Hygienic rotary lobe pumps

55 Series

Installation, Operation and Maintenance Manual

CONTENTS

1 INTRODUCTION

1.1 GENERAL INFORMATION

Thank you for purchasing PACKO products!

This manual for the 55 series Rotary Lobe Pumps describes safe and appropriate operation during operating and in all life cycles.

This manual contains instructions for installation, operation, disassembly and assembly, maintenance procedures and troubleshooting.

Read and completely understand this manual to learn how to service these pumps prior to operating or servicing the product and observe to pay special attention to the warnings.

This manual must always be available at the installation location since no liability will be assumed for any damage or operational malfunctions arising from non-compliance with these operating instructions.

1.2 MANUFACTURER

PACKO INOX LTD
Cardijnlaan 10
B-8600 Diksmuide
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1.3 COPYRIGHT

These operating instructions are written to support the installation, the use and the maintenance of the pump in accordance with the European machinery directive. They are originally written in Dutch, English, French and German by the manufacturer. All other languages are translations of the original operating instructions.

Although these operating instructions have been carefully drawn up, they do not however cover all possible eventualities that can occur during the installation, operation or the maintenance of the pump. In any event, the pump must not be used for purposes other than those stated when ordering and for which the pump has been constructed, as this could result in physical damage and injuries.

1.4 DECLARATION OF CONFORMITY

Declaration of conformity according to annex IIA of the "Machinery" Directive 2006/42 EC

We,

Packo Inox Ltd
Cardijnlaan 10
B-8600 DIKSMUIDE
BELGIUM

confirm that the Packo pump type ……., with serial number ..... fully complies with the Directive Machinery and with the (harmonised) standard EN 809, ENISO12100.

It must be brought to your attention that our product is intended to be built into a machine, and that, on the basis of the "Machinery" Directive, the complete (compound) machine can only be applied after matching the stipulations of the European demands.

PACKO Inox Ltd, Cardijnlaan 10, B-8600 DIKSMUIDE, BELGIUM is authorized to make up the technical construction file.

Date

.....

Signature:

.....

Wim Bonte
BU Manager pumps
Packo Inox Ltd

1.5 PRINCIPLE OF OPERATION

Packo 55 series pumps have 2 rotors which turn in opposite direction. Fluid enters the pump from the inlet port and fills the space between the rotors. This fluid is carried around the outside of the rotors and is forced out of the discharge port as the rotor lobes mesh together see Figure 1. Each rotor is supported on a shaft and when the pump is running within its operating limits, the rotors never touch the inside of the rotor case, or each other.

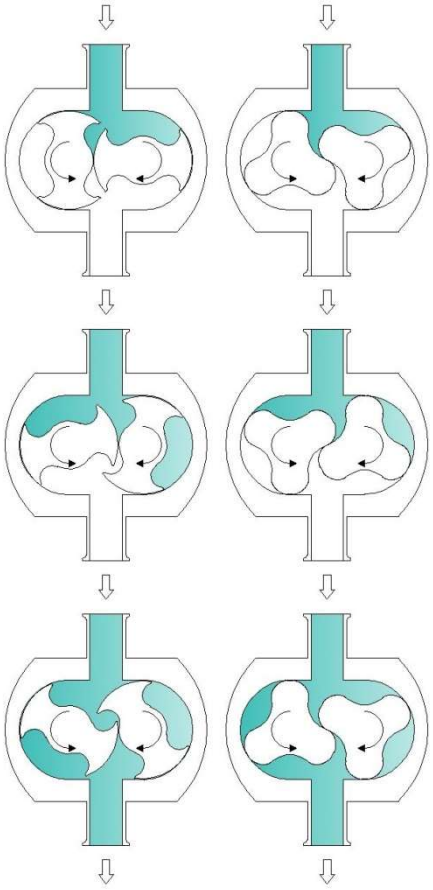


Figure 1 - Principle of operation (Showing vertical mounting)

1.6 INTENDED USE

The pump should only be used for pumping the media it was selected for and within the limits specified in the technical datasheets. Any other application beyond the intended use or conversion of the pump without written agreement with the manufacturer shall be deemed to be not in accordance with the intended use.

The pump may only be started up for the first time if it has been ensured that all safety devices are completely fitted and functional.

If any areas are subject to have the risk of explosion, the relevant explosion-proof designed pumps should be used.

Intended use also covers compliance with the conditions of operation, servicing and maintenance specified by the manufacturer.

The pump is only to be put into operation filled with medium to be pumped.

Before starting up ensure that:

- Open the valves on the suction side completely to avoid cavitation and,

- Open the valves on the discharge side completely to avoid exceeding the permitted differential pressure of the pump

- Discharge-side safety measures should be done (e.g. safety valve) to protect the pump from non-permitted excess pressure

- Protection against contact for hot, cold and moving parts must not be removed during operation

1.7 TYPE DESIGNATION

The type designation can be found on the pump name plate and also on both the order confirmation, delivery note and customer invoice.

Example (an X in the code denotes a special version):

Code no: 55 /420-145/034

- 55: pump series
- 420: pump type

- 145: Speed of the pump when the motor operates at 50Hz
- 03: motor power in kW multiplied by ten (03 = 0,3 kW)
- 4: number of poles of the motor

On the order confirmation, delivery note and invoice the pump code is more extended. The format looks as follows:

(SCHP-95) M17SKVQ

- SCHP: Lobe type (SC = Scimitar, ML = Multi Lobe – HP = High Pressure, HE= High Efficiency)
- 95: temperature class of the pump (Deg. C)
- M: type of connection (M = Tri-clamp ASME BPE) Please note: in case a PRV is selected, the above digit appears small instead large. (e.g. "m" instead "M")
- 17: housing size of the NORD reductor
- S: seal configuration (S = standard single seal, D = double mech. seal)
- K: mechanical shaft seal materials (K = carbon/silicon carbide; S = silicon carbide / silicon carbide)
- V: elastomer material (V = Viton, E = EPDM, M = Teflon)
- Q: options (T = pump and geared motor on trolley, U = pump and geared motor on trolley with cover, P = bare shaft pump, Q = pump and geared motor aligned on base plate, R = pump and geared motor aligned on base plate with cover)

Moreover, the date of construction and the pump serial number (to be stated when ordering spare parts) are also marked on the name plate.

1.8 SOUND PRESSURE LEVEL

The sound-pressure level of the pump, operating at 50Hz without cavitation measured at 1m is less than 70dB(A). In order to minimize noise and vibration, no other parts of the machine may vibrate at the same time as the pump. The best solution is therefore to allow the pump to rest directly on the concrete floor, or to fit shock absorbers between the pump and the frame of the machine.

2 SAFETY

Throughout this manual your attention is drawn to certain procedures which must be followed to ensure safe operation and servicing of this product.

ATTENTION
Do not ignore safety instructions.

ATTENTION
Do not remove by-pass or tamper with safety devices.

ATTENTION
Do not use this equipment if the end cover (122) is removed, guards are missing or inlet & outlet pipework is not connected.

ATTENTION
Do not forget the hazards of moving parts, high fluid pressure, extremes of temperature, hazardous liquids, electricity.

Always isolate and lock-out the pump drive motor before inspecting or servicing the pump.

ATTENTION
Heavy lifting and work only to be done by suitably trained personnel.

3 INSTALLATION

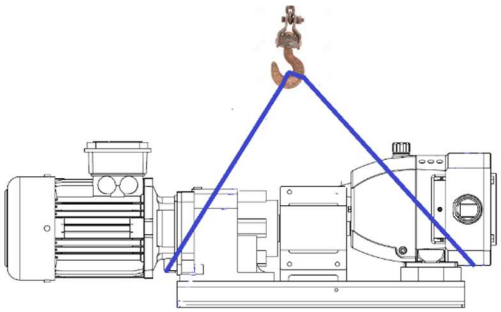
Careful attention to correct installation of 55 series pumps, and recognition of certain limitations to the operating conditions of the pump, will ensure long life and trouble-free running.

ATTENTION
Failure to follow these instructions could result in personal injury or loss of life.
Take particular care over the following:

3.1 UNPACKING AND LIFTING OF THE PUMP

Unpack the pump/unit upon delivery and inspect it for visible transport damage.
Any damage occurred during the transporting has to be immediately reported to the transport agent after receipt of the consignment. Do not put the damaged products into operation.

The pumps need to be transported and secured with care to ensure no damage is caused. 55 series pumps without motor weigh less than 10kg and can be lifted by hand. Complete pump units with drive should be lifted as shown in below picture.



Make sure you set the pump down on a stable horizontal surface.

3.2 OPERATING LIMITATIONS

PRIMING: 55 series pumps are not truly self-priming and should be installed in a "flooded inlet" pipe arrangement i.e. with the pump lower than the level of liquid to be pumped and with the supply pipe falling continuously to the pump with no loops.

PRESSURE: Do not operate the pump above the maximum differential pressure shown on the

nameplate, not even for a few seconds, as damage to the pump components will result, leading to metal particles in the pumped fluid, ineffective cleaning and possibly complete pump seizure.

ATTENTION

Never run the pump against a closed valve. Note that the pressure limit varies with the temperature.

SOLIDS: 55 series pumps can handle soft solids in suspension but will be damaged by hard particles. Take care when pumping solids, crystals, etc.

Never allow metal parts to enter the pump, i.e. weld metal, screws, tools, etc. as these will stop the pump, leading to damaged rotors, rotor case and shafts.

CAVITATION: The pumps cannot operate without sufficient pressure of liquid at the inlet port of the pump. Normally atmospheric pressure is sufficient but the actual pressure needed, is higher for:

- High Viscosities
- High Temperature
- High Pump Speeds
- Volatile Liquids

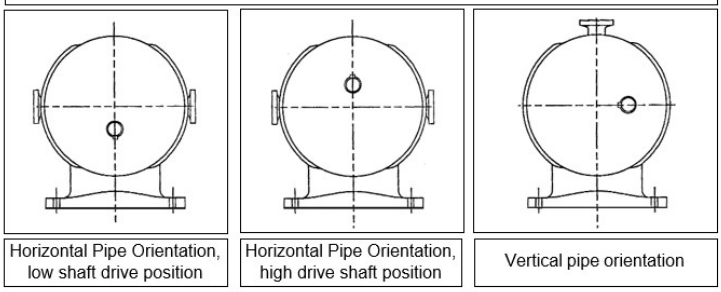
Insufficient inlet pressure will cause the pump to cavitate leading to low performance, noise and short pump life. Ensure inlet pipes are short, large bore and do not collapse under vacuum.

