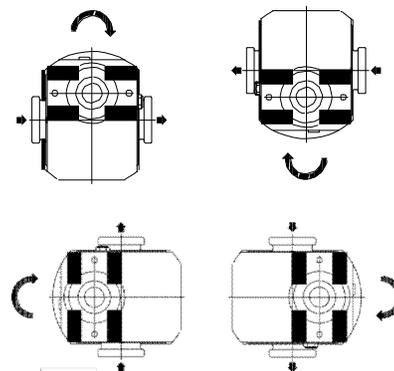
- Do** - Install a non-return valve to prevent turbinning when high pressures are applied to the pump whilst it is not in use.
- Do** - Install valves if two pumps are to be used on manifold/common discharge lines.
- Do** - Make the necessary piping arrangements if steam is required for heating /cooling tanks.

**Do not-** Subject the pump to rapid temperature changes during C.I.P. (Cleaning in Place) procedures. **Pump seizure can result from thermal shock.** A suitable by-pass is recommended.

- Do** - Protect the pump against blockage from hard solid objects e.g. nuts, bolts etc. Also protect the pump from accidental operation against a closed valve by the use of relief valve, pressure switch, etc..
- Do** - Fit suction and discharge pressure monitor points as close to the pump ports as possible for diagnostic purposes.

### 4.2 Direction of rotation

The direction of flow is dictated by the direction of rotation of the drive shaft. Reversing the direction of rotation will reverse the flow direction.



### 4.3 Pipework

All pipework **must** be supported. The pump **must not** be allowed to support any of the pipework weight.

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

**Always :-**

**Have -** Suitably sized short straight suction lines to reduce friction losses in the pipework thereby improving the NPSH available.

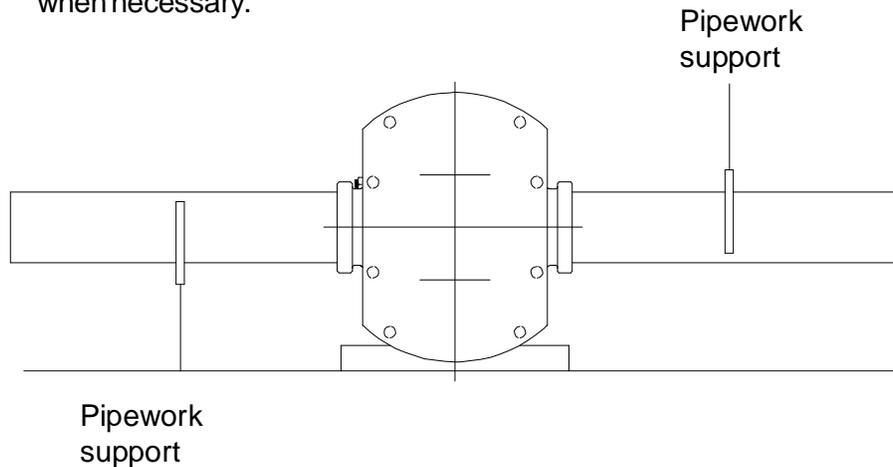
**Avoid -** Bends, tees and any restraints close to either suction or discharge side of pump. Use long radius bends wherever possible.

**Provide -** Valves on each side of the pump to isolate the pump when necessary.

**Keep -** Pipework horizontal where applicable to reduce air locks. Include eccentric reducers on suction lines if required.

**Check -** Coupling alignment during installation.

**Use -** Flexible connections between tank pipework and suction port where conditions allow.



### 4.4 Port Orientation

The pump can be mounted in either horizontal or vertical port orientation by changing the pump mounting feet and its position. Pump should not be side mounted when fitted with vertically ported feet.

# Operation Manual

## 5.0 Commissioning

When taking delivery of a new or refurbished pump unit it is essential to check that the gearbox is filled with the correct quantity of oil to the centre of the sight glass, with one of the recommended grades of lubricant in the table below. Failure to have the correct grade and level of oil in the gearbox prior to installation and start-up, could result in serious damage to the internal components.

The oil filler cap does not require to have vent/breather hole. Using this type of solid filler cap prevents the ingress of dirt and cleaning solutions that would contaminate the lubricant and reduce or destroy its effectiveness. If this cap is lost at any time it is important that a replacement of the same type is fitted immediately.

### 5.1 Lubricating the pump

The gearbox should be filled to the mid point of the sight level glass. This requires approximately 0.4 US gall of oil for a Horizontally ported pump and 0.25 US gall for a Vertically ported pump.

### 5.2 Recommended lubricants

Make	Grade
	-4°F +266°F
BP Energol	GR-XP150
Castrol Alpha	SP150
Mobil Gear	629
Shell Omala	150
Texaco Meropa	150
Esso Spartan	150

If none of the above manufacturers grades are obtainable a suitable alternative high grade 80-90 gear lubricant may be used

### 5.3 Changing the oil :-

The pump will **not** be supplied oil filled.

First change - After 150 hours of operation or after 1 month, whichever comes first.

Subsequent changes - Every 3000 hours of operation or annually, whichever comes first.

Only use the recommended oil types.

### 5.4 Oil capacity

Pump Model	Porting	US Gall.
STP125	Horizontal	0.4
STP125	Vertical	0.25

**6.0 Start up, shut down and Cleaning in Place**

	<b>Yes</b>	<b>No</b>
<b>6.1 Pump Start Up Check List</b>		
1. Has the pipework system been flushed through to purge welding slag and/or any other hard solids?	<input type="checkbox"/>	<input type="checkbox"/>
2. Have all obstructions been removed from the pipework or pump?	<input type="checkbox"/>	<input type="checkbox"/>
3. Are the pump connections and pipework joints tight and leak-free?	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there lubrication in the pump and drive unit?	<input type="checkbox"/>	<input type="checkbox"/>
5. Are the pipework valves open?	<input type="checkbox"/>	<input type="checkbox"/>
6. Are all safety guards in place?	<input type="checkbox"/>	<input type="checkbox"/>
7. Start then stop the pump to check that the product is flowing in the correct direction?	<input type="checkbox"/>	<input type="checkbox"/>
8. Are the pump speed/pressure and temperature settings below the pump maximum limitations?	<input type="checkbox"/>	<input type="checkbox"/>

**When all answers are 'yes', the pump may be used.**

**If there are any pumping problems refer to the fault finding chart**

# Operation Manual

## 6.2 Pump shut down procedure

1. Turn the pump off.
2. Isolate the pump/drive from all power and control supplies.
3. Close the pipework valves to isolate the pump.
4. Ensure all auxiliary services such as heating/cooling tanks supply etc. are isolated.
5. If the pump is to be dismantled, refer to section 8 of this manual.

## 6.3 Cleaning In Place (CIP)

The pump can be manually cleaned or cleaned in place(CIP). The following is an example of a typical CIP procedure. Specific requirements for each application should be dictated by the carrier/shipper.

- Determine last product handled by the pump
  - Remove the dust caps and/or fittings from the pump, rinse any residue from them with hot water.
  - Connect hot water hose to the pump inlet or connect pump inlet to the tank trailer outlet valve during the tank's hot water cleaning cycle.
  - When not fitted connect a ball or gate valve (to restrict liquid flow) to the pump discharge outlet.
  - If driven hydraulically, ensure that the hydraulic proportional control valve is in the neutral position.
  - If driven hydraulically or electric/hydraulically, start system and run at normal operating speed. Open the ball or gate valve on the pump cleaning system so the hot water or cleaning solution from the tank flows into the pump. (hot water should be 176°F to 194°F) If hydraulically driven, select forward on the proportional control valve and slowly increase (by pushing the handle) to full pump speed. When driven electrically start the system and slowly increase the speed with the handwheel on the belt variator.
  - Using the ball or gate valve, (to restrict liquid flow) increase the pump pressure to approximately 60-75 psi while it is operating. A pressure gauge at the discharge outlet will be required. This will ensure that the cleaning solution is cleaning the pump under high pressure conditions.
  - Run the pump for 15 minutes under this pressure.
- Relief Valve Pumps Only**  
***WARNING: Do not complete this next step if your pump does not have a relief valve !!***
- Close the ball or gate valve (to restrict liquid flow) until the pump relief valve actuates. Open the valve and close it again. Open valve once again - this should have now cleaned any residue from behind the relief valve diaphragm and any other close tolerance areas inside the pump.
  - Shut down pump system in reverse order of above.
  - Clean all external fittings from the fittings box with hot water and return.
  - Remove all hose and fittings from the pump, bag ends and seal the ports.

