VIKING PUMP®

INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR THE

RTPe
ROTARY TRANSFER PUMP ESSENTIAL

RANGE OF PUMPS

IDEX

INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR RTPe™ ROTARY LOBE PUMPS.

1.0 Safety Information.

INCORRECT INSTALLATION, OPERATION, OR MAINTENANCE OF EQUIPMENT MAY CAUSE SEVERE PERSONAL INJURY OR DEATH AND/OR EQUIPMENT DAMAGE THAT MAY INVALIDATE THE WARRANTY.

THIS INFORMATION MUST BE READ FULLY BEFORE BEGINNING INSTALLATION, OPERATION, OR MAINTENANCE AND MUST BE KEPT WITH THE PUMP. ONLY SUITABLY TRAINED OR QUALIFIED PERSONS SHOULD UNDERTAKE INSTALLATION AND MAINTENANCE.

Danger - Failure to follow the listed precautionary measures may result in serious injury or death. Areas of potential risk are identified by the following symbol:

Warning - Safety instructions which shall be considered for reasons of safe operation of the pump or pump unit and/or protection of the pump or pump unit itself are marked by the sign:

WARNING

DANGER

DO NOT OPERATE PUMP IF:

- The front cover is not installed correctly.
- Any guards are missing or incorrectly installed.
- The suction or discharge piping is not connected.

DO NOT place fingers, etc. into the pumping chamber or its connection ports or into any part of the gearbox if there is ANY possibility of the pump shafts being rotated. A severe injury will occur.

DO NOT exceed the pumps rated pressure, speed, and temperature, or change the system/duty parameters from those for which the pump was originally supplied, without confirming its suitability for the new duty. Running the pump outside of its operations envelope can cause mechanical contact, excessive heat and can represent a serious risk to health and safety.

Installation and operation of the pump must always comply with health and safety regulations.

WARNING

A device must be incorporated into the pump, system, or drive to prevent the pump from exceeding its stated duty pressure. It must be suitable for both directions of pump rotation where applicable. Do not allow the pump to operate with a closed/blocked discharge unless a pressure relief device is incorporated. If an integral relief valve is incorporated into the pump, do not allow re-circulation through the relief valve for extended periods; (refer to section 3.7).

The mounting of the pump or pump unit should be solid and stable. Pump orientation must be considered in relation to drainage requirements. Once mounted, shaft drive elements must be checked for correct alignment. Rotate pump shaft by at least one full revolution to ensure smoothness of operation. Incorrect alignment will produce excessive loading, create high temperatures and increased noise emissions. Do not use any drive arrangements, which cause side loading of the drive shaft. It may also be necessary to earth the pump head to avoid the build-up of a potential charge that could cause a spark.

The installation must allow safe routine maintenance and inspection (to replenish lubricants, check for leakage, monitor pressures, etc.) and provide adequate ventilation necessary to prevent overheating.

WARNING

Fill all gearboxes with the recommended grades and quantities of lubricant; (refer to section 5.3). Beware of over/under filling the gearbox as this could cause the pump to overheat and severe mechanical damage to occur.

WARNING

Before operating the pump, be sure that it and all parts of the system to which it is connected are clean and free from debris and that all valves in the suction and discharge pipelines are fully opened. Ensure that all piping connecting to the pump is fully supported and correctly aligned with its relevant connections. Misalignment and/or excess loads will cause severe pump damage. This could result in unexpected mechanical contact in the pump head and has the potential to be a source of ignition.

WARNING

Be sure that pump rotation is correct for the desired direction of flow; (refer to section 3.1).

WARNING

Do not install the pump into a system where prolonged run dry will occur (i.e. without a supply of pumped media). Mechanical seals require a thin fluid film to lubricate the seal faces. Dry running will cause excessive heat and seal failure. Composite O-ring are dry run capable for a limited time.

WARNING

Pressure gauges/sensors are recommended, next to the pump suction and discharge connections to monitor pressures.

Caution must be taken when lifting the pump. Suitable lifting devices should be used as appropriate. Lifting eyes installed on the pump must only be used to lift the pump, not pump with drive and/or baseplate. If the pump is baseplate mounted, the base plate must be used for all lifting purposes. If slings are used for lifting, they must be safely and securely attached. For weights of the bare shaft, pumps refer to section 5.5.1 & 5.5.2

DO NOT attempt any maintenance or disassembly of the pump or pump unit without first ensuring that:

- The pump is fully isolated from the power source (electric, hydraulic, pneumatic).
- The pumping chamber, pneumatic relief valve and any shaft seal support system are depressurised and purged.
- Any temperature control devices (jackets, heat-tracing, etc.) are fully isolated, that they are depressurised and purged, and components are allowed to reach a safe handling temperature.

Use only genuine Viking Pump Hygienic parts.
All certification, standards, guarantees & warranties originally supplied with this pump will be invalidated by the use of non-genuine Service Parts.

DO NOT attempt to dismantle a pressure relief valve which has not had the spring pressure relieved, is still connected to a pressurised gas/air supply or is mounted on a pump that is operating. Serious personal injury or death and/or pump damage may occur.

WARNING

Use only genuine Viking Pump Hygienic parts.
All certification, standards, guarantees & warranties originally supplied with this pump will be invalidated by the use of non-genuine Service Parts.

DO NOT loosen or undo the front cover, any connections to the pump, shaft seal housings, temperature control devices, or other components, until sure that such action will not allow the unsafe escape of any pressurised media.

Pumps and/or drives can produce sound power levels exceeding 85-dB (A) under certain operating conditions. When necessary, personal protection against noise must be taken.

Avoid any contact with hot parts of pumps and/or drives, which may cause injury. Certain operating conditions, temperature control devices (jackets, heat-tracing, etc.), bad installation, or poor maintenance can all promote high temperatures on pumps and/or drives.

WARNING

When cleaning, either manually or by CIP method, the operator must ensure that a suitable procedure is used in accordance with the system requirements. During a CIP cleaning cycle, a pump differential pressure of between 2 and 3 bar (30 to 45 psi) is recommended to ensure suitable velocities are reached within the pump head. The exterior of the pump should be cleaned periodically.

The surface temperature of the pump is also dependent on the temperature of the pumped medium.

1.1 Risk assessment relating to the use of Viking Pump RTPe™ rotary lobe pumps.

Note:- For a feature to be suitable for an application, The feature must be fit for its designated purpose and also suitable for the environment where it is to be installed.

Source Of Hazards	Potential Hazards	Frequency Of Hazards	Recommended Measures
Unvented cavities	Build up of explosive gas	**Very Rare**	Ensure that pump is totally filled. Consider mounting ports vertically. **See Chapter 1.0**
Rotorcase / Rotors / Front Cover	Unintended mechanical contact	**Rare**	Ensure that operating pressures are not exceeded. Ensure that suffcient NPSH to prevent cavitation. **See Chapter 1.0**
Pump external surfaces	Excess temperature. Electrostatic charging	**Rare**	User must ensure temperature limits. Do not overfill gearboxes with lubricant. Provide a ground contact for pump. **See Chapter 1.0**
Cover 'O' ring	Pump liquid leakage. Build up of explosive gas.	**Very Rare**	Check selection of elastomers are suitable for application. Ensure cover retaining nuts are tight. Service plan.
Pump casing / cover	Pump liquid leakage. Build up of explosive gas.	**Very Rare**	Stainless steel, Corrosion resistant.
Shaft seals	Excess temperature. Unintended mechanical contact. Leakage. Build up of explosive gas.	**Rare**	Selection of seal system must be suitable for application. **See Chapter 5.0**. Service plan. Composite seal can be dry run limited time.
Auxiliary system for shaft sealing	Pump liquid leakage. Build up of explosive gas.	**Rare**	Selection of auxiliary seal system must be suitable for application. Composite seal can be dry run limited time.
Rotation direction test	Excess temperature	**Very Rare**	If flushed seals are installed ensure that flush is applied to seal assemblies. Only allow pump to run for minimum period - just a few seconds.
Closed valve condition	Excess Temperature. Excess Pressure. Mechanical contact.	**Rare**	Can cause excessive pressue, heat and mechanical contact. **See Chapter 1.0**
Shaft	Random induced current	**Very Rare**	Provide a ground contact for pump. **See Chapter 1.0.**
Mechanical shaft coupling (Torque Protection)	Temperature from friction Sparks from break up of shear pins. Electrostatic charging	**Rare**	Coupling selection must suit application. **See Chapter 1.0.**
Mechanical shaft coupling (standard)	Break up of spider. Unintended mechanical contact. Electrostatic charging	**Rare**	Coupling selection must suit application. Service plan. **See Chapter 1.0.**

2.0 Introduction.

2.1 General.

RTPe™ rotary lobe pump is manufactured by Viking Pump, a unit of IDEX Corporation.

This manual includes all the necessary information for RTPe™ pumps and should be read prior to beginning installation, operation and maintenance.

Should you require any additional information regarding the RTPe™ pumps contact Viking Pump or their Viking Pump Hygienic authorised distributor (refer to section 2.2).