3.3 LOCATION & ORIENTATION

The pump should be located:

- As close as possible to the fluid source and as low as possible to maximize the net inlet pressure available to the pump.
- In a clear area allowing access all around the pump and drive for easy servicing.
- With space above for lifting equipment required.
- With the port axis vertical if pump is required to be self-draining.

Figure 2



Horizontal Pipe Orientation, low shaft drive position	Horizontal Pipe Orientation, high drive shaft position	Vertical pipe orientation

All 55 Series pumps are equally suitable for both directions of rotation.

55 Series lobe pumps can be rotated to give vertical or horizontal port orientation with high/low or right input shaft positions. This is achieved by re-positioning the gear cover/foot (22). (see Figure 2)

To change any pump from vertical to horizontal pipework or vice versa, re- position the bearing carrier in the gear housing as follows :

Drain the oil from the gearbox. Remove key (19) from the drive shaft end. Remove the 4 bolts (14) from the gear housing (22) and slide the housing off of the shaft end, being careful not to damage the inside of the lip seal on the edges of the keyway in the shaft. Press out the relevant lip seal (18) and plug and re-fit into new positions.

Rotate the bearing carrier (24) to the desired position and re-fit. It is wise to fit new sealing washers (36) to the heads of the bolts before re-fitting. Refill the oil.

3.4 DRIVES

55 Series lobe pumps can be supplied in bare shaft form i.e. without a drive motor. Drives must be selected and supplied to suit each individual application.

Pay attention to special motor requirements. e.g.

- Explosion/flame proof
- IP grade
- High ambient temperature
- Frequent stop/starts
- Materials of construction

Provision of a variable motor speed (e.g. by frequency inverter), is always recommended to enable flow to be accurately set, to accommodate changes in fluid viscosity, temperature or required flow rate, or to run pump faster for cleaning. Variable speed motors must selected to accommodate the full power and torque requirements throughout the operating speed range.

Transmission to the pump shaft will normally be by one of the following:

a) Direct Coupling: If synchronous motor speeds can be matched to the required pump speed, the drive can be via a proprietary flexible shaft coupling. A torque limiting coupling can protect the pump against overload.

In all cases the coupling manufacturer's limits should be adhered to. See Performance Data Sheet to calculate torque. Pump and motor shafts should be accurately aligned in accordance with the coupling manufacturer's instructions.

b) Reduction Gearbox: For pump speeds lower than synchronous motor speeds, a proprietary gearbox or geared motor may be fitted. Variable ratio units are available to allow pump speed to be adjusted. Coupling to the pump will be as in (a) above.

3.5 BASEPLATE

The pump and drive will normally be mounted on a common baseplate or frame which must be strong and rigid enough to withstand the drive reaction forces as well as to support the equipment without vibration. Ensure base is level - distortion could affect coupling alignment. Always check pump to drive alignment after installation and before starting pump. For maximum hygiene the pump feet should be sealed to the base.

3.6 GUARDS AND SAFETY

All moving parts must be guarded. Local safety regulations and codes of practice willspecify the minimum acceptable standard but as a guide:

- Couplings, belts and pulleys must be enclosed to prevent fingers, clothing or tools from touching moving parts.
- Guards must be made from corrosion resistant materials.
- Guards in hazardous areas must be made from non -sparking material.
- Guards must be securely fixed.
- Pump must not be operated with guards removed.

3.7 ELECTRICAL CONNECTION OF THE MOTOR

Electricity can cause injury or death -follow good practice and local regulations. In particular: -

⚠ Connect electric motor in accordance with the manufacturer's recommendations.

⚠ All electrical work must be carried outby competent personnel to local safety regulations and codes of practice.

⚠ Take special note of requirements of the area, e.g. hose-down, high humidity, explosion proof, etc.

⚠ Provide facility to isolate motor during maintenance, service and cleaning of pump.

⚠ Ensure motor rating plate corresponds to supply.

⚠ Ensure rating of motor and controls are adequate for duty, especially if application details have changed from original specification.

⚠ Allow for exceptional circumstances, e.g. cold start-up.

⚠ Provide adequate motor overload protection.

3.8 PORTS AND PIPEWORK

Pipe runs and sizes should be established at the time the pump is selected. When installing pump do not deviate from this design without rechecking pump selection:-

- Keep pipe runs short and pipe diameters large; pipes may need to be larger diameter than pump ports especiallywhen pumping viscous liquids.
- Inlet pipe must be as short as possible and as large bore as possible to prevent cavitation.
- Use large radius bends and full bore valves. Avoids globe or needle valves onviscous fluids.
- Fit isolation valves each side of the pump to simplify maintenance.
- Fit vacuum/pressure gauges each side of pump to monitor pressure conditions. Once process is established (and will not change), these can be removed.
- Avoid filters on the inlet side of pump if possible. A clogged filter will cause cavitation. A strainer - maximum hole size
  50 microns - will help to protect pumpfrom damage by particles but must bekept clear.

⚠ It is advisable to fit a temporary inlet strainer during system commissioning in order to avoid pump damage by welding particles or other foreign bodies. Removestrainer once system has been cleaned.

- Support pipework - do not allow weight ofpipe (and the fluid within) to be taken on pump ports.
- Fit expansion joints if necessary to prevent thermal expansion forces being transmitted to pump.
- Ensure all pipe joints are adequately sealed to be a) Air-tight under vacuum b) Liquid tight under pressure and c) Steam tight where applicable.
- Take special precautions when pumping hazardous, hot, toxic or bacteriological fluids - special joints (e.g. aseptic) and high specification seals may be required.
- Use hot water/steam jackets or electrical resistance tape to heat pipes carrying liquids which thicken when cool. Provide an interlock to prevent pump from runningunless liquid in pipes is at correct temperature to avoid over pressure, cavitation. or excessive drive shaft loads.

3.9 TEMPERATURE-CONTROL JACKETS

Pumps are available with an optional jacketed end cover**.** These allow hot or chilled water, hot oil or steam to be piped tothe pump to maintain product temperature inthe pump or to heat the pump prior to starting.

Application limits are:

Jacket Pressure:	2 bar (30 psi).
Temperature:	130ºC.

3.10 SEALS AND FLUSHING

Two basic types of mechanical face shaft seal are available on the 55 Series pumps. The correct type should have been selected when the pump was originally selected but you must establish that the seal fitted issuitable for the application before starting pump. (See Section 7 to identify seal type by pump model number).
Provide flushing system as required.

The **single mechanical seal** is suitable for many clean fluids which do not require a more sophisticated seal type. (See Figure 3).

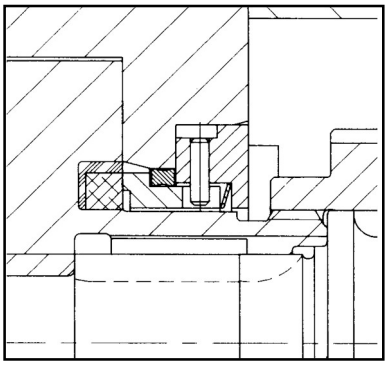


Figure 3
Single
Mechanical
Seal

Note that, silicon carbide-on-silicon carbide, seals are not recommended for steam-purged applications as the seal facescan bind together - see Cleaning and Sterilizing.

Pumps fitted with single seals require no special installation but pumps must never berun completely dry, as this will cause excessive heating of the seal faces. Use flushed seals in pumps that need to run dry.

The **double mechanical seals** fitted to the 55 Series provide the facility to contain a high pressure fluid behind the primary seal. This allows the pump to be used for applications where the single seal is unsuitable. Double seals are run with a fluid between the primary and secondary mechanical seals to form a barrier between the pump and the atmosphere.

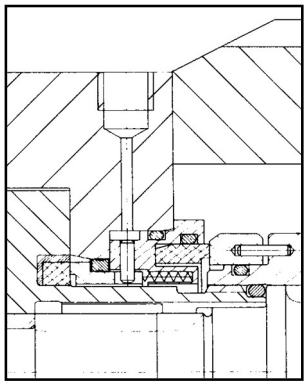


Figure 4: Double Mechanical Seal

Double Mechanical Seal with a low pressure liquid flush when:

- The pumped fluid is toxic or hazardous and must not escape from pump even in minute quantities.
- Pumped fluid changes state in contactwith air, e.g. crystallizes, forms a film, dries out or precipitates solids. The flush dissolves and rinses away the small amount of reside which could build up on the edges of the seal faces.
- Pumped fluid is close to its boiling point, e.g. water over 80°C (175°F). The flushingfluid is used to cool the seal faces.
- Pumped fluid is temperature sensitive and degrades when heated by the shearing action of the seal faces. The flushing fluidis used to cool the seal faces.
- Pump must run 'dry', i.e. no liquid in pump chamber.
- Pump is under high vacuum.
- A low pressure sterile barrier is required The system can be installed as in Figure 5a
- but must be capable of withstanding the full pressure within the pumped fluid pipe system.
    - Liquid must be compatible with the pumped fluid; water is the most commonlyused liquid.
- Pressure shall typically be 0.5 bar (7 psi) gauge. Maximum of 1.0 bar (14.5 psi) gauge.
- Temperature shall be maximum of 70°C (160°F) for water, less for volatile liquids (maximum 20°C below boiling pointof liquid).
- Flow rate shall preferably be 2 to 3 liters/h. per seal.
- Flush fluid should be connected to flow in at the lowest point on the seal housing and out at the highest point to vent air pockets.

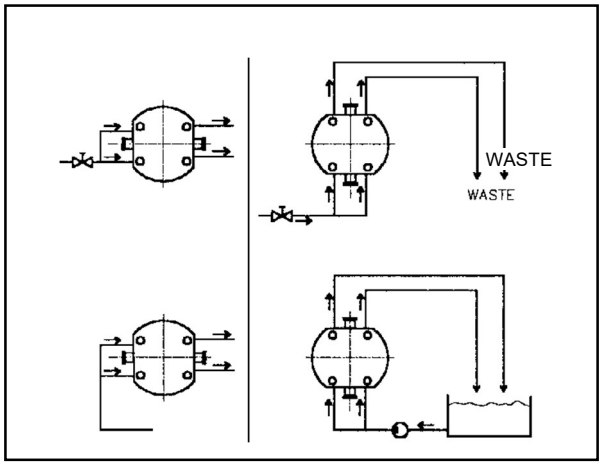


Figure 5a: Suggested Low PressureFlushing System

Double Mechanical Seal with a high pressure liquid flush when:

- The pumped fluid has no lubricating properties and cannot be allowed onto seal faces
- Pumped fluid is highly viscous, i.e. over 150,000 cps.
- A high pressure sterile liquid barrier is required.