### **IMPORTANT**

Do not subject the pump to rapid temperature changes as pump seizure can result from thermal shock.

# Operation Manual

## 7.0 Maintenance and inspection

### 7.1 Maintenance schedule

It is advisable to install pressure gauges on both sides of pump as close as possible to the ports so that any problems within the pump/ pipework will be highlighted.

#### Your weekly schedule should include:

- Checking the **oil level** in the gearcase
- Checking the **product seals** for leakage and replace as necessary. The pump has been designed to operate at a maximum continuous discharge pressure of 145 psi. However, it is capable of withstanding discharge pressures up to a maximum of 160 psi intermittently. At pressures above 145 psi there is the possibility of leakage from the primary seal, if this occurs and the seal continues to leak at pressures below 145 psi, it is an indication that the primary seal may be permanently damaged and should therefore be replaced at the earliest opportunity.
- Checking the **oil seals** for leakage and replace as necessary at the earliest opportunity.
- Check **pumping pressures**. In certain operational circumstances the pump will pose a thermal hazard and as such should not be touched during operation. After shutdown the pump unit should be allowed time to cool.

### 7.2 Recommended spare parts

The following table details the recommended spare parts that should be retained within your maintenance schedule. (Refer to the Exploded drawings and parts list in section 16 of this manual).

#### Part description

Description	Quantity
'O' ring, product seal or	2
Mechanical seal	2
'O' ring, seal housing	2
'O' ring, sleeve/shaft	2
'O' ring, sleeve/rotor	2
'O' ring, rotor nuts	2
'O' ring, front cover	1
Oil seal drive end	1
Oil seal gland end	2

Refer to spare parts manual for item numbers.

### 7.3 Maintenance tools

The following lists the maintenance tools required when working on the pump.

#### Dismantling the pump head

You will need:

- Spanners
- Socket set
- Plastic block
- Soft mallet
- Cleaning hose
- Rotor removal tool (supplied with pump)
- 6" Prybar (i.e. Snap-On Pt. 650)

#### Dismantling the gearbox

You will need - A fully equipped work shop in addition to the above.

## 8.0 Disassembly

### 8.1 Before dismantling the pump

Before starting to dismantle the pump

Always:-



#### **Purge -**

the pump and system if any noxious/hazardous products have been pumped.



#### **Isolate -**

pump/drive unit from all power and control supplies.



#### **Close -**

pipework valves to isolate the pump



#### **Disconnect -**

the pump from the drive unit.



#### **Secure -**

The pump must be securely held during maintenance to maintain stability.

**Read this section before continuing to dismantle the pump**

## Operation Manual

To aid re-assembly, note which components came off which shaft. Good engineering practise suggests that components removed from a shaft should be assembled on the same shaft.

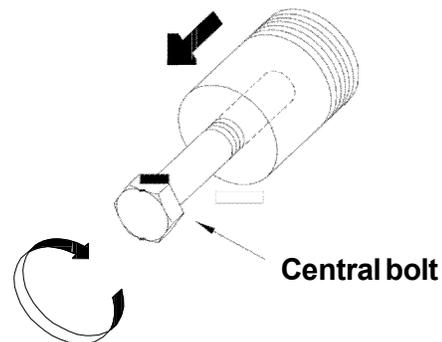
**If removing the front cover for any reason check that rotorcase retaining nuts are tight before replacing.**

### 8.2 Removing the front cover

1. Remove the 'R' clips (2) and carefully loosen the front cover retaining nuts (3) as there may still be residual pressure in the system.
2. Remove the front cover nuts and take off the cover (6). If stuck, loosen by tapping with soft mallet at overlap at sides.  
**Do not lever off.**
3. Flush out the pump head before continuing.
4. Remove the 'O' ring (7) from the front cover.

### 8.3 Removing the rotors

1. Insert a plastic block between the two rotors (13) to stop them turning.
2. Using a spanner remove the rotor nuts (9). These nuts have right hand threads.
3. The rotors can be removed from the shafts (28,29) by hand or by using the extractor tool supplied with the pump to aid disassembly. Unscrew the central bolt until flush on the inside, screw the tool two full turns into the rotor. Whilst preventing the tool from turning screw in the central bolt. The rotor is jacked off the shaft for hand removal.



### 8.4 Product seal removal

1. 'O' ring- Refer to section 10
2. Mechanical Seal - Refer to section 11

### 8.5 Removing the rotorcase

1. Remove the rotorcase retaining nuts. (5).
2. Gently tap the rotorcase (11) on each side with a soft mallet to release it from the bearing housing. (18)
3. The rotorcase will be supported on the studs (4) during removal.
4. The rotorcase and seal housing (66) can be removed as an assembly.

## 8.6 Removing the shaft sleeves and shims

1. Remove the wire shaft sleeve retaining clip (64) from the shaft taking care not to damage the shaft spline or sleeve abutment face.
2. Pull the shaft sleeve (42) off the shaft.
3. The setting ring (35) and shims (25) can be removed from the shaft. Take care not to lose or mix any shims and check no shims are left inside the sleeve.

## 8.7 Draining the pump of lubricant

1. Remove the drain plug (51) from the gear housing (14). The lubricant may now be drained into a suitable container.

## 8.8 Removing the front seal retainer

1. Remove the seal retainers (36) by levering with a screwdriver/lever.
2. Once the seal retainers are removed the oil seals (37) can be removed using a screwdriver/lever. It is essential to renew the oil seals upon reassembly.

## 8.9 Removing the gear housing

1. Remove the socket head cap screws (15).
2. Tap the foot of the bearing housing assembly (18) gently to release the gear housing (14) from the bearing housing.
3. Slide the gear housing (14) from the shafts. Remove the bearing rear outer races (39) and press out the oil seal (41). It is essential to renew the oil seal upon re-assembly.
4. Remove the gasket. (17)

## 8.10 Removing the timing gears

1. Pull the rear inner bearing races (39) off the shafts. A puller or extractor may be required to do this.
2. Disengage the tabs of the lock washers (52) fitted to the timing gear nuts (38) and with a plastic block between the gears to stop them turning remove the locking nuts with a 'sharp tap' on a 'C' spanner.
3. Remove the timing gears (23,24), keys (46) and any shims (30) from the shafts. Note position of shims(top/bottom).

## 8.11 Shaft and bearing removal

1. Replace the rotors back on the shafts. Disengage the tabs of the lock washers (32) fitted to the bearing nuts (31) and with the rotors locked by using a rag or similar to stop them turning remove the locking nuts with a 'sharp tap' on a 'C' spanner. Remove the rotors from the shafts.
2. Disassemble shafts (28,29) from bearing housing (18).
3. Remove each bearing set (33) (inner cones and outer cups) and **maintain in sets** if they are to be re-used.

**To assist assembly note the positions on the shaft from which the bearings were removed. Good engineering practice suggests that if bearings are removed from the shafts for any reason they should be replaced with new bearings.**

# Operation Manual

## 9.0 Assembly

Assemble components to the shaft from which they were removed.

### 9.1 Fitting shafts into the bearing housing

1. Locate the outer cups (33) into the bearing housing (18). This operation is made easier if the bearing housing is heated to 158°F. Press fit against the shoulders after cooling.
2. Position the drive shaft (29) vertically in the vice using soft jaws and apply antiseize compound to the bearing diameters.
3. Heat the front bearing inner cones to 230°F. **Do not use any form of live flame when heating as this will damage bearings.**
4. Assemble the front bearing inner cone (33) onto the shaft (29) ensuring a positive fit against the shaft shoulder.
5. Locate the drive shaft assembly in the bearing housing (18) in the bore marked with an 'X' in the drainage slot.
6. Locate the second heated bearing on the drive shaft and retain with the tab washer (52) and bearing nut (38) (hand tight).
7. Repeat the operation for the auxiliary shaft (28).
8. **Allow bearings to cool to handling temperature.**  
**Note:** Failure to do so will result in incorrectly set bearings.
9. Secure the drive shaft (29) and tighten the bearing lock nut (31), release the shaft, lightly tap each end of the shaft with a soft mallet and rotate.

Check the torque required to turn the shaft in the bearings. The bearings are correctly adjusted when the torque to turn each shaft is 1.40 to 1.67 lbft for new bearings.