When asking for assistance, please provide the pump model and serial number. This information can be obtained from the pump nameplate, which is located on the side of the pump gearbox, see fig 2. Should the nameplate be unreadable or missing, the pump serial number is also stamped on either side of the rotorcase, see fig 3.

If the system or product characteristics are to be changed from the original application for which the pump was selected, Viking Pump or their Viking Pump Hygienic authorised distributor should be consulted to ensure the pump is suitable for the new application.

2.2 Viking Pump Hygienic Distributors.

Viking Pump distributes its products internationally via a network of authorised distributors. Throughout this manual where reference is made to Viking Pump, service and assistance will also be provided by any Viking Pump Hygienic authorised distributor for RTPe™ pumps.

2.3 Receipt and Storage.

Upon receipt of the pump, immediately examine it for any signs of visible damage. If any damage is noted, contact Viking Pump or your Viking Pump Hygienic authorised distributor and clearly mark upon the carriers paperwork that the goods have been received in a damaged condition, with a brief description of the damage.

If the pump is not required for immediate installation then it should be stored in a clean, dry environment. It is recommended that storage temperature should be between –10°C and 40°C (14°F and 105°F).

2.4 Cleaning.

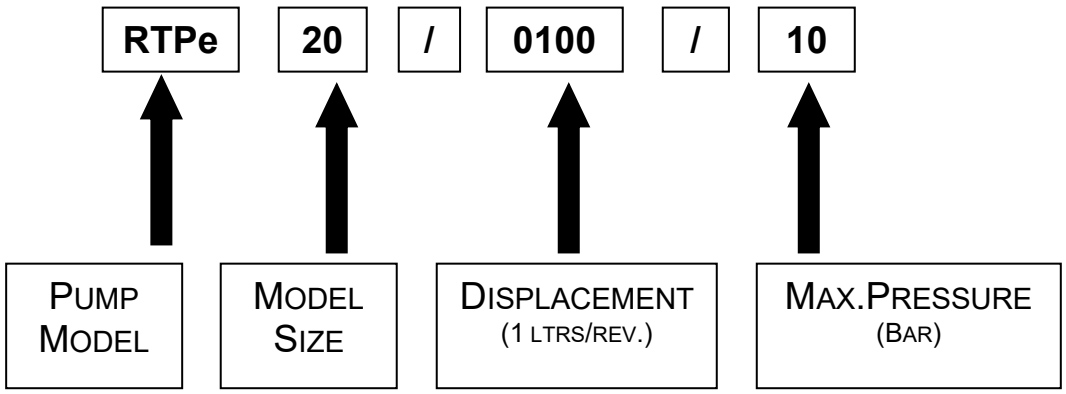
The RTPe™ pump series is suitable for both manual cleaning and CIP (Cleaning In Place), refer to section 3.3.2.

The strategic positioning of the product seals, combined with their ease of access provides an arrangement that can be more effectively cleaned by both manual and CIP procedures.

It is recommended that the exterior of the pump be cleaned periodically.

2.5 Pump Model Designation.

Fig 1 Designation of pump models

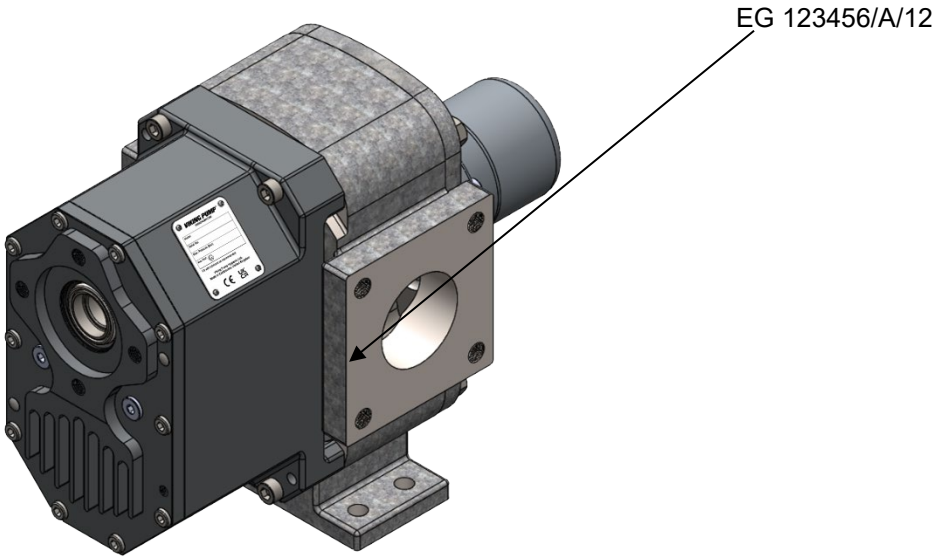


This information, together with the pump serial number, should be provided when requesting additional information on the pump or when ordering spare parts. The pump serial number is stamped on the pump nameplate(Fig 2) and the rotorcase, (Fig 3). For the maximum operating pressures, temperatures and speeds refer to section 3.2.

2.6 Pump Model and Serial Number.

Should you require any information regarding your RTPe™ rotary lobe pump contact Viking Pump or your Viking Pump Hygienic authorised distributor, providing the pump model and serial number as stated on the pump nameplate, see Fig 2, which is fixed to the pump gearbox. Should this be damaged or missing, the pump serial number is also stamped on face of the flange of the rotorcase, (see Fig 3).

Fig 3 Serial Number Location.



3.0 General.

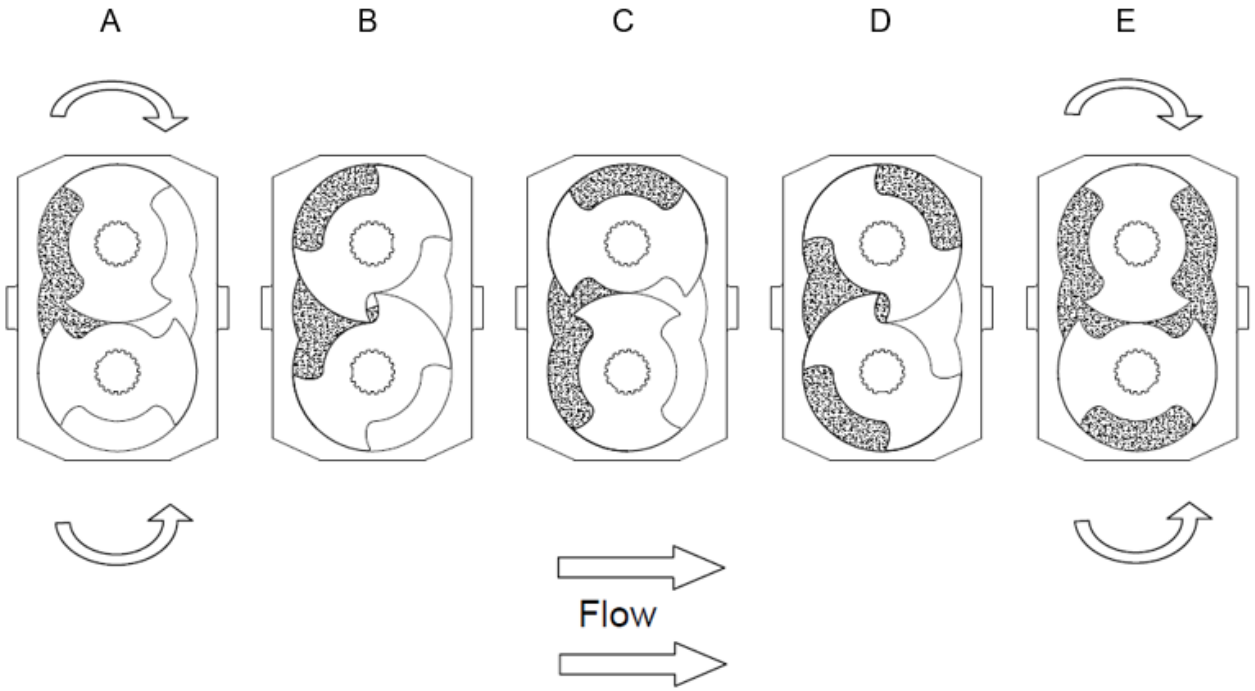
3.1 RTPe™ Pumping Principle.

The pumping action of the rotary lobe pump principle is generated by the contra-rotation of two pumping elements (rotors) within a chamber (rotorcase), Fig 4. The shaft assemblies comprise of, the shaft support bearings and the timing gears. The gears transfer the energy from the drive shaft to the driven shaft, synchronising the rotors such that they rotate without contact with each other.

As the rotors pass the suction port, (‘A’), the cavity increases creating a pressure decrease, which induces the pumped medium to flow into the rotorcase.

The pumped medium is carried around the rotorcase by the rotors, (‘B’) and (‘C’), to the discharge side of the pump, (‘D’). Here the cavity decreases, and the pumped medium is discharged from the rotorcase, (‘E’).

Fig 4 Rotary Lobe Pump Principle.