When the double seal is used with a high-pressure liquid flush for the reasons described above, a flushing system must be installed as follows:

- The flushing liquid used must itself be compatible with the pumped fluid and must itself not require a complex seal, i.e. must be non-hazardous, non-abrasive and lubricating.
- Flush liquid must be at a pressure of 1 bar (15psi) above the discharge pressure of the Jabsco lobe pump and should flow at 35 to 55 liters/hour per seal.
- Flush fluid should be connected to flow in at the lowest point on the seal housing and out at the highest point to vent air pockets.

See drawing for suggested liquid flush system (see figure 5b).

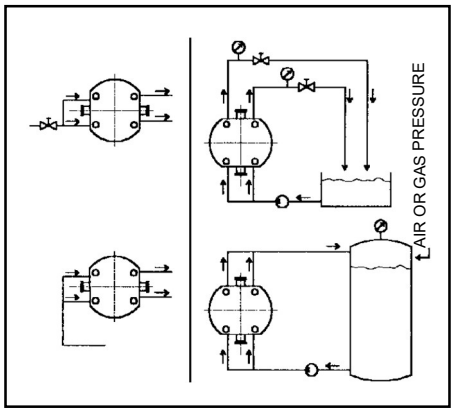


Figure 5b: High Pressure Liquid Supply System for Double Seals

Double Mechanical Seal with steam when:

No bacteria or contamination can be allowed to enter pump, i.e. an aseptic system. A steam barrier system must be installed as follows:

- Wherever possible, sterile liquid e.g. steam condensate should be used as a flush. Condensate should be connected to flow in at the lowest point on the seal housing and out at the highest point to vent air pockets.
- Where steam is essential, great care must be taken with the design of pipework, steam traps and controls.
- Steam must be clean, filtered and wet, i.e. not superheated.
- The pressure of steam should be as low as possible consistent with the desired temperature
- Steam should be connected in at the highest point on the seal housing and out at the lowest point to allow any condensate to drain from the lowest point
- See figure 6 for suggested steam connection.

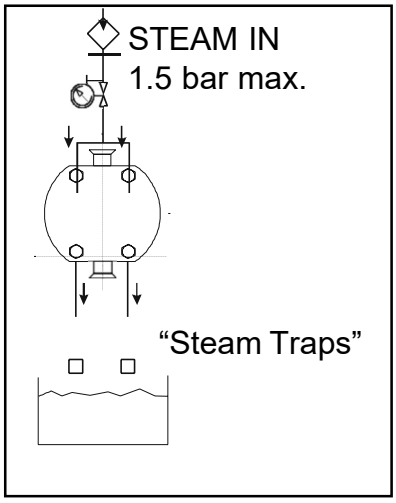


Figure 6: Steam Barrier Flush System For Double Mechanical Seal

⚠ Silicon carbide on silicon carbideseals are not recommended for steam flushed applications.

3.11 MECHANICAL SEAL MATERIALS

SEAL FACES

All primary seals are available with carbon- on-silicon carbide faces for non-abrasive fluids and silicon carbide-on- silicon carbide faces for abrasive fluids containing crystals, powders or particles or when no particles of wear can be allowed to enter the pumped fluid.
Silicon carbide-on-silicon carbide seals are not recommended for steam flushed applications.
All secondary double mechanical seals are with carbon on siliconcarbide faces.

ELASTOMERS

Product contacting primary elastomers mustbe selected to be compatible with the product and the process operation. Consideration must be given to chemical compatibility, temperatures and materialstandards. 55 Series are available with a selection of elastomers, see below.

EPDM- FDA grade
Viton®- FDA grade
PTFE

Consult Packo for more information.

3.12 END COVER BARRIER

55 Series pumps may also be fitted with an end cover to accommodate a barrier of sterile liquid or steam. This offers additional security when no bacteria or contamination can be allowed to enter pump, i.e. an aseptic system. (see Figure 7)

Liquid Barriers: The flushing liquid used must itself be compatible with the pumped fluid. Fluid should be connected to flow in atthe lowest point on end-cover and out at the highest point to vent air pockets. Barrier fluidmaximum pressure for the end cover is
2 bar. (See Figure 8).

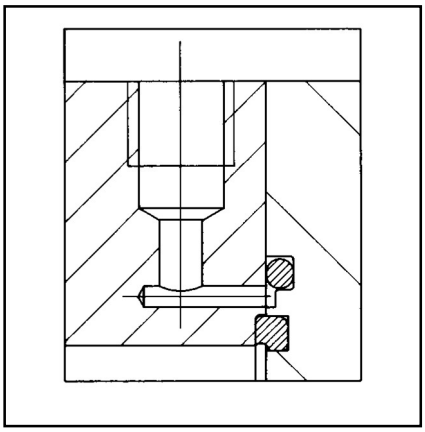


Figure 7: 55 Series Barrier End Cover

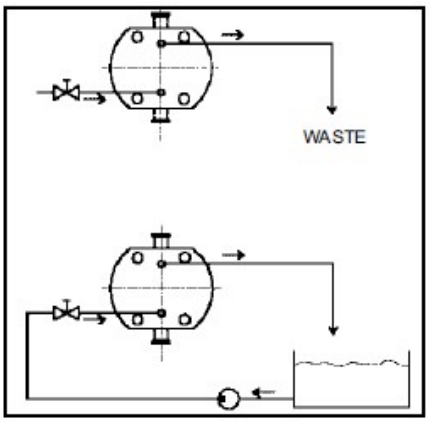


Figure 8 : Liquid Barrier System for Barrier End Cover

Steam Barriers: The pressure of steam should be as low as possible consistent with the desired temperature. Steam should be connected in at the highest point on the endcover and out at the lowest point to allow any condensate to drain from the lowestpoint. (See Figure 6).

3.13 OVERLOAD PROTECTION

To prevent injury to personnel or damage to pump or system caused by excessive pressures, a protection device should befitted such as:-

a) Pressure switch or sensor wired to stop the drive motor. Ideally, the motor should be fitted with a brake.

b) Pressure relief valve or bursting disc fitted downstream of the pump and piped to direct excess fluid away safely.

c) Torque limiting coupling between drive and pump shaft.

d) Motor current sensor.

Note: The level of protection provided by methods a) and b) above is superior to that provided by methods c) and d) which can be difficult to set accurately, especially when pumping viscous fluids.

Protection devices must be set to operate at, or below, the safe operating pressure of the pump or of the system, whichever is thelower. (See pump name plate). Note that maximum pressure varies with temperature.

4 LUBRICATION

55 Series lobe pumps are supplied fully lubricated with Nevastane XSH150 oil. The shaft bearings are greased for life and the timing gears are oil lubricated.

- Before running pump for the first time check oil level as Figure 9.

- After the first 120 hours of operation,drain oil from lower plug hole and refill with fresh oil as Figure 9. Use correct grade of oil as below or other reputable.

See performance Data Sheet for oil capacity.

- Oil should be changed as above after every 12 months or 2,500 hours running.

- When pumping hot liquids or whenbearing carrier temperature exceeds 80°C during operations, use a high temperature oil and change oil every 6 months or 1,000 hours running.

- Bearing grease should be changed whenthe shafts are removed for inspection or repair. Use correct grade of grease as below or other manufacturer's equivalentbearing grease.

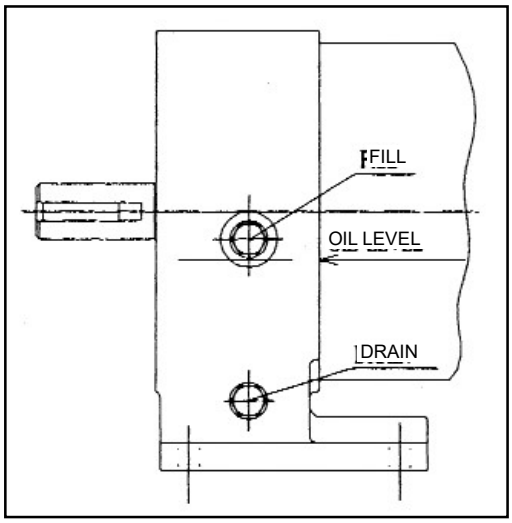


Figure 9

5 START UP & ROUTINE CHECKS

5.1 START UP

Before starting pump for the first time or after servicing or maintenance work, check the following - failure to do so could damage equipment or cause injury to personnel.

- All pump head and mounting bolts aretight.
- All pipe connections are secure.
- All guards, safety and protection devices,are in place and effective.
- Flushing fluid, if required, is flowing - see Section 2.09.
- All valves are open - **NEVER** run pump against a closed valve.
- Pipes and pump head, if heated, are to normal operating temperature.
- Pump and pipes are clear of welding flashor other debris.

⚠ **NEVER** use 55 Series pumps to flush the system the first time. Flush the whole system with suitable cleaning agents before starting the 55 Seriespump, using another more suitable pump if necessary. Be aware that heavy or metal debris tends to collect atthe lowest point in the system.

- Pump is correctly lubricated - see Section 3.
- Motor is wired for correct direction of rotation - see Figure 10.

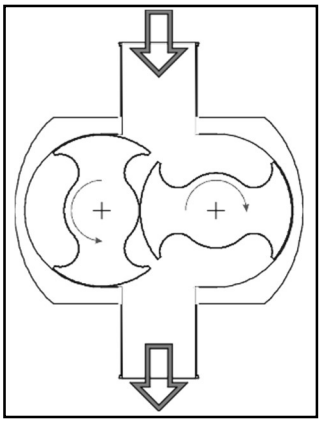


Figure 10. Direction of rotation - viewed from pump head. (Principles applies to all mounting orientations)

DIRECTION OF FLOW				
	VIEWED FROM PUMP HEAD END		VIEWED FROM DRIVE SHAFT END	
DIRECTION OF DRIVE SHAFT	Clockwise	Counter Clockwise	Clockwise	Counter Clockwise
Horizontal Ports Top Shaft Drive	Left to Right	Right to Left	Left to Right	Right to Left
Horizontal Ports Bottom Shaft Drive	Right to Left	Left to Right	Right to Left	Left to Right
Vertical Ports	Bottom to Top (up)	Top to Bottom (down)	Top to Bottom (down)	Bottom to Top (up)

When possible, start pump slowly and increase speed gradually.