If a torque wrench is not available tighten until shaft is firm without spinning. Repeat the above for the auxiliary shaft (28).

10. Lock the bearing retaining nuts (31) with the tab washers (32). If no tab lines up with any slot gradually tighten (never loosen) until engagement is possible.
11. Apply oil to the bearings.

### 9.2 Fitting the front seal retainers

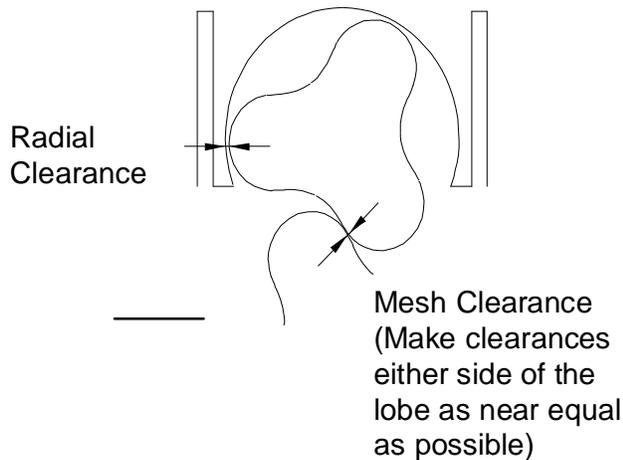
1. Lightly lubricate the outside diameter of the oil seals (37) then press the oil seals into the front seal retainers (36).
2. Clean the rear face of the retainers and the mating faces on the bearing housing (18). Apply silicone sealant to the retainers and press into place.

### 9.3 Fitting timing gears and setting rotor timing

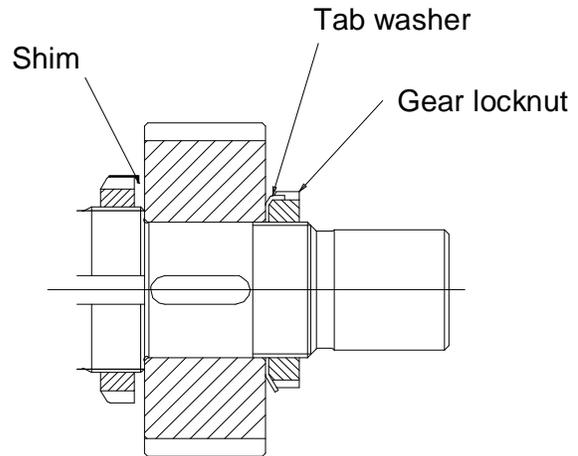
1. Locate the timing shims (30) on each shaft from which they were removed.
2. Locate gear keys (46) into shafts (28,29).
3. Slide each timing gear (23,24) onto the shafts, realign marks if gears were previously marked in pairs.
4. Locate tab of locking washer (52) in keyway of each gear.
5. Fit the timing gear lock nuts (38) and with a plastic block in the gears to stop them turning tighten with a 'sharp tap' on a 'C' spanner.

**9.4 Adjusting the rotor timing**

1. Slide rotors (13) onto the shafts (28,29), but do not tighten the retaining nuts (9).
2. Turn the shaft so that the rotors are in the position shown below.



3. With the rotors loose on the shafts, using feeler gauges measure between the point indicated (mesh) whilst squeezing the lobes together. Turn the shaft as required to measure all six positions.
4. If the measurement points are unequal, note the difference and which side of the rotor has the larger clearance.
5. Correct the difference by adding or removing shims (30) between the gear face and shaft shoulder as indicated in the diagram. Fully tighten the gear retaining nuts and check the clearances are within the specification limits. If correct, lock the gear lock nuts (38) with the tab washer (52).
6. Remove the rotors.



**9.5 Fitting the gear housing**

1. Clean the gear housing (14) and heat to a temperature of 158°F. Re-assemble the bearing outers (39) into the housing. Allow to cool to handling temperature then with light lubrication to the outside diameter of the oil seal (41) press into the housing.
2. Ensuring that the faces of the bearing housing and gear housing are clean, fit new gasket (17) to bearing housing.
3. Carefully slide the gear housing over the shaft ensuring the oil seal is not cut or damaged. Tighten the socket head cap screws (15) to a torque figure of 33 lbft.

## Operation Manual

### 9.6 Setting the rotor clearances

#### **Incorrect setting of the rotor clearances will damage the pump.**

1. Fit the rotorcase (11) and retain with four nuts (5) tightened to 30 lbft.
2. Fit the setting ring (35) with chamfer towards the shaft shoulder and 0.020 inch of shims onto the shaft. At this point, do not fit 'O' rings (45). Slide shaft sleeve onto the shaft ensuring that the drive pin locates in any position other than the missing spline.
3. Fit the rotors (13) and torque the retaining nuts (9) to 110 lbft.
4. Using a micrometer and feeler gauges measure the front and back clearances respectively.
5. Adjust the shims (25) if necessary to ensure the front and back clearances are within the specified limits.
6. Check the radial clearances are within specification limits.
7. If all clearances are correct, remove rotors, shaft sleeves and rotorcase taking care not to disturb the shims.
8. Lightly grease the seal sleeve 'O' rings (45) and fit to the sleeve.
9. Fit the sleeves onto the shafts ensuring that the drive pins locate in any other position than the missing spline.

10. Fit the seal sleeve retaining clips (64) onto the shafts.
11. Fit the rotorcase (11) and retain with four nuts (5) tightened to 30 lbft.

### 9.7 Fitting the seal

O'ring - Refer to section 10

Mechanical Seal - Refer to section 11

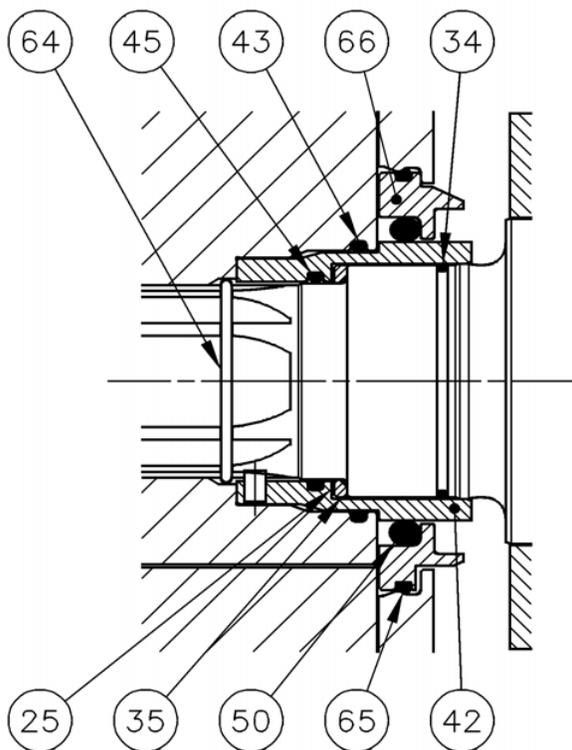
### 9.8 Fitting the rotors

1. Align the rotor with the missing spline of the shaft.
2. Lubricate the rotor nut sealing 'O' (10) ring and fit to the nut groove.
3. Use a plastic block between the rotors to stop them turning while tightening the rotor nuts (9) to 110 lbft.
4. To check that the rotors are correctly synchronised turn the pump by hand, and check the meshing clearances with feeler gauges through all six points.

### 9.9 Fitting the front cover

1. Fit the front cover 'O' ring (7).
2. Fit the cover (6) onto the rotorcase studs (4) and tighten the front cover nuts to the recommended torque - 30 lbft. Fit 'R' clips (2).
3. The pump can now be mounted with its drive unit.
4. **Prior to start up the pump must be filled with oil.  
Read the start-up check list before proceeding to start the pump,  
see section 6.1**

## 10 Replacing 'O'Ring Seal



ITEM	DESCRIPTION
25	Shim Pack
34	'O' Ring Shaft
35	Setting Ring
42	Shaft Sleeve
43	O-ring Sleeve/Rotor
45	O-ring Shaft/Sleeve
50	O-ring Product
65	O-ring Seal Housing/Rotorcase
66	Seal Housing

### 10.1 Product 'O'ring seal replacement

1. The product 'O'ring (50) can be removed from the front of the pump with a screwdriver or similar tool once the rotor retention nut (9) and rotor (13) are removed. Take care not to damage the sleeve surface.