A
B
C
D
E
Flow

3.2 RTPe™ Operating Parameters.

Fig 5 Operating Parameters

RTPe20

Theoretical Displacement			Nominal Connection Size		Max-Diff. Pressure		Maximum Speed	Max Temp	Max Temp
Litre/ rev	Imp.gal /100 rev	US gal / 100 rev	mm	inches	bar	psi	rev/min	C	F
1.00	21.9	26.4	75	3	10	145	1000	110	230

The maximum pressure and speed operating parameters are given above. In practice, there may be limits due to the nature of the product to be pumped and/or design of the system in which the pump is to be installed. Consult Viking Pump or your Viking Pump Hygienic authorised distributor for assistance.

WARNING

If the system or product characteristics are to be changed from the original application for which the pump was selected, Viking Pump or their Viking Pump Hygienic authorised distributor should be consulted to ensure the pump is suitable for the new application.

The pump should not be subjected to sudden temperature changes to avoid the risk of damage from sudden expansion/contraction of components. Care should be taken when selecting pumps for handling liquids containing abrasive particles as these may cause wear of pump head components. For advice or assistance contact Viking Pump or your Viking Pump Hygienic authorised distributor.

3.3 System Design and Installation.

When incorporating any pump into a system it is considered a good practice to minimize piping runs and the number of pipe fittings (tees, unions, bends etc.) and restrictions. Particular care should be taken in designing the suction line, which should be as short and straight as possible with a minimum of pipe fittings to minimise restricting product flow to the pump. The following should be considered at the design stage of any system

Be sure ample room is provided around the pump to allow for:

- Access to the pump and drive for routine inspection and maintenance, i.e. to remove pump front cover and rotors.

- Ventilation of the drive to prevent overheating.

The exterior of the pump unit may exceed 68°C (154°F),
Appropriate measures must be taken to warn or protect operators.

WARNING

The pump must not be used to support piping. All piping to and from the pump unit must be independently supported. Failure to observe this may distort the pump head components or assembly and cause serious consequential damage to the pump.

Valves should be provided adjacent to the pump suction and discharge connections to allow the pump to be isolated from the system for routine inspection and maintenance.

Rotary lobe pumps are of the positive displacement type and therefore an overload protection device must be provided. This can take the form of:

- An pressure relief system, i.e. integrated to the pump.
- An in-line pressure relief system, i.e. external to the pump.
- Incorporation of a torque-limiting device in the drive system.

WARNING

It is recommended that all piping and associated equipment from the tank to the discharge point is thoroughly cleaned before installation of the pump to avoid the possibility of debris entering the pump and causing damage.

WARNING

Pressure gauges should be installed adjacent to the pump suction and discharge connections such that system pressures can be monitored. These gauges will provide a clear indication of changes in operating conditions and where a relief valve is incorporated in the system, will be necessary for setting and checking the functioning of the valve.

WARNING

It is imperative that the suction condition at the pump inlet meets the Net Positive Suction Head required (NPSHr) by the pump. Failure to observe this could cause cavitation, resulting in noisy operation, reduction in flow rate and mechanical damage to the pump and associated equipment.

WARNING

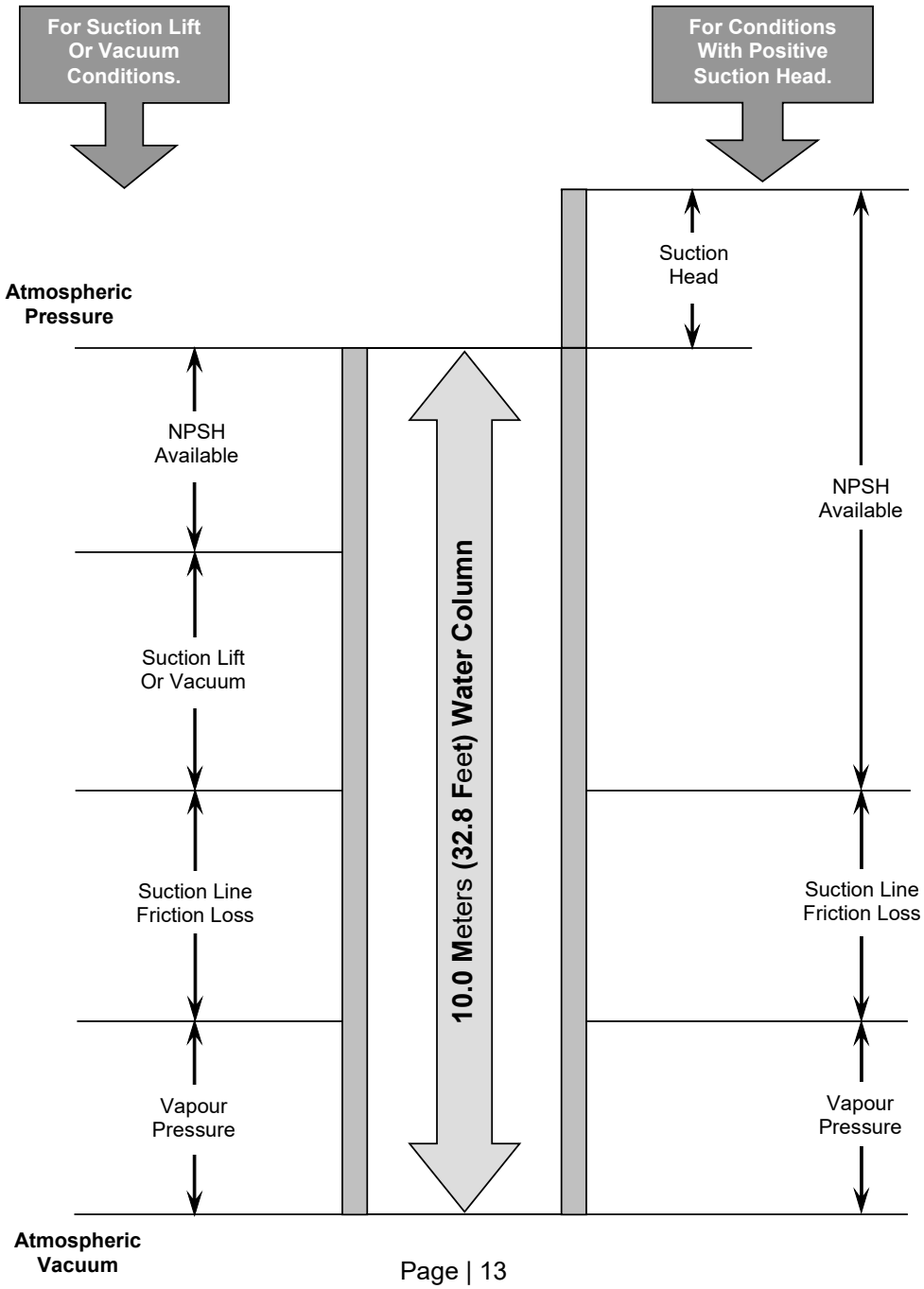
The Net Positive Suction Head available (NPSHa) from the system must always exceed the Net Positive Suction Head required (NPSHr) by the pump

Observing the following general guidelines should ensure the best possible suction condition is created.

- Suction piping is at least the same diameter as the pump connections.
- The length of suction piping is kept to the absolute minimum.
- The minimum number of bends, tees and pipework restrictions are used.
- Calculations to determine system NPSHa are carried out for the worst condition see below.

Should advise on pump or system NPSH characteristics be required then contact the factory or their authorised distributor.

Fig 6



Where motor mounting options are to be installed follow the manufactures recommended guidelines. However, when installing a pump complete with base and drive the following guidelines must be observed:

- The preferred drive arrangement for the RTPe™ pump is close coupled.

- If flexible couplings are used they must be incorporated and correctly aligned within the limits recommended by the coupling manufacturer. To check coupling alignment rotate the shaft by at least one full revolution and ensure that the shaft rotates smoothly.

Couplings of a non-flexible design must never be used.

- Couplings must always be enclosed in a suitable guard to prevent contact with rotating parts that could result in personal injury. Guards should be of suitable material, and of sufficiently rigid design to prevent contact with rotating parts under normal operating conditions.

- When installing pump sets in flammable or explosive environments, or for handling flammable or explosive materials, special consideration must be given not only to the safety aspects of the drive unit enclosure but also to the materials used for both the coupling and the guard to eliminate the risk of explosion.

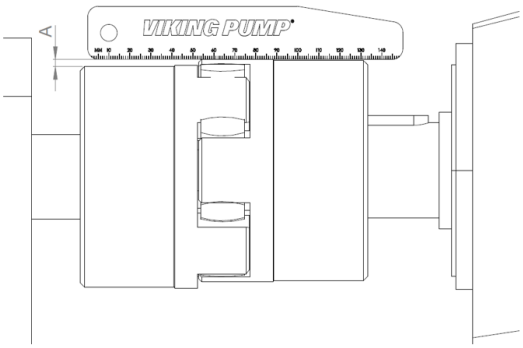
- Baseplates must be secured to a flat level surface such that distortion and misalignment are avoided. **Once baseplates are fastened in position the drive alignment must be re-checked.**

- When using electric motor drives, ensure that the electrical supply is compatible with the drive and controls and that the method of wiring is correct for the type of starting required by the motor i.e. Direct On-Line, or another similar method. Ensure all components are correctly grounded.