- Listen for unexpected noises.
- Check for leaks.
- Check that pump gives desired flow rate at normal operating speed.
- Do not continue to run pump if fluid is not flowing; dry running can damage seals - see Section 2.09.
- Observe pump during first few hours of operation - check for noises and excessive heating of pump bearing housing, i.e. if above 80°C , unlesspumping hot liquids when 110°C may be reached.
- If operating at high speeds or with hotliquids, surface temperatures can exceed 50°C, safety labels may be required to comply with local safety regulations.

⚠ All pumps and equipment surfaces which become hot, i.e. above 60°C , during operation should carry warning labels.

5.2 DAILY CHECKS

- Visual checks of all joints for signs of leakage of product, flushing liquid (if used) and oil or grease from the gearbox.
- Listen and look for any unusual noises, vibration or temperature change.
- If minor problems are identified theseshould be rectified at the end of the shift and if major they should be attended to atonce.

5.3 WEEKLY CHECKS

- As Daily Checks.
- Remove end cover of pump and inspect for signs of damage or wear. Repair or replace as necessary.
- Check lubrication level and top up as necessary. This must be done with the pump stopped.
- Check lubrication level on drive unit and top up as necessary. Follow the manufacturer's instructions.

5.4 MONTHLY CHECKS

- As Weekly Checks.
- Remove end cover and rotors andinspect seal faces for wear and conditionof elastomers. Replace as necessary or note for planned maintenance.

5.5 SIX MONTHLY CHECKS

- As Monthly Checks.
- Change end cover gasket.

5.6 ANNUAL CHECKS

- Possible change mechanical seals if fitted.
- Change all L-cups, O-rings and/or gaskets on pump head.
- Inspect gearbox oil seals and gearhousing O-ring for signs of leakage and replace as necessary.
- Check bearing wear by seeing if there is any movement of the shaft side to side orforwards and backwards. If movement is perceived remove gear cover and dismantle bearings for inspection, replace if necessary.

- Drain and change oil in pump gearbox.

By ensuring a visual inspection daily and regular checks at planned intervals, pumps can be maintained to maximum performance for many years.

6 CLEANING & STERILIZATION

55 Series pumps are designed for use with products that require the process equipment and pumps to be cleaned. The standard (level) of cleaning or sanitization required depends on the needs of the process and product. This information is provided for guidance only. It is the responsibility of the pump user to satisfy him/herself that the cleaning protocol chosen is adequate to achieve the desired levels of cleanliness and Packo cannot accept any responsibility for contamination or loss.

In order to clean the pump it must either be dismantled (manual cleaning), or cleaned in place.

Detergent manufacturers can give advice on the correct use of chemicals and temperature. CIP usuallyneeds a velocity of 1.5 m/sec (5 ft/sec) through the pipeline to achieve the turbulentflow required.

Procedure For Cleaning In Place (CIP)

Each pump is supplied in a generally clean condition but it is the responsibility of the user to establish suitable cleaning and sterilizing regimes appropriate to the fluid and process. These should be implemented before the pump is first used and as often as require thereafter. The following guidelines will help with effective cleaning of 55 Series pumps and minimize risk of damage to the pump.

1. Rinse through system with a suitable liquid, usually water at approximately 50°C, as soon as possible after completion of process to remove bulk of residues before they dry onto place (CIP) as part of the procedure for cleaning the entire process. The higher the standard required, the more sophisticated the cleaning process.

6.1 CLEANING IN PLACE (CIP) AND MANUAL OR STRIP CLEANING

Cleaning Systems

The type of cleaning system used depends partly on the level of cleaning required but also on what is to be removed. Organic materials such as oils, fats, proteins need a different system to inorganic materials such

surfaces.

2. If CIP will not be carried outimmediately after rinsing, leave pump and system full of rinse liquid.
3. Choose chemical cleaning agents to suit the nature of the contamination to be removed and use them in accordance with manufacturer's recommended dilution, temperature and circulation time but do not exceed 90°C. Confirm compatibility with pump materials of construction.

4. CIP fluid flow should result in a mean pipeline velocity of at least 1.5 m/sec. (5 ft/sec).

The table below gives a guide to the required flow rates.

Model	Port Size	Flow l/min
55210	½" (12mm)	7
55320	¾" (19mm)	18
55420	1" (25mm)	35

If using the lobe pump to circulate the CIP fluid, refer to the Performance Data Sheet for pump speed to give required flow, taking account ofpressure losses through pipework. Note that all pumps are more susceptible to cavitation when pumping hot liquids. Ensure adequate Net Inlet Pressure available.

If using a separate pump to circulate CIP fluids, the lobe pump may need to be rotated at a speed sufficiently high to allow the fluid to pass freely through.If sufficient pipe velocity cannot be achieved, fit a by-pass loop to divert excess flow past the pump.

CIP fluid pressures must equal or exceed process pressure at all points in the system to ensure fluid reaches all contact surfaces. It may be necessary to restrict flow in discharge pipework to achieve this but do not exceed differential pressure and temperatures shown on pump Performance Data Sheet. A minimum differential pressure of 1 bar is recommended for effective cleaning.

5. After CIP, rinse through withneutralizers and clean water to remove all traces of cleaning agents.

⚠ Do not pass cold liquid through pump immediately after hot - allow temperature to change slowly. Failureto observe can result in pump seizure.

Procedure for Manual Cleaning

See elsewhere in this manual for procedures to dismantle and re-assemble fluid contact parts.

⚠ Take care not to scratch or damage pump parts. One part of the seal face remains in the rotor when it is removed. Be extremely careful not to damage this seal face.

Do not use steel abrasive wool or brushes on fluid wetted surfaces as particles may become embedded in the surface and causecorrosion.

Use suitable cleaning agents in accordancewith their manufacturer's instructions regarding temperatures, dilutions, skincontact precautions and other safetyinformation. Thoroughly clean all fluid contact surfaces and rinse as required.

As a minimum it will be necessary to removethe end cover and rotors. Re-assemble pump in accordance with this manual.

6.2 STERILIZING IN PLACE

It is possible to pass steam through the complete assembled system to sterilize the internal surfaces without dismantling the pump.

To achieve 100% sterility, it is important to steam through for a period long enough for the coldest part of the system to reach the correct temperature and hold for the time period required to kill off the organisms.

Procedure for Sterilizing In Place (SIP)

If using chemical sanitizers, followguidelines as for CIP above. If using steam,pump specification must be chosen at time of selection noting:

- EPDM elastomers offer best resistance to repeated steam contact but will need to be changed periodically.

- PTFE (Teflon®) is least suitable for steam contact - PTFE end cover joints may need to be replaced every time the pump is sterilized.

Pump should be mounted with the port axis vertical to avoid collecting liquid pools.

1. Thoroughly clean pump and process lines prior to sterilization.

2. If pump is fitted with sterile barriers (on seals, end cover) for the purpose of maintaining sterility, barrier fluidmust be connected throughout SIP cycle to avoid re-infection.

3. Pass clean, wet steam through system until all component temperatures have stabilized. Steam must be free of scale, rust and particles - a filter may be necessary. Typically steam will be at 121°C and 1 bar (15 psi). Soak time,to bring the pump up to temperature, is typically 20 minutes but this shouldbe established, e.g. using thermocouples, as the required soak time will vary with individual installations.

⚠ Do not rotate the lobe pump during this heating phase.

⚠ Do not loosen or remove any pump components or pipe connections during steam sterilization as escapingsteam may cause serious injury.

4. Continue to pass wet steam through the lobe pump and process lines during the hold time. Hold time will be determined by the user to achieve desired level sterility. Typically this will be between 20 and 60 minutes.

   The lobe pump should not be rotated during this hold time unless absolutely essential to achieve sterility, due to increased risk of pumpseizure. All pump components will normally reach desired temperature by thermal conduction without rotating the pump.

   If essential, the lobe pump can be rotated by hand during hold time - beware of danger of hot surfaces - orat a maximum of 50 rpm but only if the pump is fitted with either:
   Single carbon/silicon carbide seals (Code 3) or double seals (codes 1 or 4) provided a liquid flush, e.g. condensate, is connected and operating at a pressure above the steam pressure within the pumpduring SIP.

⚠ If the lobe pump is fitted with single silicon carbide/silicon carbide seals(Code 2) it **must not** be rotated during hold time as the seal faces can bind together.

5. At the end of hold time, pump must be allowed to cool naturally or can bepurged with sterile air/inert gas.

⚠ Pump must not be rotated during cooling.

6. Do not allow cool liquid to enter the lobe pump before pump temperature has fallen to 60°C (140°F) or lower.

If the pump is fitted with silicon carbide/silicon carbide seals (Code 1 or 2), flood it with liquid to lubricate the seals before rotating it.

7 INSPECTION AND REPAIR

55 Series pumps need no adjustment during normal operation. It is advisable though to check oil levels and inspect pump head components (especially seals and joints) periodically so that they may be cleaned or replaced before they fail in service.

All primary fluid contact components of the pump can be inspected and serviced without removing the pump rotor case from the bearing carrier and without removing either the pump or drive unit from the baseplate, as follows:

⚠ **For your safety:**
Before commencing any repair or inspection, isolate power to pump and drive motor. Depressurize, drain and isolate pipework, seal flush and temperature control jackets (if fitted).

N.B. Inspect the rotor seals, rotor cavitiesand internal mating threads. Thoroughly clean any soil using a stiff beaker brush or equivalent with a suitable cleaning agent followed by an anti-bacterial solution.

7.1 END COVER

(see Figure 10 and 11)

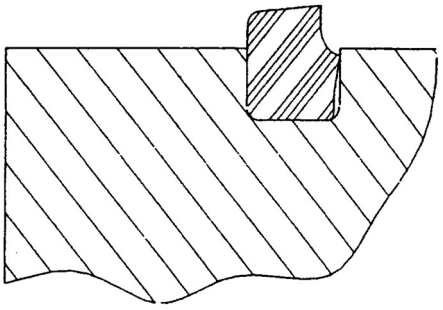


Figure 10

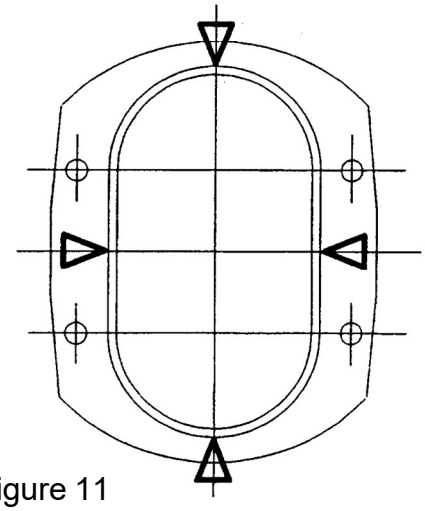


Figure 11

Removal

Before removing the end cover (65), ensurethe pump & drive are isolated, the pump is cool enough to safely touch, drained of any fluids (take special care with hazardous fluids) and ensure that pump, seal flushing system and jackets are isolated and depressurized.