### 10.2 'O'ring seal fitting

1. Press a new product 'O'ring fully into the seal housing (66), replace the rotors and rotor retention nuts. To aid seal fitting water may be used to lubricate the 'O'ring.

### 10.3 To remove the seal housing

1. Remove the gland guards (21).
2. Thoroughly clean the inside and outside of the seal area on the rotorcase and the bores of the rotor.
3. Remove the product 'O'ring (50).
3. Use a suitably sized screwdriver or lever to lever between the seal housing (66) and shaft sleeve (42). This will ease the seal housing out of the rotorcase. Ensure care is taken not to damage the sleeve sealing surface.

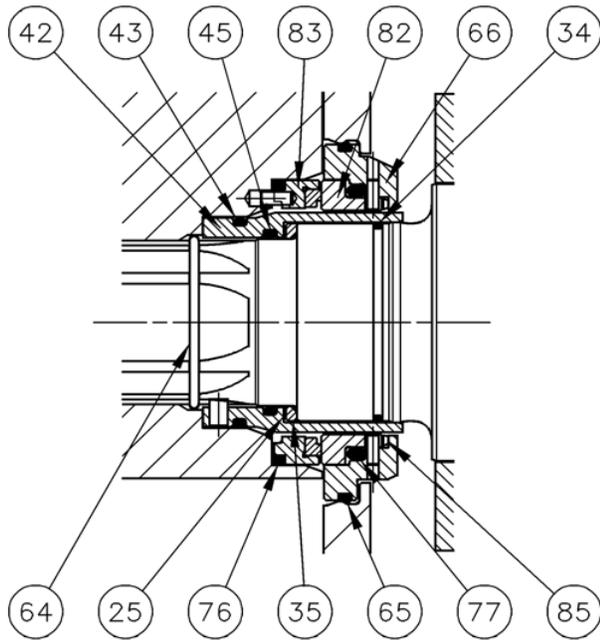
### 10.4 Seal housing fitting

This can be done with the rotorcase on or off the pump.

1. Ensure the seal housings and seal recesses are clean.
2. Position the seal housing (66) loosely in the rotorcase with the flat, inside the rotorcase, aligned. Once correctly aligned push the seal housing into the rotorcase. Check the seal housing is below the back face of the rotorcase.
3. Lightly lubricate the O-rings with water or a suitable grease.

# Operation Manual

## 11 Replacing Mechanical Seal



### 11.1 Single mechanical seal

The seal comprises of a rotary face with associated 'O' ring which is located in the rotor with two pins providing the drive. A wave spring provides a closing force through the static face. Two pins provide anti-rotation fixing for one static face with associated static 'O' ring.

ITEM	DESCRIPTION
42	Shaft Sleeve
43	O-ring Sleeve/Rotor
45	O-ring Shaft/Sleeve
64	Clip Shaft Sleeve Retention
65	O-ring Seal Housing/Rotorcase
66	Seal Housing
76	'O' Ring Mech Seal/Rotor
77	'O' Ring Mech Seal/Housing
82	Seal Face Static
83	Seal Face Rotary
85	Wave Spring

### 11.2 Single mechanical seal removal

1. Remove the gland guards (21).
2. Thoroughly clean the inside and outside of the seal area on the rotorcase and the bores of the rotor. The static element of the seal and the seal housing (66) should be removed as an assembly.
3. Use a suitably sized screwdriver to lever between the seal housing and shaft sleeve (42). This will ease the seal assembly out of the rotorcase.
4. With the static seal assembly on a suitable work bench use a screwdriver or lever in the wave spring recess to prise the static seal face (82) out of the seal housing. The wave spring (85) can be pressed over the drive pins and removed.
5. Use a screwdriver/lever to prise the rotary seal (83) face out of the rotor.

## 11.3 Single mechanical seal fitting

1. Ensure the seal housings and seal recesses are clean.
2. Lightly lubricate the 'O'rings and springs with a silicon grease (Food quality if required).
3. Position the wave springs (85) into the seal housing (66).
4. Fit the static face (82) with associated 'O' ring to the seal housing recess. Ensure location pins engage correctly.
5. Press the rotating faces (83) in to the rotor bores ensuring the drive pins locate correctly.
6. Position the seal housing loosely in the rotorcase with the flat inside the rotor case aligned. Once correctly aligned push the seal housing into the rotorcase. Check the seal housing is below the back face of the rotorcase.

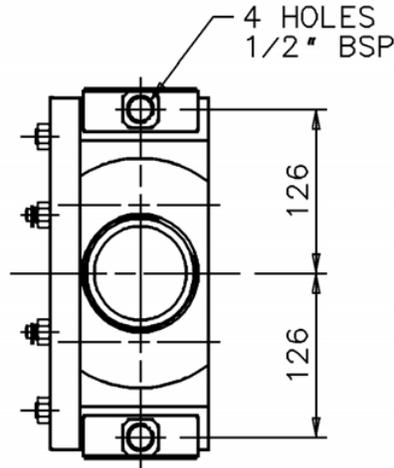
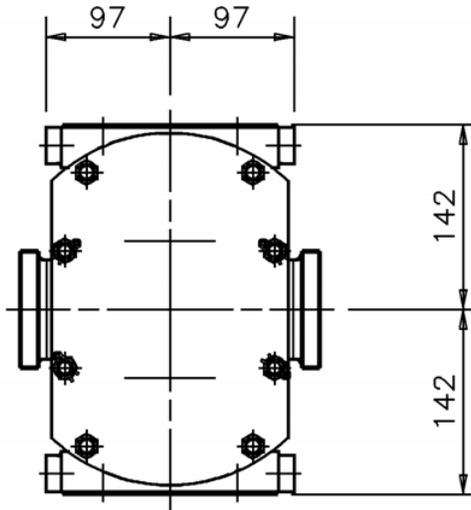
**NOTE:** To assist fitting the seal housing the rotor and rotor retaining nut can be used to press the seal housing.

7. Wipe all lapped seal face surfaces until clean.
8. Follow the rotor assembly procedure in section 9.8

# Operation Manual

## 12 Pump heating tank

### 12.1 Heating tank dimensions



Care should be taken when piping up and connecting to heating tanks.



#### Heating tank removal

1. Relieve all pressure from the heating tank system.
2. Clean heating tank area.
3. Disconnect the pipework.
4. Remove the M8 cap screws and heating tanks.

Heating tanks supplied with new pumps are hydrostatically tested. A certificate can be provided on request.

Prior to operation a hydrostatic test of the heating system is recommended.

Hydrostatic test pressure (water) :- 90 psi  
Maximum working pressure :- 55 psi

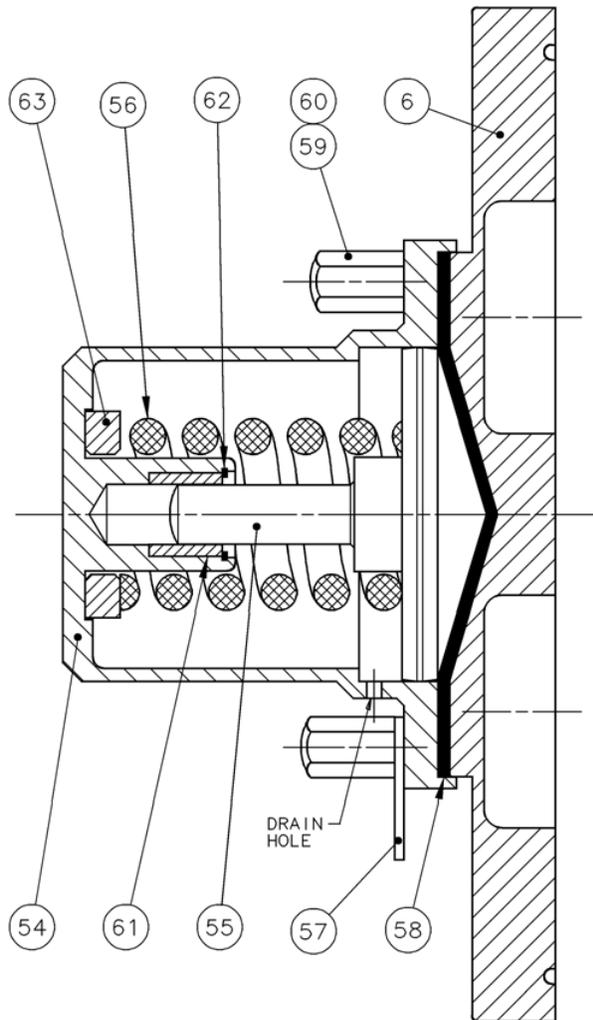
Heating tanks should be in operation approximately 15 minutes prior to pump start-up and remain in operation for 15 minutes after pump shutdown.