3.3.2 Pump and Motor Alignment

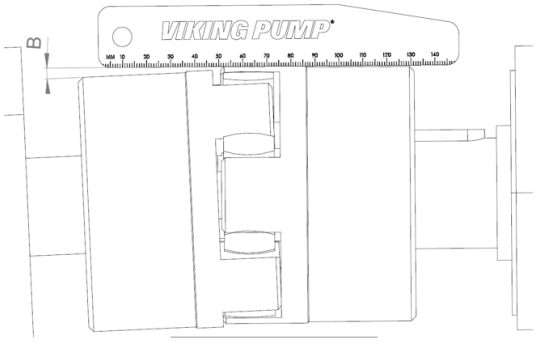
Before the pump unit is installed is it important to ensure that the mounting surface is flat to avoid distortion of the baseplate, which may cause pump/motor shaft misalignment and pump/motor unit damage. Once the baseplate has been secured, the pump shaft to motor shaft coupling alignment should be checked and adjusted as necessary. This is achieved by checking the maximum angular and parallel misalignment for the couplings as stated below, the recommended couplings are KTR Rotex. Shaft alignment that is outside the stated tolerances can be corrected by applying shims under the motor or pump foot, or, by moving the pump or driving sideways on the baseplate. All bolts that have been loosened should be re-tightened to the stated torque figure.

Radial tolerance: - Measure 4 positions at 90° around coupling



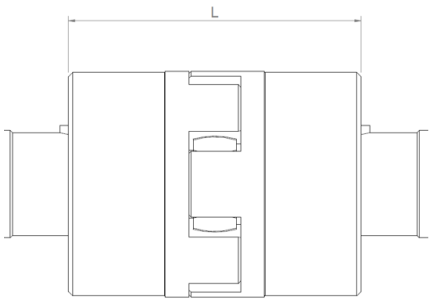
Size RX		14	19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
Max. Radial (mm) Displacement "**A**" upto	1500 RPM	0.17	0.22	0.22	0.25	0.28	0.32	0.36	0.38	0.42	0.48	0.5	0.52	0.55	0.6	0.62	0.64	0.68
Max. Radial (Inch) Displacement "**A**" upto	1500 RPM	0.007	0.009	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.019	0.020	0.020	0.022	0.024	0.024	0.025	0.027

Angular tolerance: - Measure 4 positions at 90° around coupling



Size RX		14	19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
Max. Angular (°) Displacement "**B**" upto	1500 RPM	1.1	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.0	1.1	1.1	1.1

Length Tolerance:-



Size RX		14	19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
Dimension L ± 1.0mm	1500 RPM	35	66	78	90	114	126	140	160	185	210	245	270	295	340	375	425	475
Dimension L ± 0.039"	1500 RPM	1.378	2.598	3.071	3.543	4.488	4.961	5.512	6.299	7.283	8.268	9.646	10.630	11.614	13.386	14.764	16.732	18.701

3.3.3 Cleaning In Place.

The RTPe™ can be effectively cleaned. To assist in maximising the effectiveness of cleaning within the pump head it is recommended that the cleaning cycle has a flow rate equivalent to a velocity of 1.5 metres per second; in a pipe of equal diameter to the rotor case connections. With a differential pressure of 2 to 3 bar (30 to 45 psi) being developed across the pump head.

For applications where, maximum drainage of the pump head is required, for example in the handling of 'Agri-Foodstuffs' and/or where CIP is employed, the pump ideally should be mounted with the rotor case connections in the vertical orientation. A procedure must be determined to ensure that the pump is effectively cleaned. Any cleaning liquids must be appropriate to both the products being handled and the materials of construction of the pump.

3.4 Start-Up Procedure.

WARNING

- Check that all piping and associated equipment are clean and free from debris and that all pipe connections are secure and leak free.

WARNING

- Refer to section 5.3 for lubricant capacities and grades.
  As standard, the pump is shipped with grease lubricant unless otherwise specified. The oil filled pumps differ in gearbox construction where breather, drain plug, and sight glasses are fitted.

WARNING

- If an external relief valve is incorporated in the system check that it is set correctly. For start-up purposes, it is considered a good practice to set the relief valve lower than the system design pressure. On completion of start up the relief valve should be reset to the required setting for the application. The required setting should never exceed the lower of either the pumps maximum pressure rating or the system design pressure.

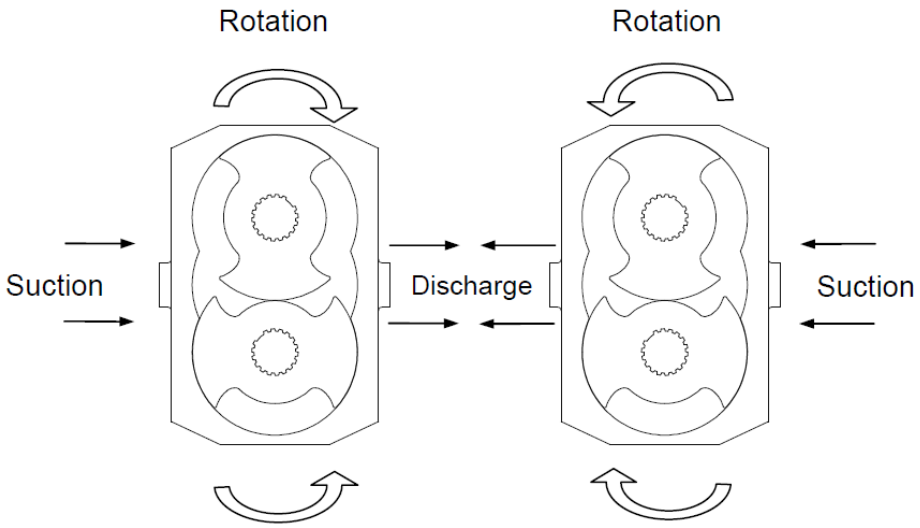
WARNING

- Ensure both suction and discharge valves are fully open, and pipework is free from all obstructions. RTPe™ pumps are of the positive displacement type and should therefore never be operated against a closed valve as this would result in pressure overload, resulting in damage to the pump and possibly the system.

WARNING

- Ensure rotation of the drive shaft is correct for the direction of flow required, see Fig 7.

Fig 7 Direction of Rotation



WARNING

- Ensure product is available at the inlet before starting the pump. The Composite seal are dry run capable for a limited time, the risk of seal failure increases with mechanical seal if allowed to run dry.

- Before beginning operation, it is considered a good practice to momentarily start/stop the pump to check the direction of rotation and ensure that the pump is free of obstructions. Once this has been carried out, begin operation keeping a visual check on suction and discharge pressure gauges and monitor pump temperature and power absorbed where possible.

3.5 Shutdown Procedure.

When shutting the pump down, stop the pump, close both the suction and discharge valves and ensure that the necessary safety precautions are taken:

- The prime mover power source has been isolated.
- Pump head and piping have been drained and purged.

3.6 Routine Maintenance

Grease

- Check for any signs of lubricant leakage
- Low maintenance gearbox, factory filled with EP 00 semi-fluid grease. The grease should not require replacement during the lifetime of the bearings or until 20,000 hours of operation.

Oil

WARNING

- Check oil levels regularly.
- Change the oil every 12 months or 3000 operating hours, whichever is the sooner.

For lubricant capacities and grades refer to section 5.3.

Seal Replacement Interval:

It is recommended that the Rotor Retainer O-ring seal is replaced every 12 months to maintain a bacteria-tight seal.

Rotor Retainer Seal Inspection:

Periodically inspect the Rotor Retainer O-ring seal for any discolouration, nicks, or cracks. If any of the defects above are noticed, the O-ring seal must be replaced. Inspection and replacement refer to the seal replacement procedure.

3.7 Integral Pressure Relief Valve.

Integral pressure relief valves are normally used to protect the pump from the effects of increases in system pressure caused, for example, by a restricted or closed discharge line. In response to a pressure increase, the valve opens and internally circulates the pumped media within the pump chamber.

WARNING

When the valve opens, because the volume of fluid circulating is relatively small, the temperature of the fluid in the pump chamber may rise if the pump continues to operate for an extended period. In severe cases, this may result in temperatures in excess of the pumps operating limits or vaporisation of the fluid. For these reasons when the valve has activated the cause of the system pressure increase should be eliminated as continuous operation of the pump with the valve open is not recommended and may cause severe damage to the pump.