- Remove bolts (68) and remove cover (65). If it is stuck tap carefully sideways with a soft hammer, do not lever off.

- Do not damage face of cover or jointring(s); place face upwards on a
- clean surface.

Re-fitting:

N.B. Make sure end cover joint ring grooveis clean, then insert the joint ring, ensuring that it seats evenly.

a) 55 Series - Fit end cover joint ring (66) inend cover as Figure 10. Press in, in 4 places first, see Figure 11, then press inthe rest to avoid forming loops.

b) To refit, reverse the procedure, ensuringthe end cover is correctly located on rotor case by using the gasket to locate it before tightening screws.

7.2 ROTORS

Removal

The rotors (40) are held in place by threaded retainers (28) behind the rotor case. To remove rotors proceed as follows:-

a) Remove end cover - see Section 7.1. Loosen two hexagon socket screws (29)in each rotor retainer by **HALF TURN ONLY**.

b) Lock the pump rotors with a soft spacer -a plastic block (92) is supplied for this purpose. Unscrew each rotor retainer (28) in turn, to push the rotors forwards, using the tool supplied (91) - see Figure 13.

c) When the retainers are free to turn, pullthe rotors off their shafts, you may wishto mark or label the components. Factory-built pumps have the letters DSengraved on the sleeve of the Drive Shaft rotor.

d) Keep each rotor with its respective shaftto ensure correct mating of sealing faces on re-assembly - you may wish tomark or label the components at thisstage.

e) Take care not to damage the rotors and especially the smooth face of the mechanical seal (56) which is pressed inthe back. Do not attempt to remove the seat unless you intend to fit a new seal (56) or cup rubber (49).

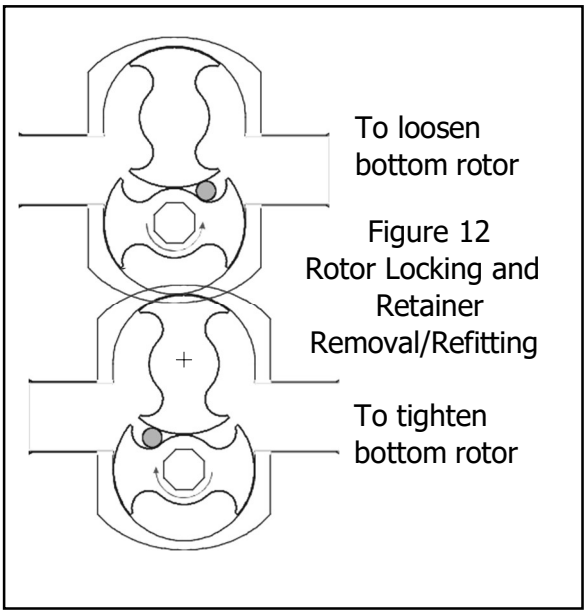


Figure 12
Rotor Locking and Retainer Removal/Refitting

Re-fitting:

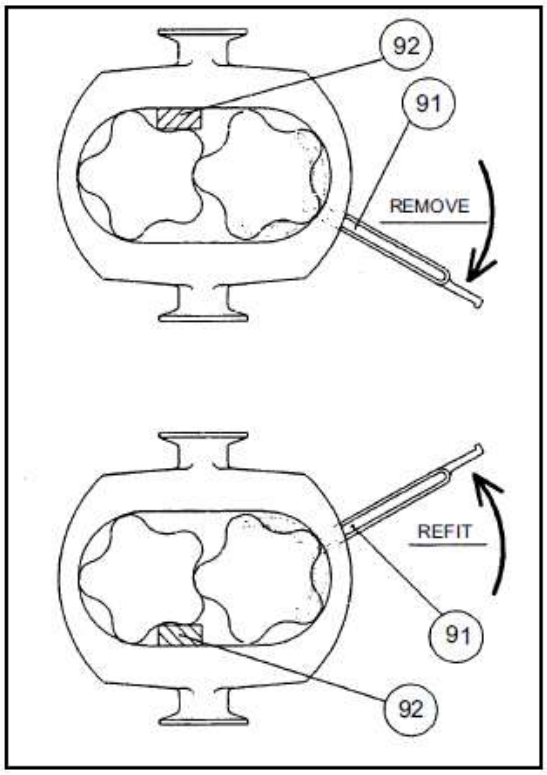
a) With the seal and cup rubber correctly fitted within the back of the rotor, clean and dry the seal faces with a soft tissue before re-fitting. Do not lubricate seal faces.

b) Slide the rotor assemblies into their respective shafts. When fitting each rotor it should slide freely on its drive key.

c) Engage the thread on the end of the rotor sleeve with the rotor retainer, then rotate the retainer to draw the rotor into the rotor case.

d) Tighten each retainer using the plastic block to lock the pump. Do not hit the tool handle with another tool - hand tight is sufficient. Tighten the two hexagon screws in each rotor retainer to prevent it from loosening (See Figure 13).

Figure 13



7.3 MECHANICAL SHAFT SEALS – SINGLE SEAL & PRIMARY SEAL OF A DOUBLE SEAL

When the rotors have been removed (see Section 6.02) the primary seals can be inspected for wear, cracks, chips, scratches or signs of burning caused by running dry.

Inspect rubber joints for damage ordeterioration. Clean the seal faces with soft lint-free tissue before re-assembly.

It is advisable to purchase and fit new elastomer trim kits from your local distributor, when removing and re-fitting seal faces. As a precaution it is also advisable to have a spare set of seal faces available as these parts are very brittle and are easily broken.

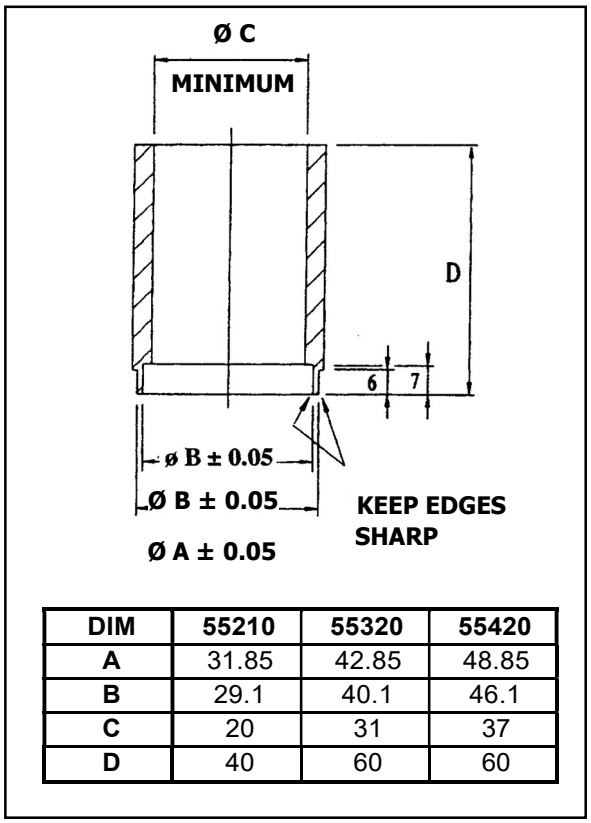
<u>To dismantle mechanical seals:</u>

a) Carefully remove the static seal seats (56) from their bores in the rotor case (38). Take great care not to scratch or damage thesmooth face of the seal. Keep each seal withits respective shaft to ensure correct mating of the seal faces on re-assembly.

b) The joint ring (50) may come out with theseal face. If not, then remove it from the rotor case bore and keep it together with the seal face. You may wish to label the components. The 55210 size pump has a wave spring which can also be removed at this time.

c) Only remove the rotary seal seat (56) from the back of the rotor (40) if you intend to fit a new seal or cup rubber (49).

d) Make up or purchase a sleeve (90) as Figure 14. Press ring down onto cup rubberto force out seat. Do not try to prise out the seat with screwdrivers or similar tools. **Seat materials are brittle.** If seal seat is to be fitted later, note which way up it was fitted - seats are not reversible.



DIM	55210	55320	55420
A	31.85	42.85	48.85
B	29.1	40.1	46.1
C	20	31	37
D	40	60	60

Figure 14

To Re-assemble Mechanical Seals:

Note: if refitting previously used seal faces ensure that rotary and static faces are in their original pairs.

⚠ Fit the seal face with the narrow face track into the rotor case. The seal face with the wide face track should be fitted into the rotor.

a) 55210 pump - insert wave springs (55) into housings. 55320 and 55420 pumps - check that coil springs (54) are in place in housings. Fit joint ring (50) to seal face and lubricate bore in rotor case with a suitable lubricant compatible with the pumped fluid and process. Do not use mineral-oil based lubricants on EP rubber joints; silicone grease is suitable. Align one slot with pin in rotor case and push in seal face; seals should slide freely against their springs.

b) To fit seat to rotor, first fit a new cup rubber to rotor (See Figure 15). Ensure seat is fitted the correct way round, i.e. with smooth working face exposed.

Note: The back, i.e. non-working face is identified by a groove or white mark. Lubricate outside diameter of seat with a suitable lubricant (see above) and press seat evenly into cup rubber. Do not damageseat face. When correctly fitted, seat is flushwith back face of rotor and must not betilted. Any 'run out' of seat will cause seal leakage. Seal assembly is now complete.

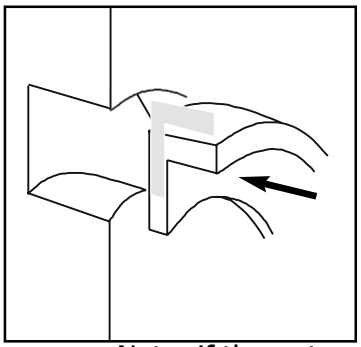


Figure 15 Cup Rubber Insertion in Rotor

Note: if the rotor case has been removed (see section 7.6), static seal seats should be inserted into the rotor case, before mounting the rotor case onto the bearing housing.

Carefully clean all seal faces with a soft lint- free cloth and to remove all dust and grease. It may be necessary to use a compatible solvent to remove oil or grease.

7.4 SHAFT SEALS - DOUBLE MECHANICAL

(See section 7.3 for servicing of primary (product) seal face.)