#### 12.2 Heating tank fitting

1. Ensure all mating faces are clean and free of product.
2. Secure using the M8 cap screws and lock washers. Tighten to a torque of 33 lbft.
3. Connect pipework.
4. Check system for leaks prior to use.

NOTE: If the pump was not originally fitted with heating tanks, the rotorcase will require drilling and tapping.

## 13 Relief Valve



ITEM	DESCRIPTION
6	Front Cover
54	Valve Housing
56	Spring
55	Valve Head Stem
57	Anchor Plate
58	Diaphragm
60	Nut
61	Bush
62	Circlip
63	Spacer Valve Preloading

The relief valve is factory set to operate at 145 psi to partially protect the pump from over pressurisation. The relief pressure can not be field adjusted.

### 13.1 Disassembly - Relief valve

**Take extreme care when removing the valve housing as the spring has been compressed.**

1. If the pump is still in the system, ensure there is no pressure in the pump head.
2. Clean the outside of the pump and valve casing.
3. Remove the nuts (60) and housing (54). Loosen the nuts equally in order to move the housing away from the rotorcase squarely.
4. Remove the valve spring (56), spacer valve head assembly and diaphragm (58).

### 13.2 Assembly - Relief valve

1. Ensure mating faces are clean and free of product.
2. Fit the diaphragm with PTFE face towards relief valve front cover.
3. Place the spring (56) on the valve head (55).
4. Fit the valve head/spring assembly into the valve housing (54).
5. Mount the housing assembly to the front cover and retain with nuts. Tighten nuts evenly to a torque of 15 lbft.

# 14 Faults, causes and remedies

	Under capacity	Irregular discharge	Prime lost after starting	Pump stalls after starting	Pump overheats	Motor overheats	Excessive power absorbed	Noise & vibration	Pumping element wear	Excessive primary seal wear	Product loss through primary seal	Seizure	Causes	Remedies
z													1	Reverse drive
z													2	Expel gas from supply line & pumping chamber, introduce liquid
z	z	z	z					z					3	Increase supply line diameter, increase suction head. Simplify supply line configuration & reduce length. Reduce speed. Decrease product temp., check effect of increased viscosity on available & permitted power inputs
z	z	z	z					z					4	Remake pipework joints, check primary seal
	z	z	z					z					5	Expel gas from supply line & pumping chamber, introduce liquid
z	z	z	z					z					6	Raise product level. Lower outlet position
	z	z						z					7	Service fittings
	z					z	z	z					8	Decrease pump speed. Increase product temperature
	z							z					9	Increase pump speed. Decrease product temperature
								z	z				10	Cool the pumping chamber
				z		z	z	z					11	Heat the pumping chamber
								z					12	Clean system. Fit strainer to inlet line
	z	z	z	z		z	z	z					13	Check for obstruction. Service system to prevent problem recurring. Simplify
						z	z	z					14	Decrease pump speed
	z												15	Increase pump speed
	z					z	z	z					16	Check alignment of pipes. Fit flexible pipes or expansion fittings. Check pipework support.
								z					17	Check alignment & adjust mounts accordingly
								z					18	Fit lock washers to loose fasteners & retighten
				z		z	z	z					19	Refer to pump manual for replacement parts
						z	z	z					20	Refer to pump manual for replacement parts
z	z		z	z		z	z	z					21	Refer to pump manual for instructions
								z					22	Check rated & actual duty pressures
	z												23	Check pressure setting & adjust if required. Examine & clean sealing surfaces, replace worn parts
	z							z					24	Check for wear on sealing surfaces, replace if necessary

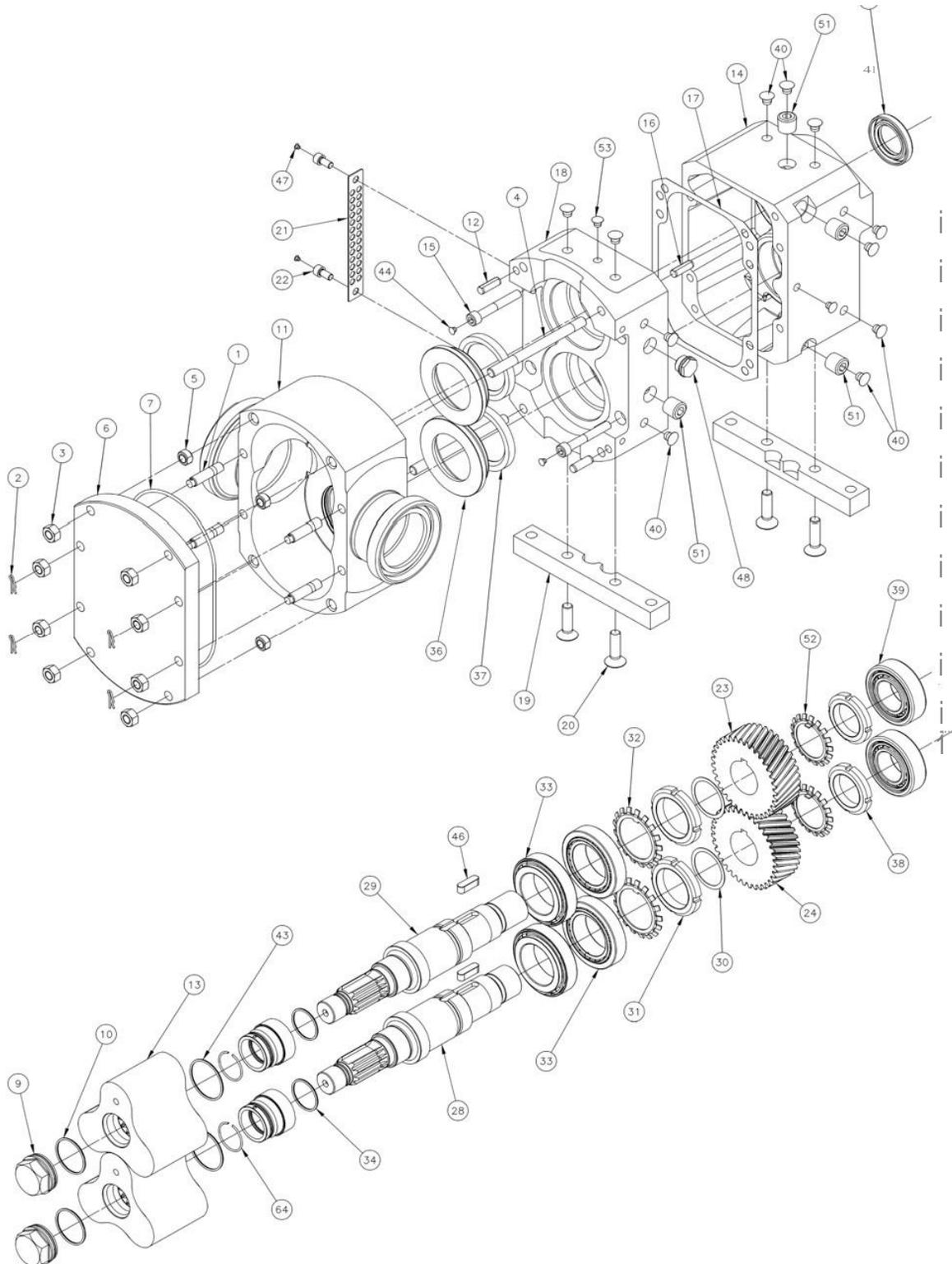
**15 Torque settings/spanner sizes**

Recommended torque settings in lbft

Description	Pump	Tool Sizes
	STP125	
Front cover nut	30	19mm
Rotorcase retainer	30	16mm
Rotor nut	110	41mm
Bearing housing screw	33	8mm Allen
Relief valve nut	15	14mm
Foot screw	75	8mm Allen
Gland guard screw	15	6mm Allen