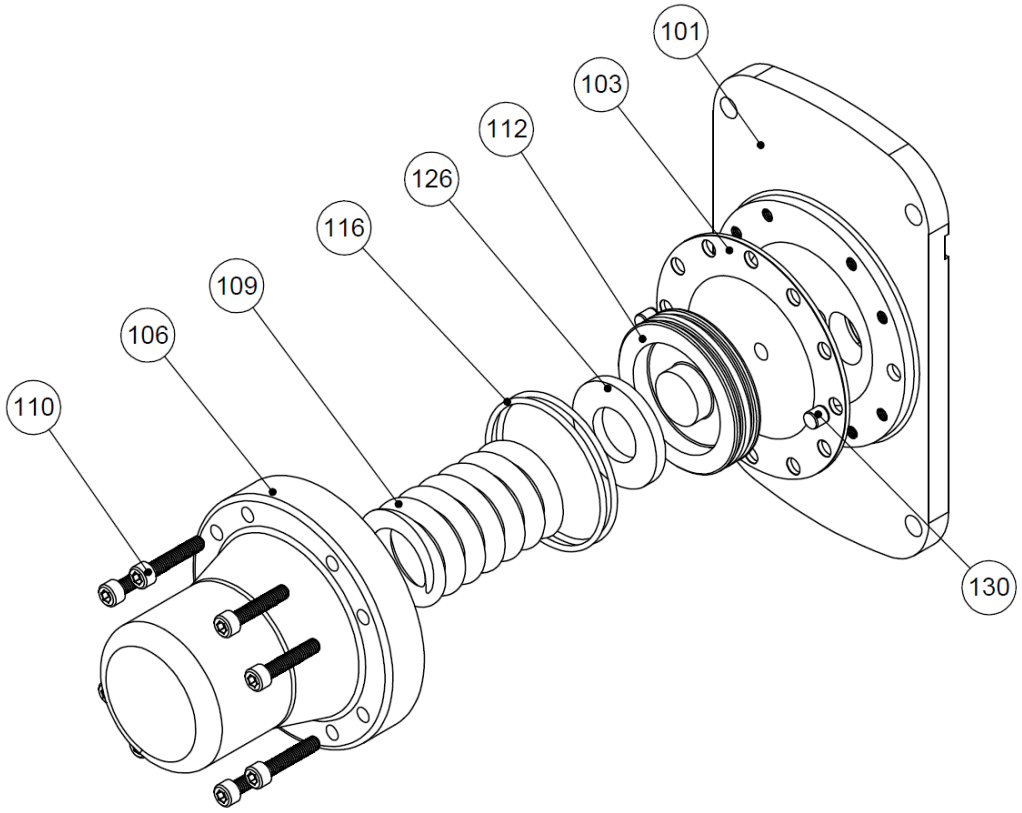
If the pump on which the valve is installed is to be installed in either a pressurised system or one incorporating a vessel under vacuum, the application of the valve should be referred to Viking Pump or their Viking Pump Hygienic authorised distributor. In addition to where the pump is mounted onto a mobile unit with drive, it is recommended that an integral pressure relief valve is installed.

WARNING

Note: Care should be taken not to exceed either the pumps maximum pressure rating or the system design pressure.

The spring housing component including spring and valve; are manufactured as complete units and available in 6.5 and 8 bar options. This must be specified at the time of order. If further adjustment is required to the assemblies consult Viking Pump or your local Viking Pump Hygienic distributor.

Fig 8 Pre-Set Relief Valve.



ITEM NUMBER	DESCRIPTION
101	RV FRONT COVER
103	DIAPHRAGM
106	SPRING HOUSING
109	SPRING
110	SCREW
112	VALVE HEAD
116	O-RING
126	SPACER
130	DOWEL

DANGER

Under no circumstances should any attempt be made to dismantle a pressure relief valve which has not had the spring pressure relieved (where applicable) or is mounted on a pump that is operating. Serious personal injury or pump damage may occur.

4.0 RTPe™ Pump Disassembly and Assembly.

Before undertaking any work on the pump the Shutdown Procedure should be followed in section 3.5, and site safety practices must be observed.

While dismantling or assembling the pump it is essential to ensure that the pump and/or components are secured to provide adequate stability.

Large pump components or assemblies should be lifted using suitable devices. Use threaded holes for attaching lifting eyes where appropriate.

During dismantling or before assembly all components should be inspected for fit, wear, and damage. If worn or damaged the components should be replaced before re-assembly.

The position of all parts should be identified as they are removed to ensure they are reinstalled in the same position.

Lip-seals and O-rings are incorporated within the assembly. Regular inspection and correct maintenance of these items will ensure that the lubrication is sustained, the pump maximum working life is achieved. To ensure this, it is extremely important that care is taken when removing and installing new O-rings and lip-seals. When removing and replacing lip-seals ensure that the location bore for the outside diameter and the seat for the back of the lip-seal is not damaged as this may create a leakage path.

When removing Lip-seals or O-rings care should be taken to avoid cutting or tearing the sealing faces as they pass over splines, threads or other potentially sharp or abrasive edges. All lip-seals and O-rings should be carefully examined and if damaged in any way, replaced on assembly.

All O-rings and sealing lips of Lip-seals should be lightly lubricated with a suitable lubricant before installing.

Prior to assembly, ensure all parts are clean and free from burrs or damage. When a vice is to be used, it should have protective jaws to avoid damage to components. Do not apply undue force to install or position components.

All fasteners are required to be tightened to the required torque setting during assembly, refer to section 5.2.

Bearing cones may be pressed into position providing the proper equipment and procedures are employed to prevent component damage.

WARNING **Under no circumstances should bearing cones or cups be hammered into position.**

For torque settings of fasteners and shaft rolling torque, see section 5.2.

4.1 Disassembly.

4.1.1 Front Cover and Rotor Removal
See Fig 9.

- Follow recommended Shutdown Procedure, referring to section 3.5.

- Gradually loosen front cover retaining screws (50). Care should be taken as residual product and pressure may still be present in the pump head. As the screws loosened this will vent to atmosphere.

- Remove bolts (50).

- Remove front cover (38), using lever slots where necessary, continue and remove the front cover O-ring (39) from front cover (38).

- Remove rotor retainer's (35) using the Rotor Locking tool supplied.

WARNING

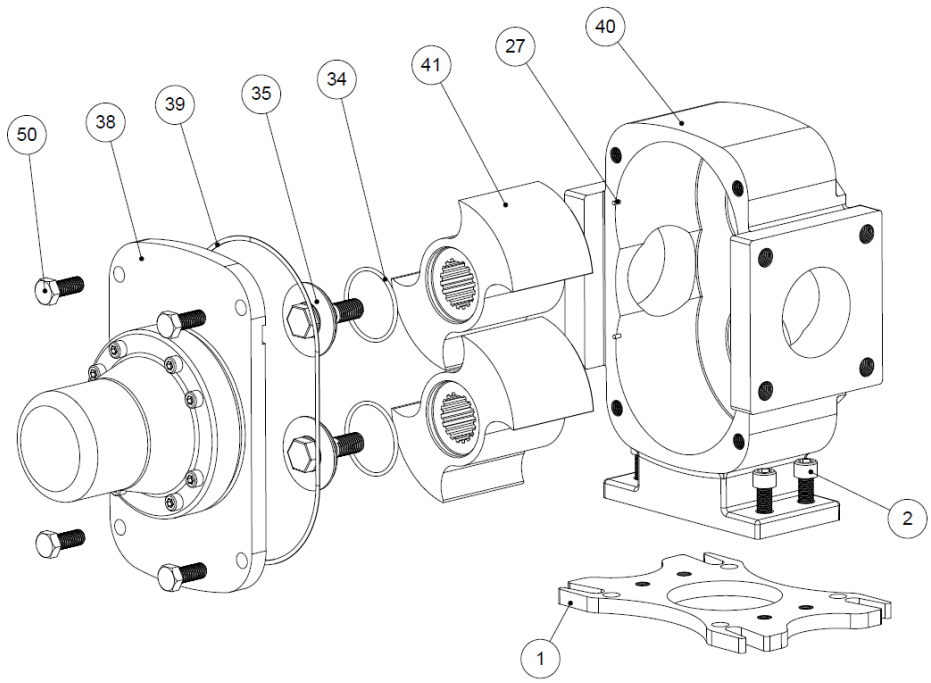
Note: A 24mm Combination spanner/socket should always be used. The use of other tools may damage the retainer.

- Remove retainer O-ring (34).

- Remove rotors (41) from shafts (9 and 10 – not shown), taking care not to damage the product seal components. Contact Viking Pump or an authorised Viking Pump Hygienic distributor for details.

- Remove product seals, refer to section 4.3.

Fig 9 Front Cover & Rotor Removal



4.1.2 Gearbox Disassembly
(After Completing 4.1.1).

The following procedures assume that the pump has been removed from the base-plate and that the product seals have been removed (see section 4.3 & Fig 10).

- Remove drain plug (81).

- Remove retaining screws (74) and remove the endplate (70) from the gearbox (16) utilising the retaining screws (74) in the jacking points provided, see fig 11. The endplate is located on dowels (57) and is sealed by the O-ring (3), see fig 10.

Fig 10 Endplate Removal.