Pumps fitted with double seals have secondary seals in order to retain a flushing or barrier fluid. To service primary seals see section 7.3. To service secondary seals it isnecessary to remove the rotor case - see Section 7.6 -Then proceed as follows:

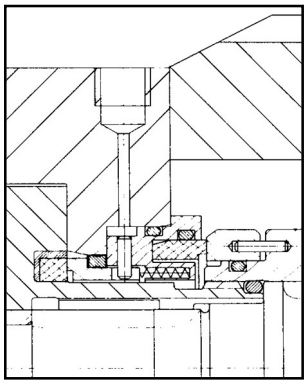


Figure 16
Double
Mechanical
Seal

Removal:

a) Remove 6 screws (47) and clamp (48) from back of rotor case and withdraw seal housings (45).

b) Remove static faces (57) from housings (45). This can be done by inserting a small pin through the holes in the housing andpushing on the rear of the seal face.

c) If fitting new O-rings (51) prise them out of the housing (45).

d) Pull rotary seats (57) off of rotor retainers. Take care not to scratch or damage the smooth faces of the seals. Keep each seal with its respective shaft to ensure correct mating of seal faces on re-assembly - you may wish to label the components at this stage.

e) If fitting new O-Rings (46) prise them out of the groove in the rotor retainer (28).

Re-assembly:

a) To re-assemble, place O- Ring (51) in double seal housing (45), lubricate outside ofstatic seat with a suitable lubricant compatible with the barrier fluid. Align holes in seal face with pins in seal housing (see figure 16) and push seat fully in.

b) Fit O ring (46) to rotor retainer (28). Gently push seal seat squarely on to rotor retainer, aligning hole in rear of seal face with pin on the support ring. Ensure that the face is free to move against the springs.

c) Clean seal faces with soft lint-free tissue to remove any grease or dust - do not lubricate. Refit rotor case taking care that shafts do notdamage secondary seal faces. (See section 6.06)

7.5 SEAL HOUSINGS

It is not normally necessary to remove the seal housings (45) from the back of the rotorcase except to check condition of springs (54). If required to do so, proceed as follows:

Note: Seal housings vary for single & double seals (See section 3.2).

Removal:

7.5.1 Remove end cover (see section 6.01), rotors (see 6.02), rotor case (see 6.06).

7.5.2 Position rotor case (38) face down on a clean smooth surface, seal housings (45) uppermost. Taking care not to damage the front of the rotor case.

7.5.3 Loosen screws (47) and remove clamp plates (48). Carefully withdraw the seal housings.

7.5.4 If double seals are fitted remove static seal seats (57) from the housings (45), keeping mating seal faces together. Youmay wish to label the components.

7.5.5 Inspect components for wear, replace as required.

Re-fitting:

a) **Single Seal** - Insert seal housing (45) into rotor case (38). Re-fit clamp plates (48) and tighten screws (47).

7.6 ROTOR CASE

Disconnect process pipes and any flush/barrier connections, first ensuring fluid is not under pressure. The rotor case can be removed after withdrawing the end cover(see section 6.01), the rotors (see section 6.02) and the two hexagon socket screws
(37) holding the rotor case (38) to the bearing carrier (24). Note that the rotor caseis dowelled and can only be re-fitted one way round.

If primary or secondary static seal seats arestill fitted to the rotor case take care not to damage them on the shaft ends (16 & 17).

To re-fit, reverse the above procedure. Torque the two hexagon head socket screws
(37) to the correct setting. (see PerformanceData Sheet).

7.7 ROTOR FRONT & REAR CLEARANCE ADJUSTMENT

The 55 Series pump has very small, carefully controlled clearances between rotors and rotor case - see PerformanceData Sheet. These can be checked by feeler gauges (shims) or inspection tools(micrometer, vernier caliper).

If the end clearances are incorrect they canbe adjusted without removing the pump from its baseplate.

If pump is being re-built using new components, first fit 0.5mm thick shim pack(39), fit rotor case and rotors and check clearances/protrusion.

Continue as follows:

a) Remove rotors and rotor case as Section6.02 to 6.06.

b) Loosen screws (29) in rotor retainers (28) until pins (30) can be removed. Remove rotor retainers from shafts, taking care not to lose shims (39).

c) Add shims to shim pack to reduce front clearance, remove shims to increase front clearance - see Figure 17. Shims are available in increments of 0.025mm (0.001 inch).

d) Re-fit rotor retainers, rotor case and rotors and re-check clearances. Re-adjust shims as necessary.

e) Check rear clearance.

When setting the front clearance the rear clearance should automatically be correct and will be approximately the same as the front clearance ± 0.01mm (0.0005”). If the rear clearance is less than this then the frontand rear clearances should be adjusted so that they are equal.

If any side-to-side movement of the rotors can be detected or if the radial clearance is incorrect, - see Figure 18 - check condition of bearings - see Section 6.10 & 6.11. Thereis no adjustment for radial clearance - replace shafts and/or bearings if worn.

Multilobe Rotors only

If the meshing, i.e. rotor to rotor clearance is incorrect, - see Figure 18 - re-time pump or replace timing gears - see Section 7.12.

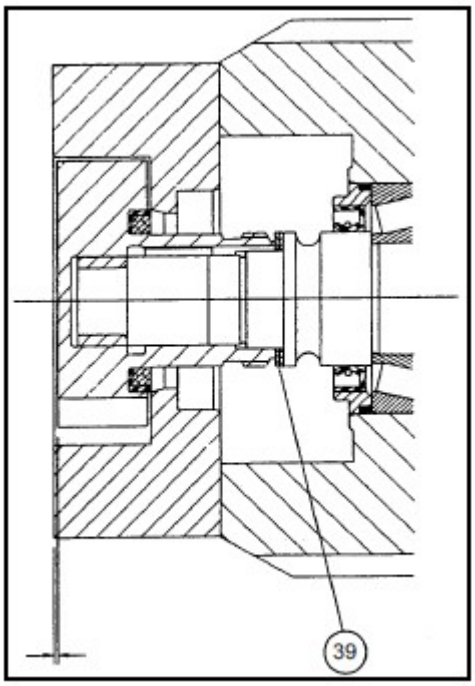


Figure 17

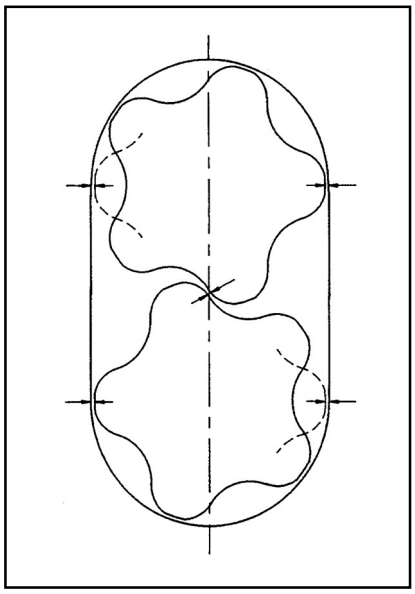


Figure 18
Multilobe Rotor shown

7.8 THERMAL JACKET - END COVER

Ensure that the liquid feed to the jacket is switched off before attempting to service it.

a) Dismantle the jacket (81) from the cover (79 or 80) by removing the screw(s) (84) from the centre of the jacket

b) Remove the inner O-ring(s) (82) from the groove(s) around the screws and the outer O-ring(s) (83) from the groove around the outside edge of the jacket.

c) Replace the O-rings and re-fit the jacket.

d) Tighten the screws to the correct torque.

7.9 BEARING CARRIER

Power input to the pump is via the drive shaft (17). The gearbox has two contra-rotating shafts (16 & 17), supported by taper roller bearings (23). The shafts are synchronized by a pair precision cut gears
(20) that distribute power between the drive shaft (16) and driven (lay) shafts (17).

55 Series pump gearboxes have been designed for easy inspection and maintenance. Care must be taken, as correct gearbox assembly is essential for effective pump operation and long-life. If in doubt consult your supplier or the manufacturer. (See Figure 19).

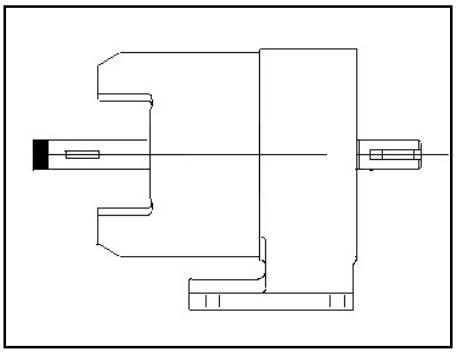


Figure 19
Pump
Gearbox

Inspection:

Bearing carrier (24) and gearbox internals can be inspected by removal from the gear housing (22). Before removing the gear housing for inspection it is advisable to purchase, a new gearbox O-ring (6) and four gear-cover screw seals (36). Then proceed as follows:

a) Disconnect pump from drive and remove shaft coupling.

b) Drain lubricating oil from pump gearbox via drain plug (9).

c) Remove four gear cover securing screws (14) and plastic sealing washers (36).

d) Remove drive shaft key (19) and slide bearing carrier assembly out of gear housing (22), taking care not to damage thedrive shaft oil seal on the drive shaft key- way.

e) Preliminary inspection can now be carried out without further dismantling. e.g. condition of timing gears or movement in thebearings.

f) If all is found to be satisfactory, refit in reverse order using new O-ring (6) & seals (36).

7.10 GEARBOX SHAFTS, GEARS AND BEARINGS

a) If the shafts are to be removed for any reason, label all components including bearing outer races, shims etc. and keep in their correct positions.

b) With the pump disconnected from its drive, remove rotor-case (see section 6.06), drain oil via plug (9) and remove bearing carrier (24) from gear housing (22), bend

down the tab washers (11) which lock the gear-nuts (12).

c) Before loosening the gear-nuts (12) lock the rotors on the shaft using the plastic block (92) supplied for this purpose. Loosen the gear-nuts (12) using a C-spanner (91).

d) Remove gear-nuts (12), tab washers (11), timing gears (20) and drive shaft keys (10), from the shafts.

e) Remove the six screws (27) and washers (26) from the front of the bearing carrier.

f) Using a light press or soft hammer, drive out the shafts (16 & 17) towards the front (rotor-case end) of the bearing carrier (24) (See Figure 20). This will push out the front bearing retainers (2). The outer race of the front bearing (23) will also slide out of the bearing carrier.

The outer race of the rear bearings (23) canbe pulled out of the of the housing (24) usingyour fingers.

To remove the inner race of the front bearinga press will be required.

Re-assemble in the reverse order, checkingand re-adjusting the bearing pre-loads. (Seesection 6.11).