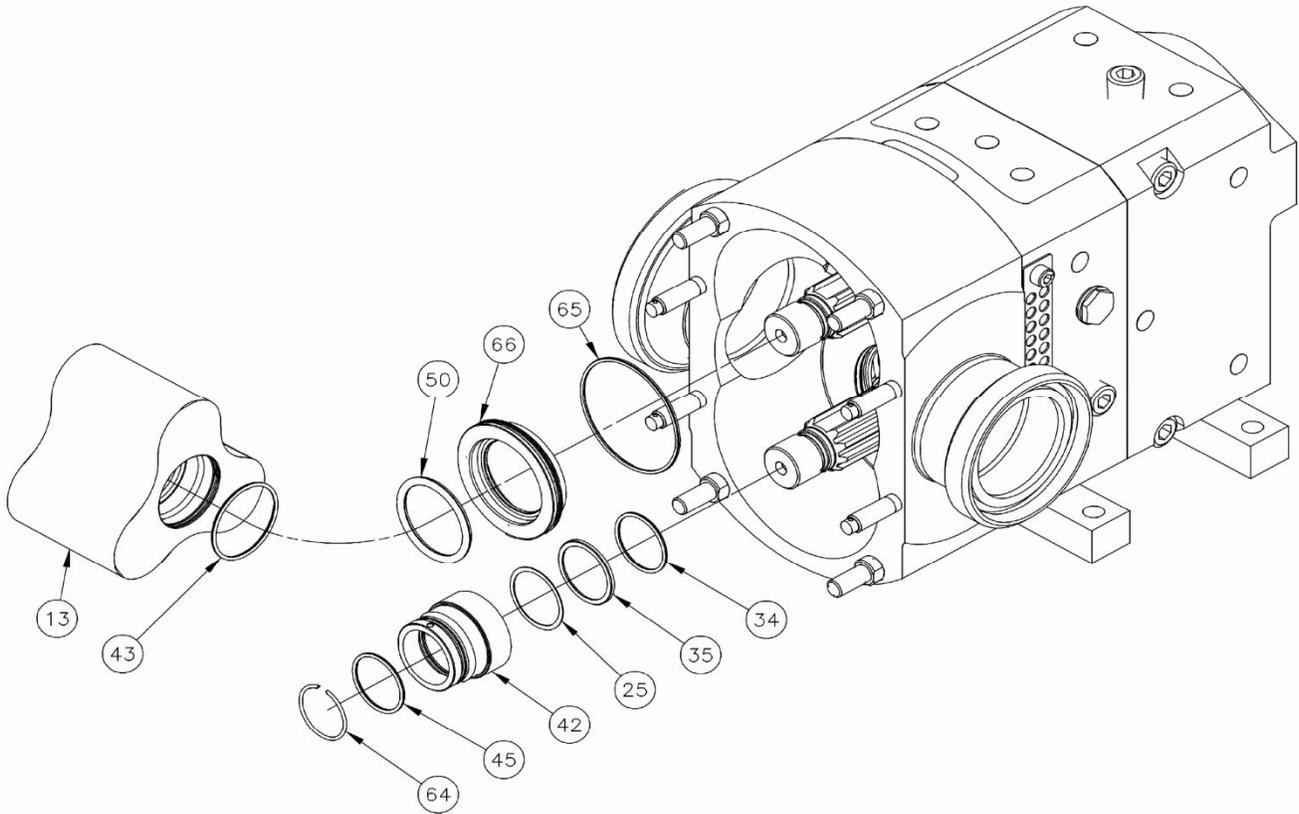
**STP125 Pump Model – Exploded View Drawing**

**16 Exploded view drawing and parts list**



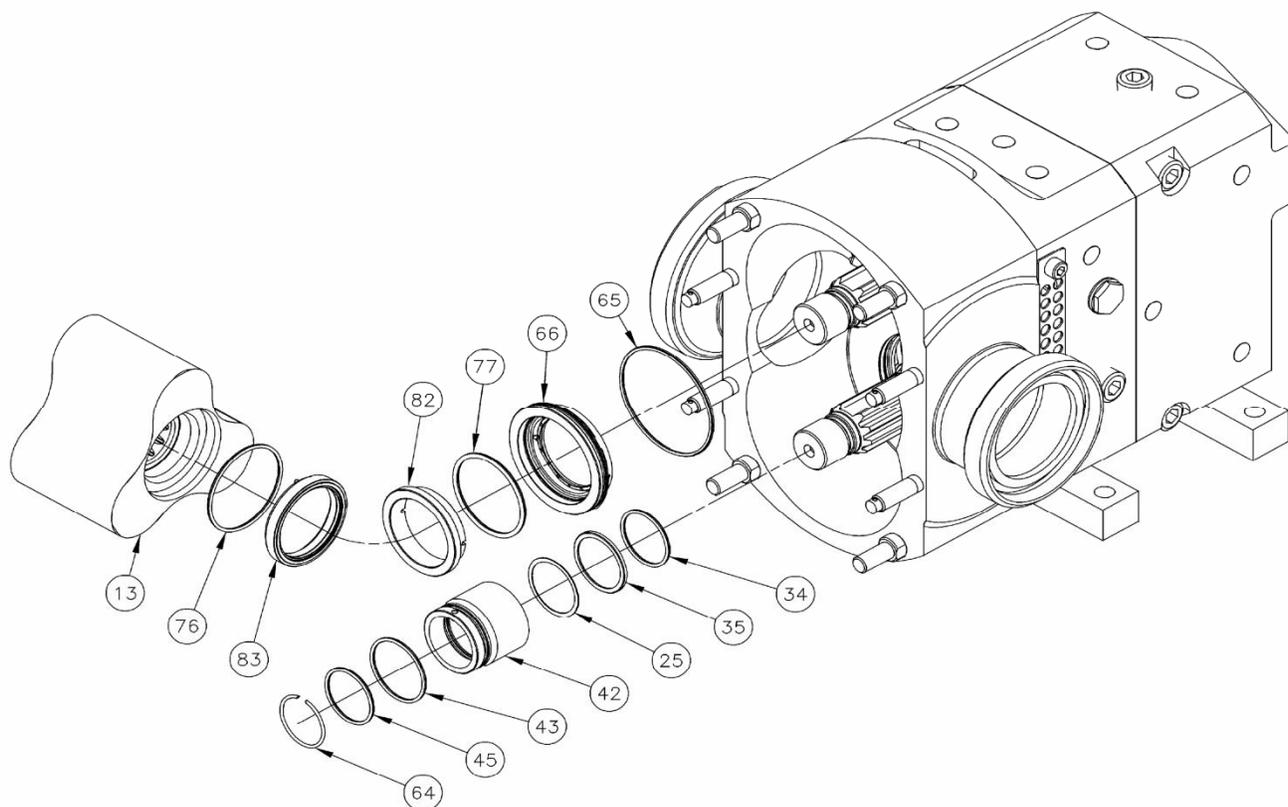
STP125 Pump Model - Main Parts			
Dwg. Item	Description	Qty.	Part No.
1	STUD 12MM x 54 WITH CLIPHOLE	4	170412250
2	RETAINER SS PUMP CASE NUT 'R' CLIP	4	518101200
3	NUT HEX FULL S/S M12	8	190012200
4	STUD - M12 X 155MM S/S - FP2000/STP125	4	199121200
5	NUT ROTORCASE RETENTION - FP2000/STP125	4	518061211
6	COVER, FLAT FRONT, NO RLF. VLV. - STP125	1	521042214
7	O-RING SS PUMP FRONT COVER -266	NBR Viton PTFE	1 522000205 522010206 522031200
9	NUT, ROTOR RETENTION - STP125	2	518061212
10	O-RING, ROTOR, STP125, RTR NUT END	NBR Viton PTFE	2 522001250 522011241 522031206
11	BODY, LIQ. PUMP, SS, 3" ACME - STP125 BODY, SS, 3" ACME - STP125, FOR HT. TANK	1	500030208 500030209
12	DOWEL - M10 - FP2000/STP125	2	199101200
13	ROTOR, TRILOBE, O-RING - STP125	7 bar 10 bar	2 503187206 503187205
	ROTOR, TRILOBE, MECH. SL. - STP125	5 bar 10 bar	
14	HOUSING GEAR ALUM - STP125	1	528030205
15	CAPSCREW HEX HD ISO 8.8 M10x70mm 316 S.S	4	128010070
16	DOWEL - M10 - FP2000/STP125	2	199101200
17	GASKET GEAR/BRG HOUSING - FP2000/STP125	1	526151201
18	BEARING HSNG., LIQ. PUMP, ALUM - STP125	1	502030202
19	FOOT, GEARCASE, HORIZ. PORT, SS - STP125	2	507034204
20	CAPSCREW, COUNTERSUNK, M10x25mm - STP125	4	124106224
21	GUARD GLAND - FP2000/STP125	2	521143202
22	SOCKET HD CAPSCREW- M8x16mm- 316 STAINLS	4	126008216
23	TIMING GEAR SET - FP2000 / STP125	1	529000208
24	TIMING GEAR SET - FP2000 / STP125	1	529000208
28	SHAFT, DRIVEN - STP125	1	504033215
29	SHAFT, DRIVE, HYDRAULIC - STP125	1	504033214
30	SHIM KIT STEEL - FP2000/STP125	1 set	516072229
31	NUT BEARING LARGE - FP2000/STP125	2	518060219
32	WASHER TAB BEARING - FP2000/STP125	2	518020208
33	BEARING - TAPER ROLLER - FP2000/STP125	4	510001202
34	SLINGER SEAL RETAINER - STP125	NBR	2 518080203
36	RETAINER, SEAL - STP125	2	518081210
37	SEAL, LIP, GLAND END - STP125	2	512010220
38	NUT BEARING SMALL - FP2000/STP125	2	518060220
39	BEARING, ROLLER, REAR - STP125	2	510003205
40	BLANKING PLUG, PLASTIC, LARGE - STP125	14	521214210
41	SEAL, LIP (REAR), NITRILE - STP125	1	512010219
43	O-RING, ROTOR, STP125, O-RING/LIP	NBR Viton PTFE	2 522001246 522011242 522031207
	O-RING, ROTOR, STP125, RTR NUT END	NBR Viton PTFE	
44	PLUG, GEAR HSNG SCREW, PLASTIC - STP125	4	521214211
46	KEY -GEAR 3/8 SQ X 1-1/4" -FP2000/STP125	2	299014218
47	PLUG, GLAND GUARD SCREW, PLASTIC - STP125	4	521214212
48	HYD SIGHTGLASS w/WASHER FOR SS PUMP -UK	2	307058203
51	PLUG TAPER BSPT 1/2X3/4 - FP2000/STP125	6	248108508
52	WASHER TAB GEAR - FP2000/STP125	2	518020206
53	BLANKING PLUG, PLASTIC, SMALL - STP125	3	521214213
64	CLIP, SHAFT SLEEVE RETAINER . STP125	2	518081203