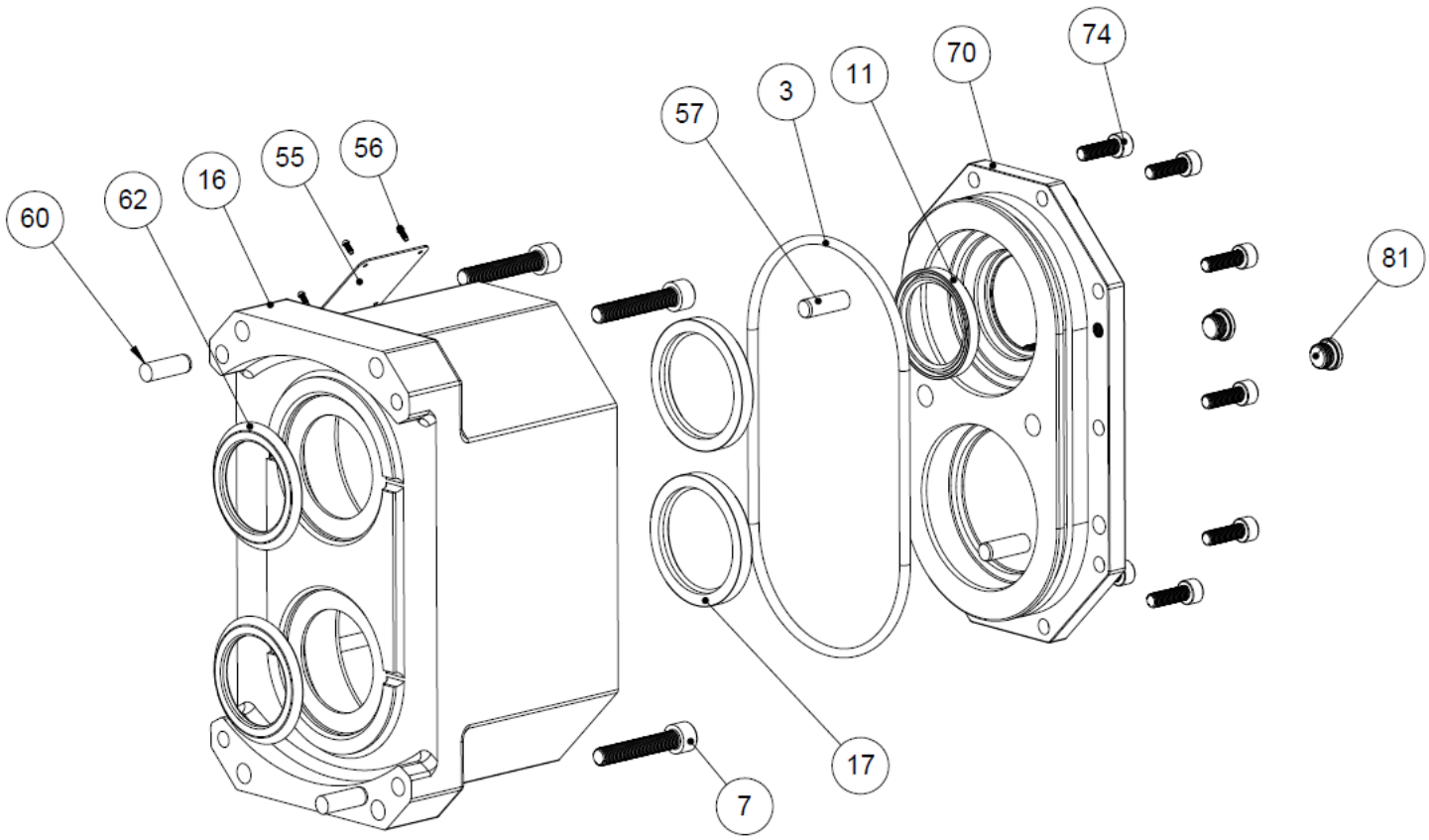
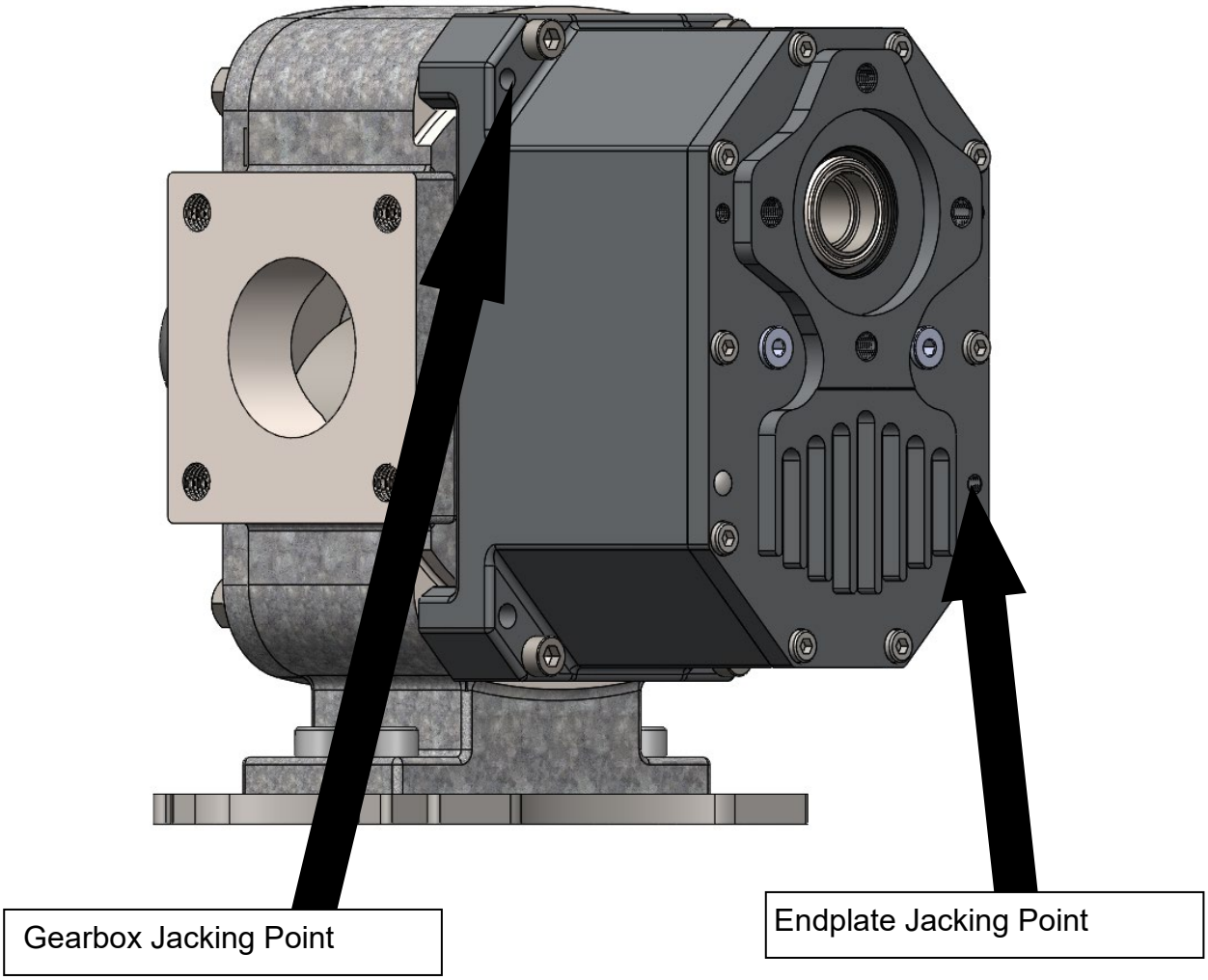


Fig 11 Gearbox and Endplate Jacking Points.



- Remove the cups of the rear bearing (19, see Fig 12) from the endplate (70).

- Remove rear Lip-seal (11).

- Remove shaft assemblies from the gearbox (16, see section 5.6). Shaft assemblies will be complete with gears (14), and bearings (24 and 19) – see fig 12.

- Remove Gamma Seal (62)

- Disassemble gearbox (16) from rotorcase (40) by removing the retaining screw (7). Utilising the retaining screws (7) in the jacking points on the gearbox; the gearbox (16) and rotorcase (40) can be separated, see Fig 11.