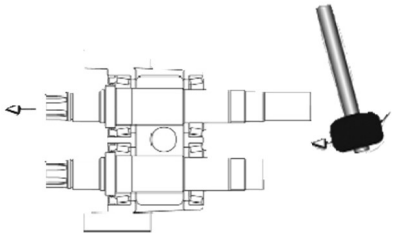


Figure 20
Removing
Shafts

7.11 BEARING PRE-LOAD ADJUSTMENTS

a) Whenever the shafts are removed from the bearing carrier, the bearing shields (4) should be removed and all grease cleaned from shafts, bearings and bearing carrier. Press out lip seals (7) from bearing carrier and lip seals (1) from retainers.

b) If new bearings are fitted, these must be pressed fully against the shoulder on the shaft and against the bearing spacer. Checksurfaces where lip seals run are smooth.

c) Stand bearing carrier vertically on gear housing on wooden blocks. Push outer raceof rear bearing into bore in bearing carrier and fit one shaft.

d) Fit outer race of front bearing and tap it down whilst rotating shaft, to fully seat bearings.

e) Fit shim pack (25) under bearing retainerand add or remove shims until retainer face protrudes 0.02 to 0.05mm (0.001" to 0.002") above unpainted areas of bearing carrier - see Figure 21.

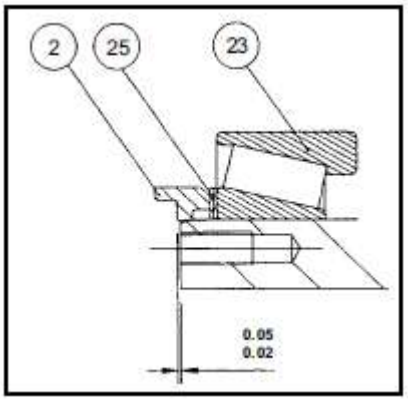


Figure 21

f) Fit clamp washers (26) and Screws (27). Tighten screws and check that shaft is free to turn but with some resistance. If shaft is very tight remove shims to reduce pre-load. If shaft can be moved from side-to-side, add shims to increase pre-load.

g) Remove shaft and fit new lip seals to bore in bearing carrier and to bearing retainers.

h) Fill space between bearings on shaft with grease - see Section 3 - and fit bearing shields. Re-fit shaft in its correct bore in bearing carrier. Fit outer race shims and bearing retainer with a new O-ring (3). Fit clamp washers and tighten screws.

i) Repeat instructions b) to h) for other shaft.

j) Fit gear spacers (8) gears (20), tab washers (11) and gear nuts (12) and adjust timing (not required for scimitar rotors) as in Section 6.12

7.12 TIMING ADJUSTMENTS – MULTI LOBE ROTOR ONLY

a) Fit timing gears to shafts - ensure marks are aligned as Figure 22. Fit rotors but do not fit rotor case or rotor retainers. Do not fit gear nuts (12) yet.

b) Pinch a 0.15mm (0.006 inch) feeler blade between two lobes - see Figure 23.

c) Push both gears forward. If both gears contact their gear spacers, fit tab washers (11) and nuts (12) to both shafts, then continue from (d) below.

   If one gear leaves a gap "A" - see Figure 24 - measure this gap with feeler gauges. Fit tab washer (11) and nut (12) to the <u>other</u> shaft, hand tight only. Still gripping the feeler between the rotors, pull the loose gear back and measure the gap "B" - see Figure 25.

Remove both rotors and the loose gear. Fit a shim pack (21) equal to the average of the two measurements of the gap :

$$\text{Shim pack thickness} = \frac{A + B}{2}$$

Re-fit gear nuts and fit second tab washers and nut.

d) Tighten both nuts to correct torque. <u>DO NOT</u> wedge the <u>rotors</u> to prevent shafts from turning - hold each gear in turn in a vice with soft jaws as Figure 26.

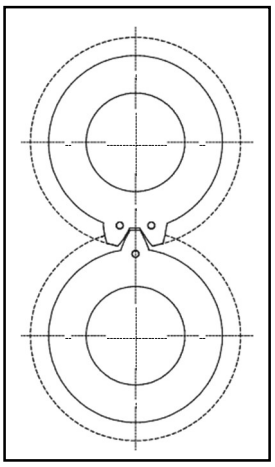
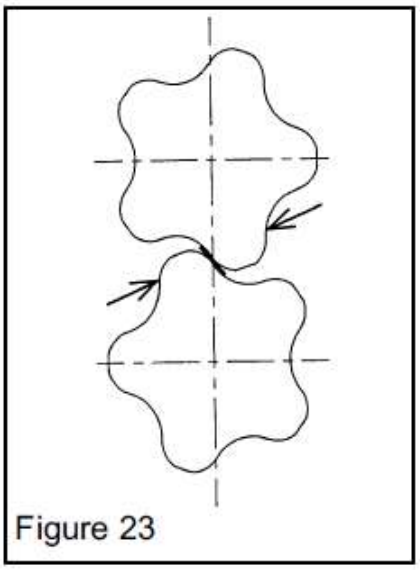


Figure 22
Gear Timing Marks



e) Slide rotors onto their correct shaft and check clearance between every lobe with feeler gauges. At no point should lobes touch each other when pinched together. If necessary add or remove shims to give as close to equal clearance as possible between lobes at every point of rotation. Shims are available in increments of 0.025mm. Note that 0.10mm of shims will rotate one rotor relative to the other by 0.03mm at the mid-meshing point.

f) Tighten nuts to correct torque and finally check timing. Bend up tab washers and re-assemble gear housing. Re-fill with oil - see Section 5.

Continue to assemble pump as Section 7.9.

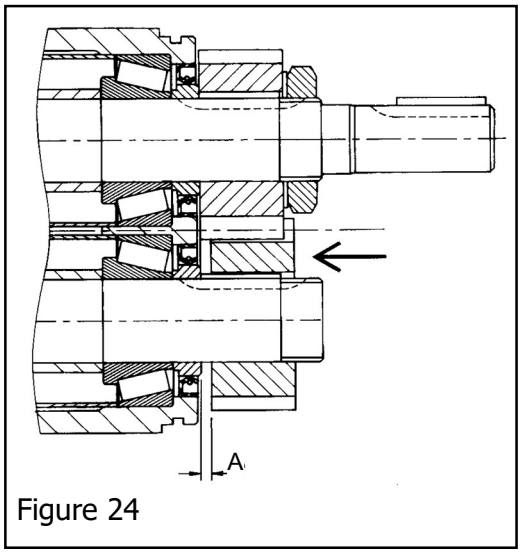


Figure 24

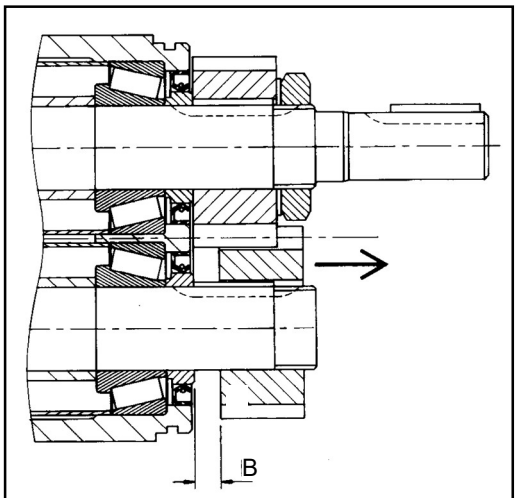


Figure 25

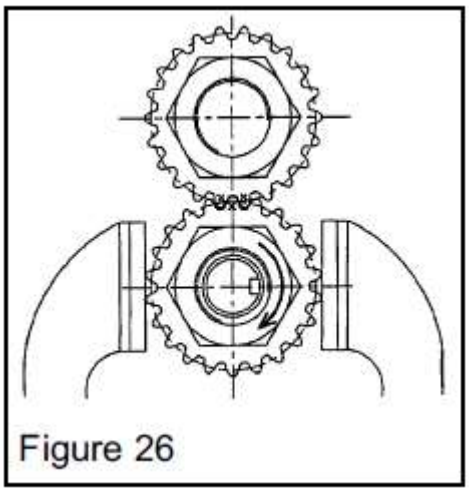


Figure 26

8 ATEX APPLICATIONS

General

This supplement applies to the 55 series rotary Lobe Pumps used in applications covered by the ATEX Directive 2014/34/EC.

Protection Class


II 2 GD c Tx[1]

[1] Temperature class depending upon the processes media refers to section 'Maximum Surface Temperature' in below text.

Safety Zones Applicable

Zone 1, 2, 21 & 22

The baseplate of the pump must be earthed in order to prevent a build-up of static electricity.

Maximum Surface Temperature


ATTENTION

The maximum surface temperature of the LU is dependent upon the temperature of the media processed by the pump.

The table shows the maximum permitted temperature of the processed fluid within the pump in order to ensure that the maximum surface temperature of components does not exceed the corresponding temperature class.

Temperature Class	Maximum Surface Temperature	Maximum Temperature of Processed Fluid
T1	450°C	N/A
T2	300°C	N/A
T3	200°C	140°C
T4	135°C	85°C

Table 1 - Temperature class

55 series rotary Lobe Pumps are limited to a processed fluid temperature of maximum 140°C.