## O-Ring Seal Parts - STP125 Pump Model



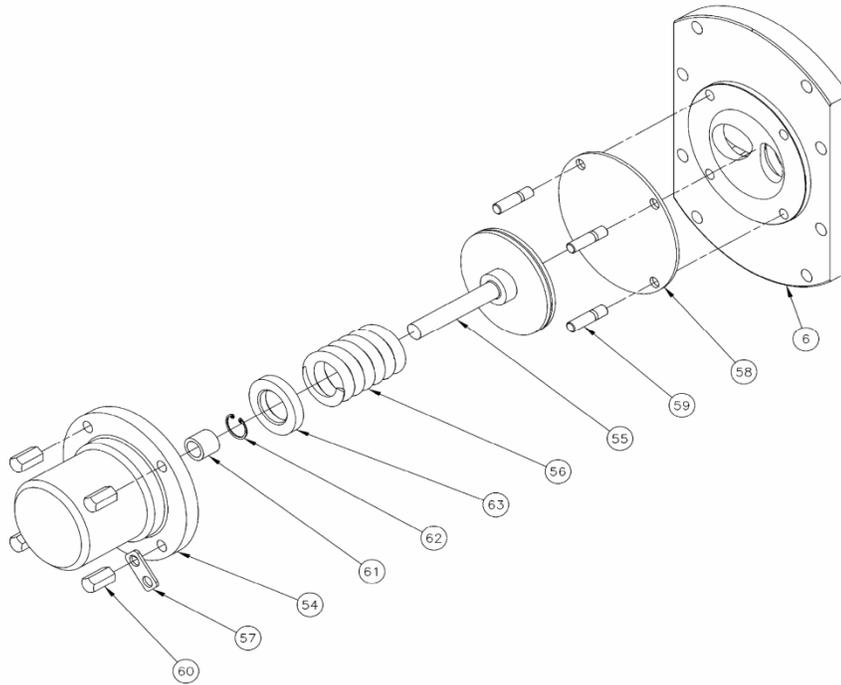
Dwg. Item	Description		Qty.	Part No.
13	ROTOR, TRILOBE, O-RING - STP125	7 bar 10 bar	2	503187206 503187205
25	SHIM SET, ROTOR ALIGN, S/S - STP125		1 set	516073207
34	SLINGER SEAL RETAINER - STP125	NBR	2	518080203
35	SETTING RING - STP125		2	518081209
42	SEAL SLEEVE, O-RING VERSION - STP125		2	516041214
43	O-RING, ROTOR, STP125	NBR Viton PTFE	2	522001246 522011242 522031207
45	O-RING, SHAFT, STP125	NBR Viton PTFE	2	522001247 522011243 522031208
50	O-RING, SEAL, STP125	NBR Viton	2	522001249 522011244
64	CLIP, SHAFT SLEEVE RETAINER - STP125		2	518081203
65	O-RING, HOUSING, STP125	NBR Viton PTFE	2	522001248 522011245 522031209
66	SEAL HOUSING - STP125 (O-RING SEALS)		2	518081204

## Mechanical Seal Parts - STP125 Pump Model



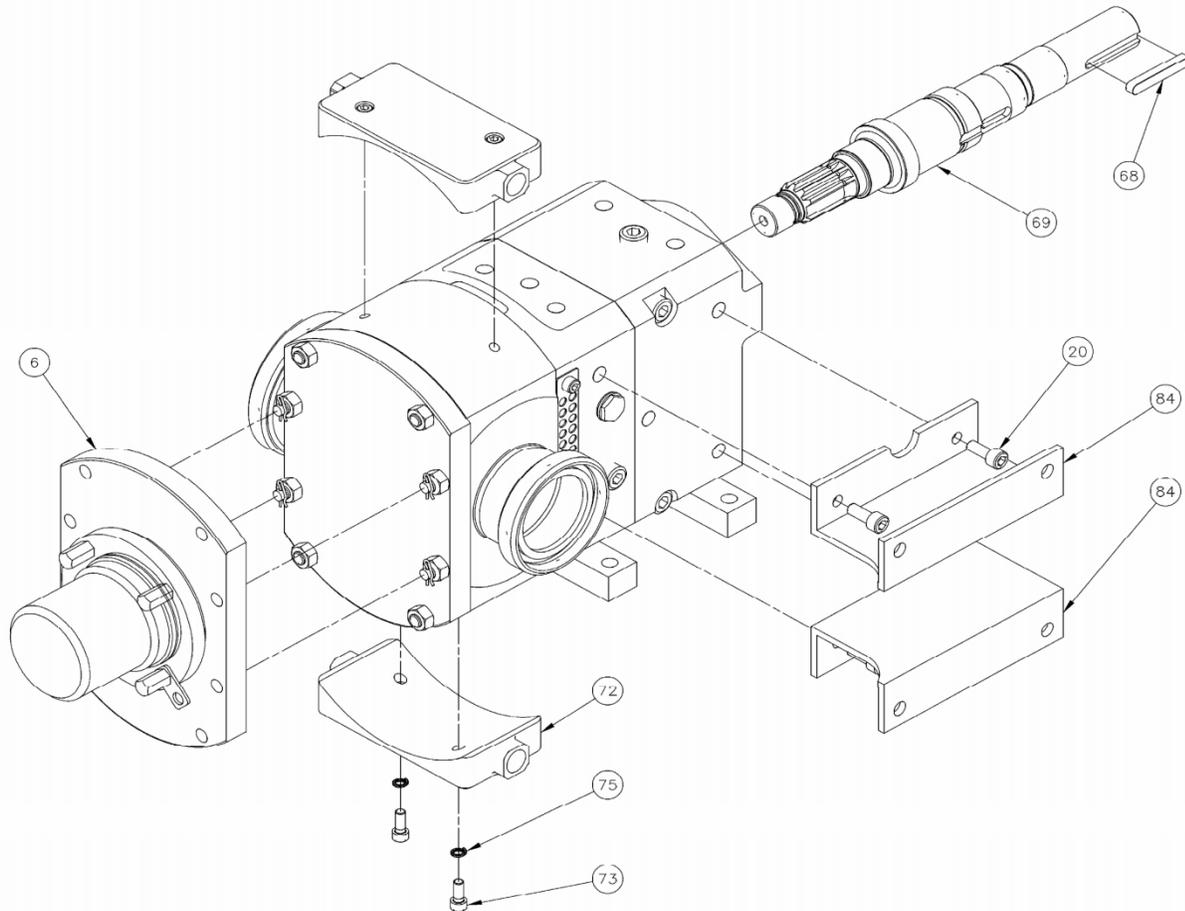
Dwg. Item	Description		Qty.	Part No.
13	ROTOR, TRILOBE, MECH. SL. - STP125	5 bar 10 bar	2	503187207 503187208
25	SHIM SET, ROTOR ALIGN, S/S - STP125		1 set	516073207
34	SLINGER SEAL RETAINER - STP125	NBR	2	518080203
35	SETTING RING - STP125		2	518081209
42	SEAL SLEEVE, MECH. SEAL VERSION - STP125		2	516041216
43	O-RING, ROTOR, STP125, RTR NUT END	NBR Viton PTFE	2	522001250 522011241 522031206
45	O-RING, SHAFT, STP125	NBR Viton PTFE	2	522001247 522011243 522031208
64	CLIP, SHAFT SLEEVE RETAINER - STP125		2	518081203
65	O-RING, HOUSING, STP125	NBR Viton PTFE	2	522001248 522011245 522031209
66	SEAL HOUSING - STP125 (MECHANICAL SEALS)		2	518081206
76	ROTARY SEAL RING, STP125, MECH.	NBR Viton PTFE	2	522001251 522011246 522031210
77	STATIONARY SEAL RING, STP125, MECH.	NBR Viton PTFE	2	522001252 522011247 522031211
82	STATIONARY SEAL RING, SS - STP125		2	518081207
83	ROTARY SEAL ASS'Y - STP125 (MECH. SEALS)		2	518081208