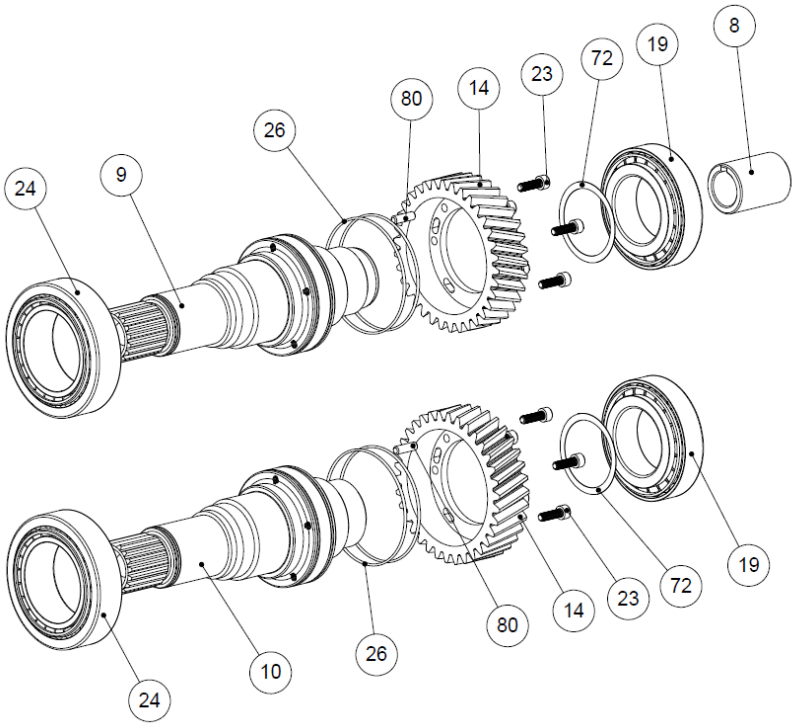
- Remove Lip-seals (17) from the gearbox (16).

- Remove bearing cup (24) from the gearbox (16).

4.1.3 Shaft Disassembly.

- Remove the rear bearing assembly (19).
- Remove the bearing pre-load shims (72, see section 4.1.3). **The shims may be different for each assembly and therefore should be kept in their respective positions.**
- Remove the timing gear screws (23).
- Remove the timing gear (14) and locating dowel (80), using jacking points.
- Remove O-rings (26) from the rear of the shaft (9 or 10).
- Remove front bearing assembly (24).

Fig 12 Bearing & Timing Gear Removal.



Note Right-hand helix for drive shaft gear (stamped D), left-hand helix for driven shaft gear (stamped L). When ordering spare timing gear set is essential to purchase and install these as a pair.

4.2 Assembly.

4.2.1 Gearbox & Rotorcase Assembly,
See Fig 13.

- Install front bearing cups (24 not shown).

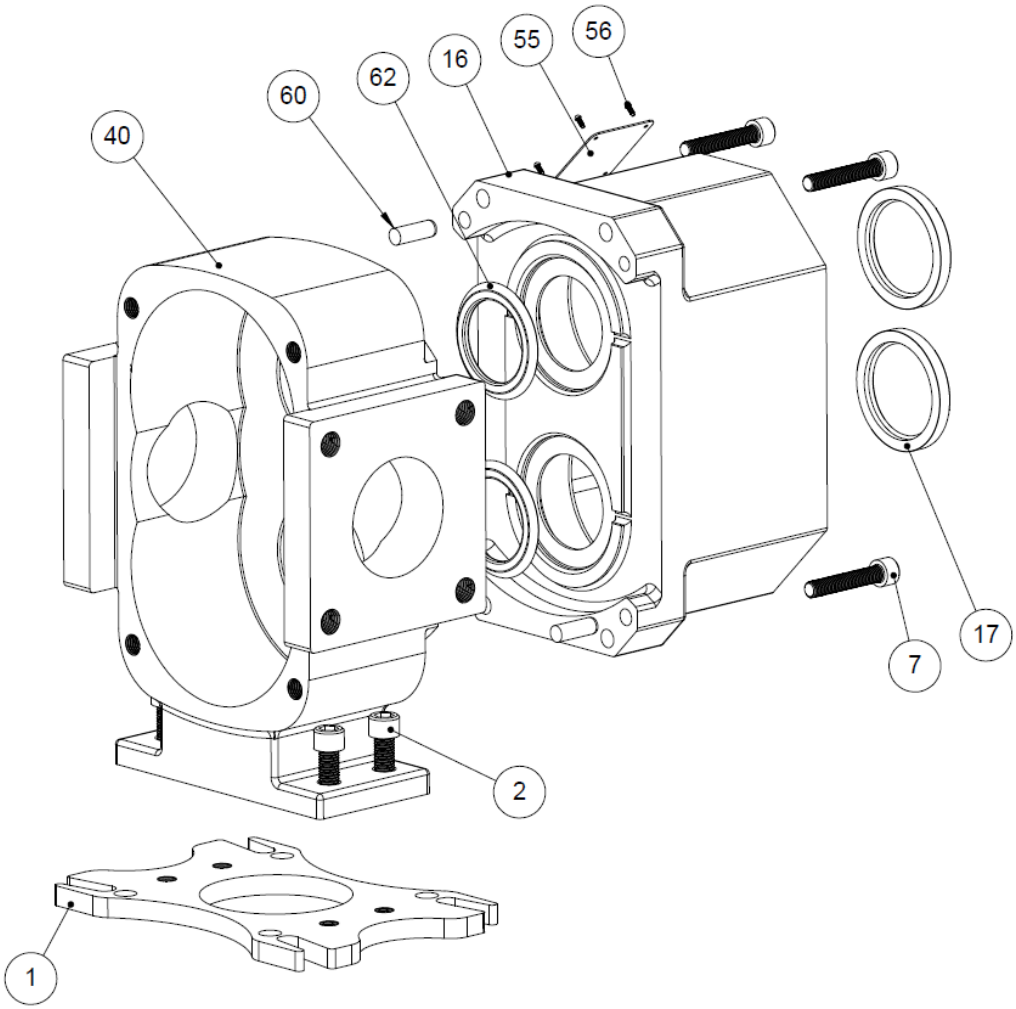
WARNING

Do not install the front lip seals (17) until the bearing pre-load has been set. The lips may give a false rolling torque reading as well as increasing the risk of damage during assembly.

- Install rotorcase (40) to the gearbox (16) and secure using cap screws (7).

- If not already installed, adaptor plate (1) to rotorcase (40) in the required positions using cap screws (2). Install the seal sleeve (if required) see section 4.3.

Fig 13 Gearbox & Rotorcase Assembly.



4.2.2 Shaft Assembly – RTPe20

- Install front bearing (24) to the shaft (9 or 10).

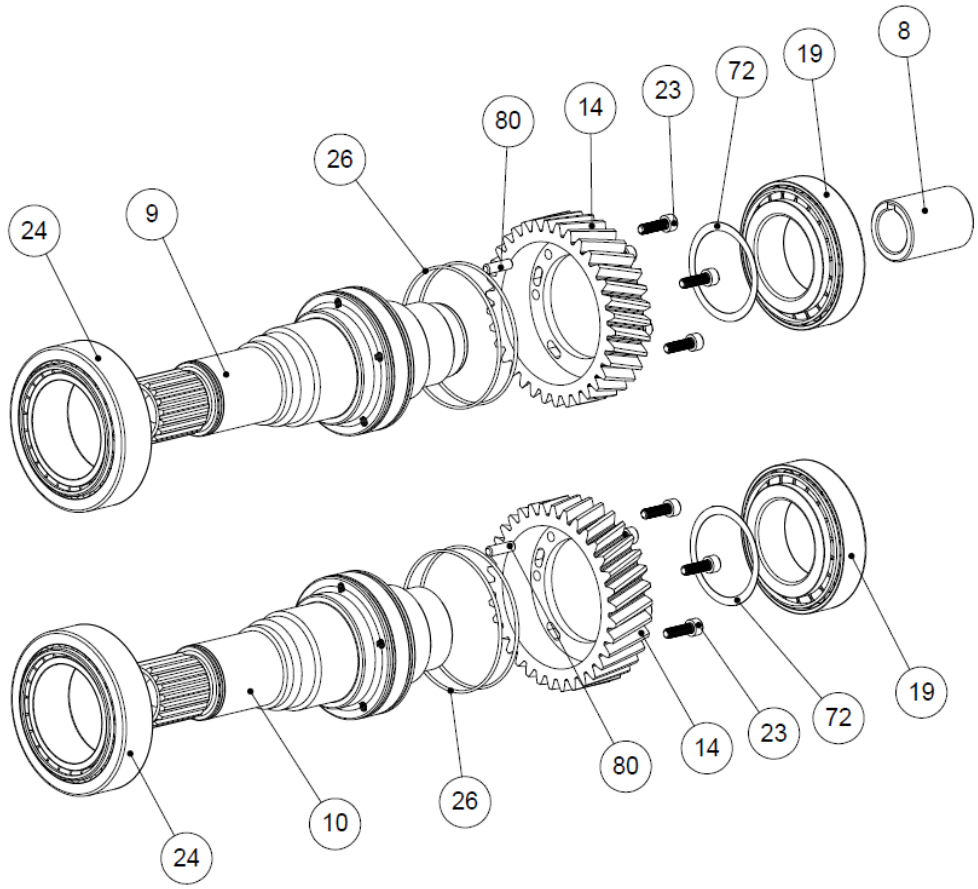
- Install O-rings (26), to shafts (9 or 10) in the appropriate grooves. Lightly lubricate all O-rings with a compatible lubricant.

- Install the gear (14) over the O-rings (26) and secure with retaining bolts (23). It is recommended that the screws be aligned at the centre of the slots provided to give an equal amount of adjustment in either direction. **They should also not be tightened to the correct torque at this point, as an adjustment to the timing may still be required.**

- place a nominal amount (0.15 & 0.075 mm) of shim (72) under the rear bearing.