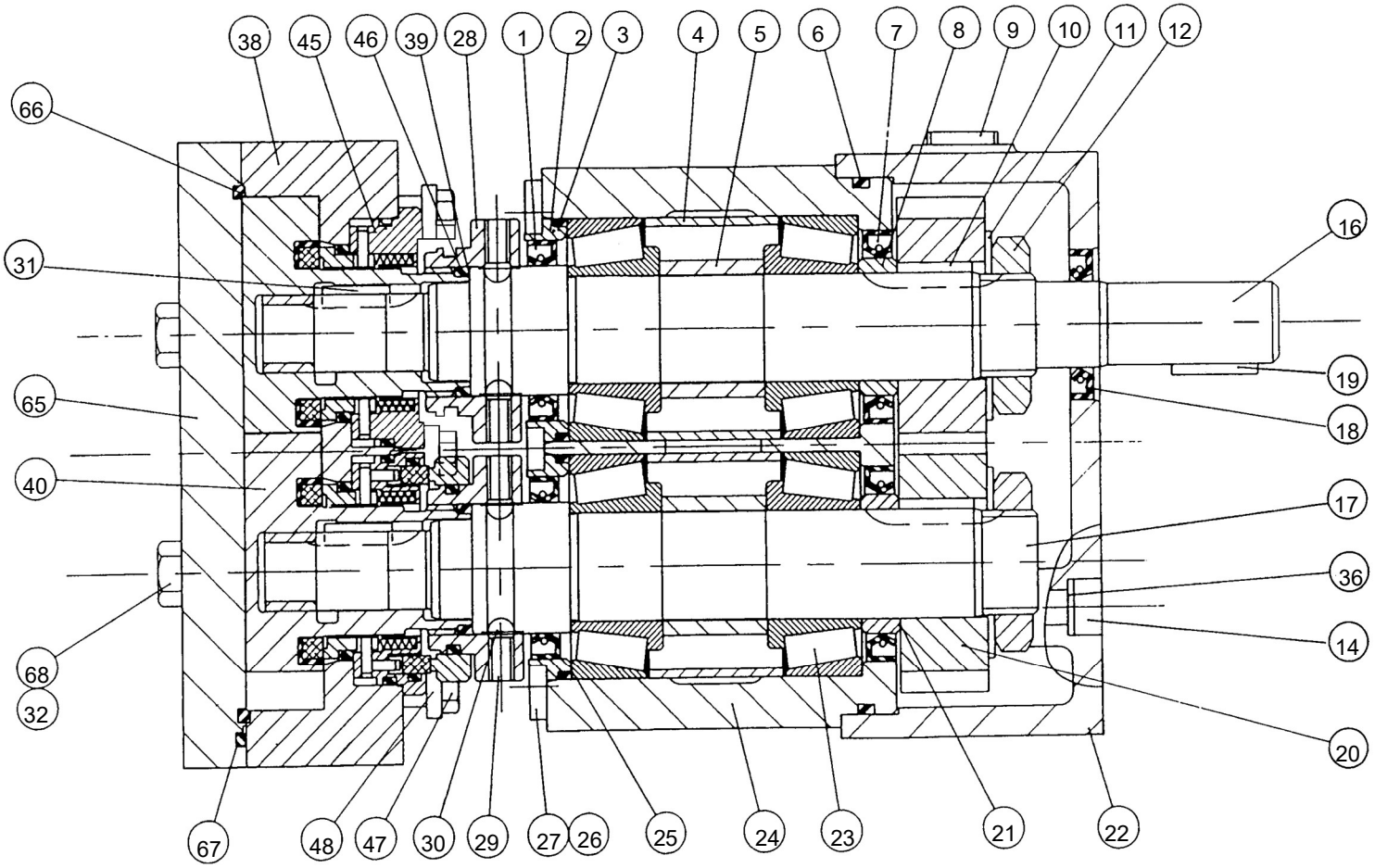
Seal Flushing

To prevent the potential risk of hot surfaces on the pump seals it is essential to apply additional cooling and lubrication of the seal faces through the use on an additional auxiliary support system as described in SEALS AND FLUSHING.

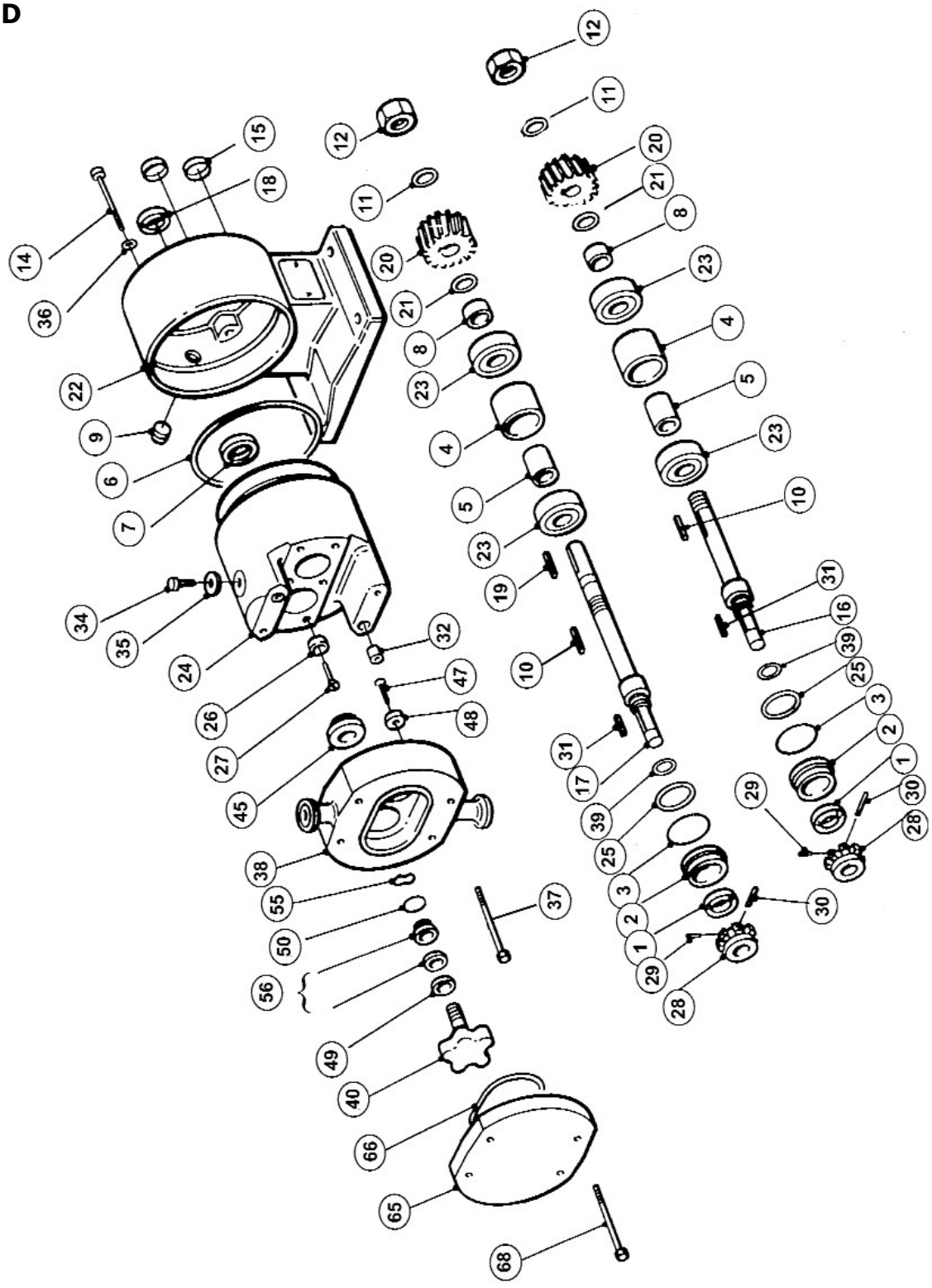
In addition to the system requirements described in SEALS AND FLUSHING, controls must be implemented to ensure the continuous and uninterrupted operation of the flushing circuit during pump operation.

It is essential to ensure that all the air/gas is purged from the seal housings so that the seals are fully immersed in the quench/barrier fluid.

9. SECTIONAL DRAWING

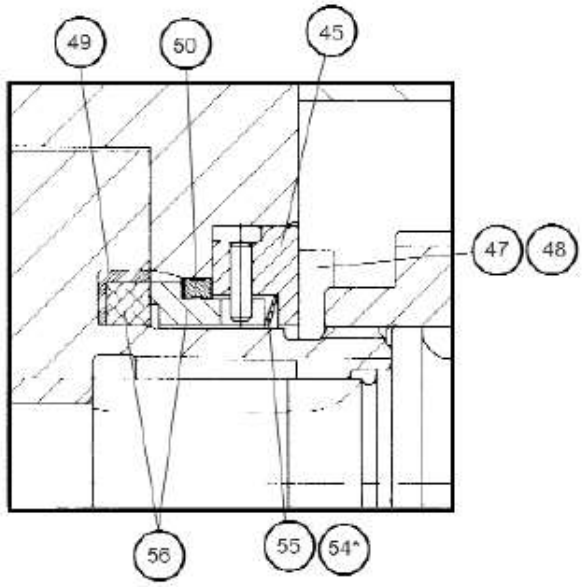


9.1 EXPLODED DIAGRAM



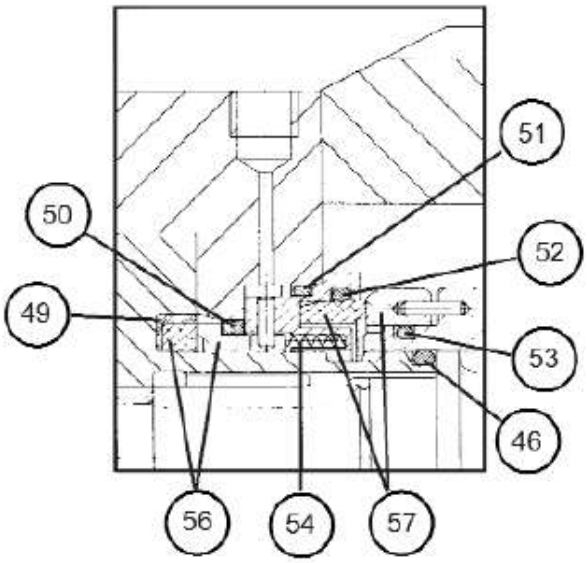
9.2 OPTION & EXTRAS - SECTIONAL VIEWS

Single Seal



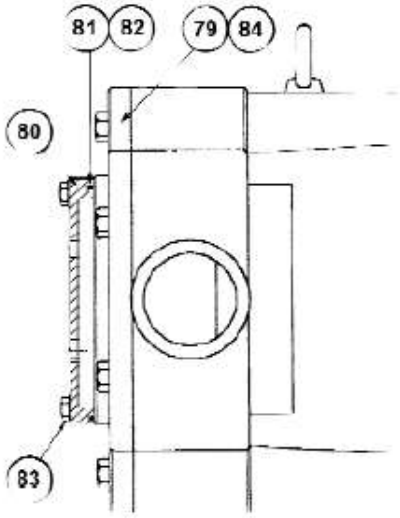
* - Wave Spring shown (55210 only). On 55320 & 55420 models this part is a Coil Spring.

Double Seal

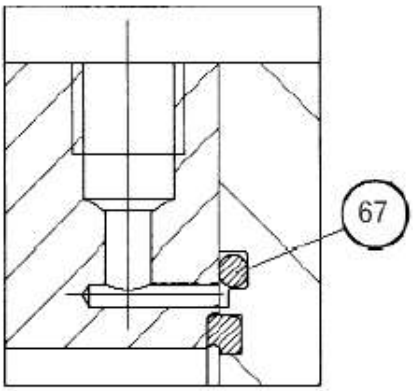


47 48 - Not shown

Thermal Jacket - End Cover



Aseptic Barrier - End Cover



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