## Relief Valve Parts - STP125 Pump Model



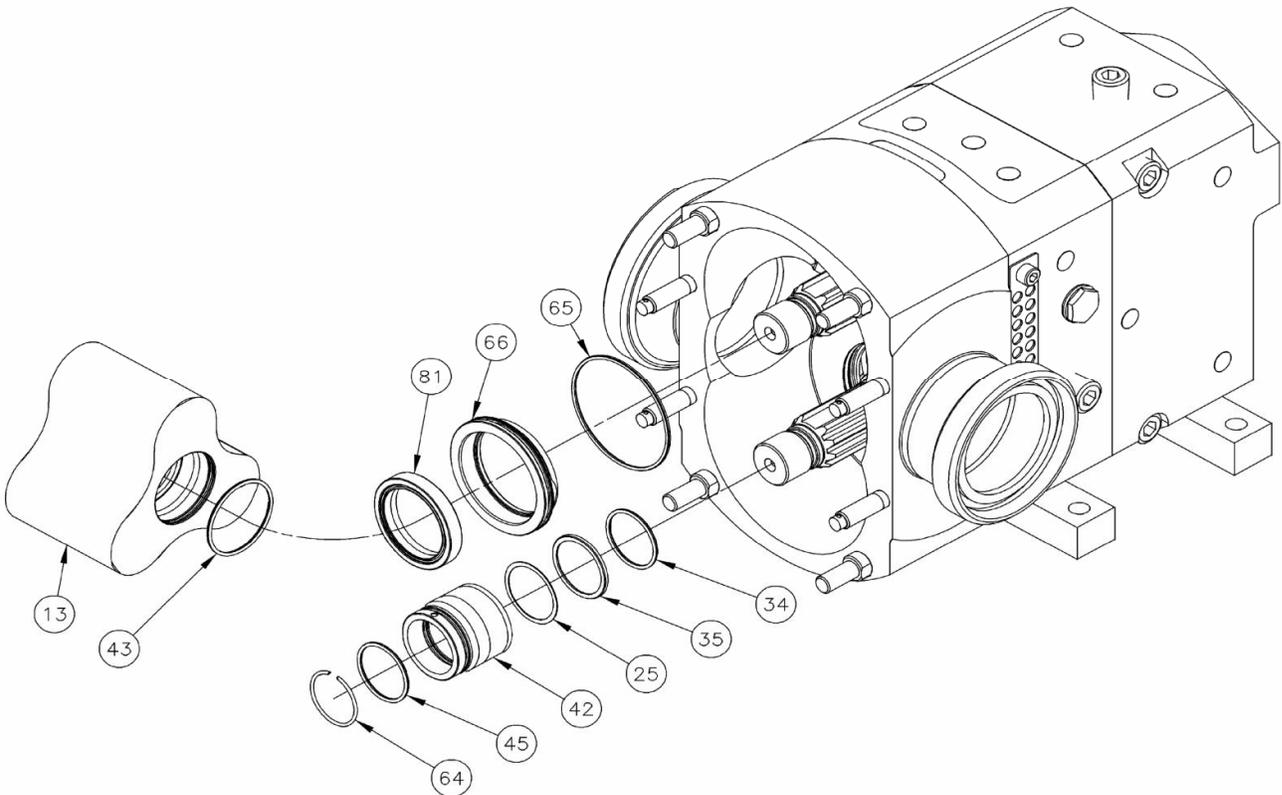
Dwg. Item	Description	Qty.	Part No.
6	COVER, FLAT FRONT, FOR REL. VLV. - STP125	1	521042215
54	BODY RELIEF VLV FP2000/STP125 INT. SUPP.	1	500074202
55	RELIEF VALVE HEAD/STEM - STP125	1	532051202
56	SPRING COMP 65 PSI RELIEF VALVE	1	517022201
57	ANCHOR PLATE, SS, FOR RELIEF VLV -STP125	1	532120201
58	SEAL DIAPHRAGM, FP2000/STP125	1	513132200 PTFE/NBR 513132201 PTFE/Viton
59	STUD, M10-1.5 x 40MM LG., S/S - STP125	4	168210240
60	NUT, HEX, HOUSING STUD - M10 X 38MM, S/S	4	188410238
61	BUSHING PLAIN 2130-MT POPPET VALVE	1	510102206
62	RETAINING RING INT. S/S 0.917x0.026 GRVE	1	244014201
63	SPACER SPRING, RV, SS, 10 BAR - STP125	1	516041217

## Other Optional Parts - STP125 Pump Model



Dwg. Item	Description	Qty.	Part No.
6	COVER ASS'Y., COMP. w/RV, NBR - STP125	1	521042216
	COVER ASS'Y., COMP. w/RV, VITON - STP125		521042217
20	CAPSCREW SKT HD ISO 8.8 M12 x 30mm PLTD.	4	130112030
68	KEY RND END 10MM X 8MM X 63MM	1	199050209
69	SHAFT, DRIVE, KEYED - STP125	1	504033216
72	HEATING TANK FOR ROTORCASE, SS - STP125	2	500030210
73	CAPSCREW SKT HD M8 X 20MM S/S GRA4-70	4	126108220
75	WASHER LOCK SST M8	4	194008200
84	FOOT, GEARCASE, VERT. PORT, LH - STP125	1	507034205
	FOOT, GEARCASE, VERT. PORT, RH - STP125		507034206

## Lip Seal Parts - STP125 Pump Model (not 3A compliant)



Dwg. Item	Description		Qty.	Part No.
13	ROTOR, TRILOBE, O-RING - STP125	7 bar 10 bar	2	503187206 503187205
25	SHIM SET, ROTOR ALIGN, S/S - STP125		1 set	516073207
34	SLINGER SEAL RETAINER - STP125	NBR	2	518080203
35	SETTING RING - STP125		2	518081209
42	SEAL SLEEVE, LIP SEAL VERSION - STP125		2	516041215
43	O-RING, ROTOR, STP125	NBR Viton PTFE	2	522001246 522011242 522031207
45	O-RING, SHAFT, STP125	NBR Viton PTFE	2	522001247 522011243 522031208
64	CLIP, SHAFT SLEEVE RETAINER - STP125		2	518081203
65	O-RING, HOUSING, STP125	NBR Viton PTFE	2	522001248 522011245 522031209
66	SEAL HOUSING - STP125 (LIP SEALS)		2	518081205
81	DOUBLE LIP SEAL, ROTORCASE - STP125	PTFE	2	512141200



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