- Install rear bearing (19).

Fig 14 Shaft Assembly.



- Install the shaft assemblies into the gearbox (16) so that the cone and cup halves of the front bearing (24) are now one unit.

- Assemble the endplate by installing O-ring (3) **Do not install the rear lip seal (11) until the bearing pre-load has been set. The lips may give a false rolling torque reading as well as increasing the risk of damage during assembly.**

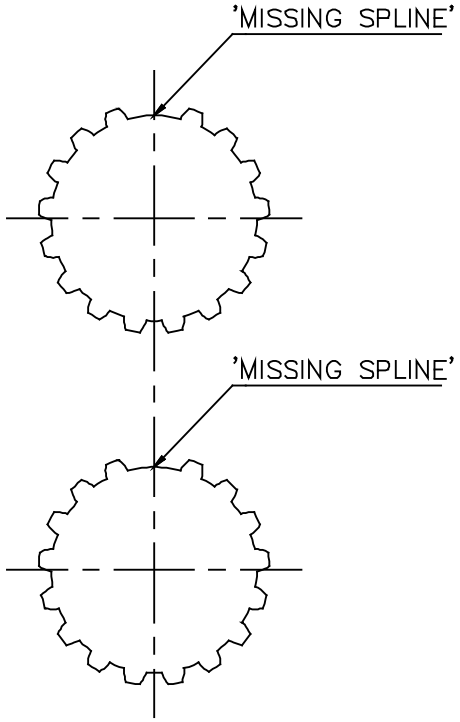
WARNING

- Install endplate assembly onto the gearbox (16) locating on the dowel (57).

4.2.3 Timing.

- Rotate the shafts (9 and 10) so as to position the gaps made by the missing splines, in the vertically uppermost position, See Fig 15.

Fig 15 Aligning the missing splines.



- Assemble the rotors (41), rotor retainers (35) and O-rings (34) onto the shafts (9 and 10).

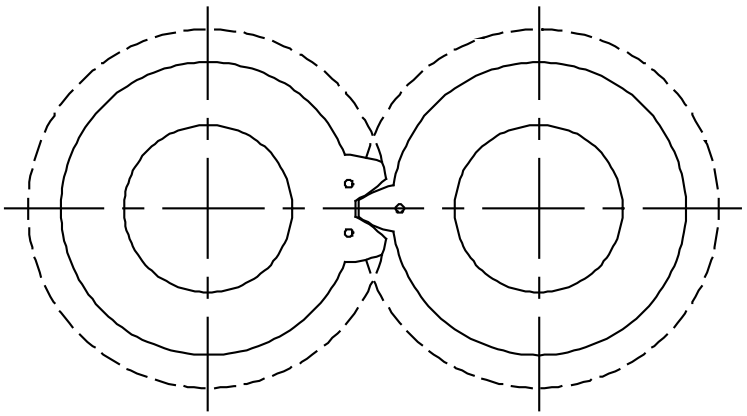
- To achieve the correct timing clearance, rotate one shaft, whilst securing the other. The gear (14) will rotate on the lubricated O-rings until the correct mesh clearance is achieved. For mesh, clearances refer to section 5.1.

- If the rotor clearances cannot be achieved, then the rotor assembly will need to be dismantled and the shaft assembly removed from the gearbox. Rotate one tooth on the gear mesh, replace the shaft, and re-adjust the timing once more.

- Once the correct clearances have been achieved, tighten the gear retaining screw (23) to the correct torque see section 5.2, and mark the teeth at the mesh point, see Fig 16.

- **Recheck all clearances before moving on to the next stage.**

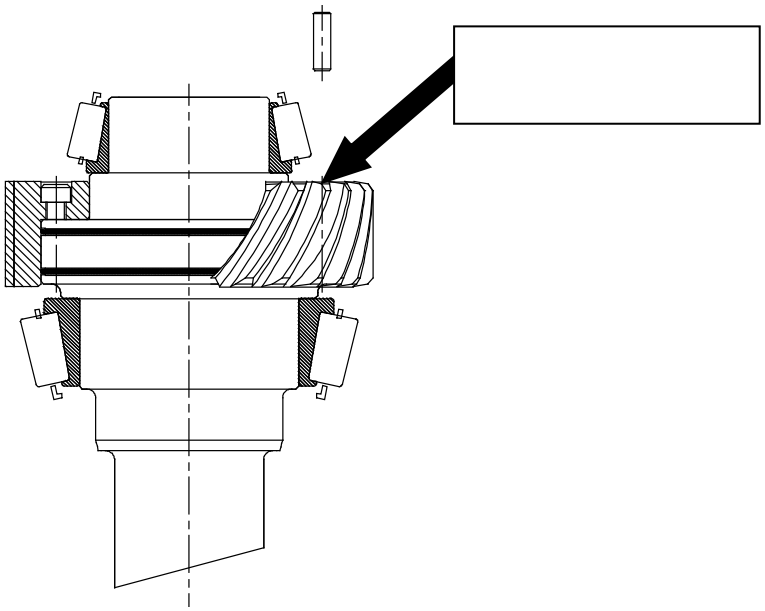
Fig 16 Aligning the mesh point.



- Remove the shaft assemblies from the gearbox (16).

- Using the holes provided drill and ream both gear (14) and shaft (9 and 10) to suit Ø6.0 mm dowel (80), as shown in Fig 17. It is important to drill and ream the hole so that the dowel is positioned equally between the gears (14) and shafts (9 and 10).

Fig 17 Installing and positioning the timing dowel.



- Install the Ø6.0 mm dowel into the drilled and reamed hole; applying a suitable adhesive to ensure that the dowel stays in place.

4.2.4 Setting the rolling torque.

WARNING

It is important that the product seals, both front and rear lip seals are not installed until the bearing pre-load has been set and the clearances checked. The seals may give a false rolling torque reading as well as increasing the risk of damage during assembly.

- Re-install one of the shaft assemblies into the gearbox (16) and replace the endplate assembly, ensure that the retaining screws (74) are tightened to the correct torque, see section 5.2.

- Using a torque meter, check the rolling torque of each shaft assembly (separately) referring to section 5.2 for the correct settings. If necessary, adjust the amount of shim (72) under the rear bearing cup (19). Either by adding shims (72) to increase the rolling torque or by removing shim (72) to decrease the torque until the correct setting is achieved.

- Repeat steps detailed above for the remaining shaft assembly.

- Once the rolling torque has been set for both shaft assemblies. If the gearbox assembly is still installed to the rotorcase assembly, remove retaining screw (7). Utilising the jacking points on the gearbox and the screws (7), disassemble the gearbox assembly from the rotorcase assembly, see fig 12. The lip seals (17) can be installed inside the gearbox (16) and the 'slinger' disc (62) where applicable, requires lubricating with a compatible lubricant before assembly onto the shaft. The lip seal (11) can also be installed into the endplate (70).

4.2.5 Rotor Clearances.

- Install rotors (41) onto shafts (9 and 10) in rotorcase (40), install retainer O-ring (34) into the bore of the rotor and secure with rotor retainer (35). Set to correct torque (see section 5.2) using a 24mm socket and torque wrench.

WARNING

Note: The retainer O-ring (34) seals the shaft/rotor spline and should not be re-used if cut, distorted or damaged in such a way as to impair its ability to form a seal. If in doubt a new O-ring should always be installed.

- Using a depth micrometer or similar device measure front clearance between the rotorcase and rotor front faces. With a feeler gauge set or similar device measure the side and rear clearances.

- With rotors (41) installed, check all clearances, front (A), radial (C), rear (B) and mesh (D), against the Clearance Chart, refer to section 5.1. Remove rotors (41) and install product seals, refer to section 4.3, reassemble rotors (41), retainers (35) and Orings (34) tightening to the correct torque.

- Install O-ring (39) into the front cover (38). Install front cover (38) to rotorcase (40), securing with screws (50), tightening to correct torque, refer to section 5.2.
-

4.3 Product Seal Fitting and Removal.

4.3.1 General Procedures for Installing Seals.

- Mechanical seals are precision-engineered assemblies incorporating finely lapped seal faces and seats. They must, therefore, be handled with care and will not give optimum performance unless installed carefully and according to instructions.

- Where mechanical seals are to be reused ensure that seal components are kept in their appropriate sets. **Do not mix old and new seal faces on the same seal.**

- Remove any sharp corners and burrs that may damage any elastomers such as O-rings or lip seals.

- Ensure that all seal component fitting bores and housings are thoroughly cleaned before installation.

- The seal faces and seats must be handled with care and cleaned thoroughly before installation.

- Ensure that seal faces are undamaged, and the O-rings are not cut, swollen, or cracked.

- O-rings within the seal assemblies should be lightly lubricated with an elastomer compatible, O-ring lubricant. Ensure there is not an excessive amount of lubricant especially around the seal face area.

- Ensure seal seats are mounted squarely.

- Ensure when installing seals with brittle faces such as silicon carbide that extra care is taken.

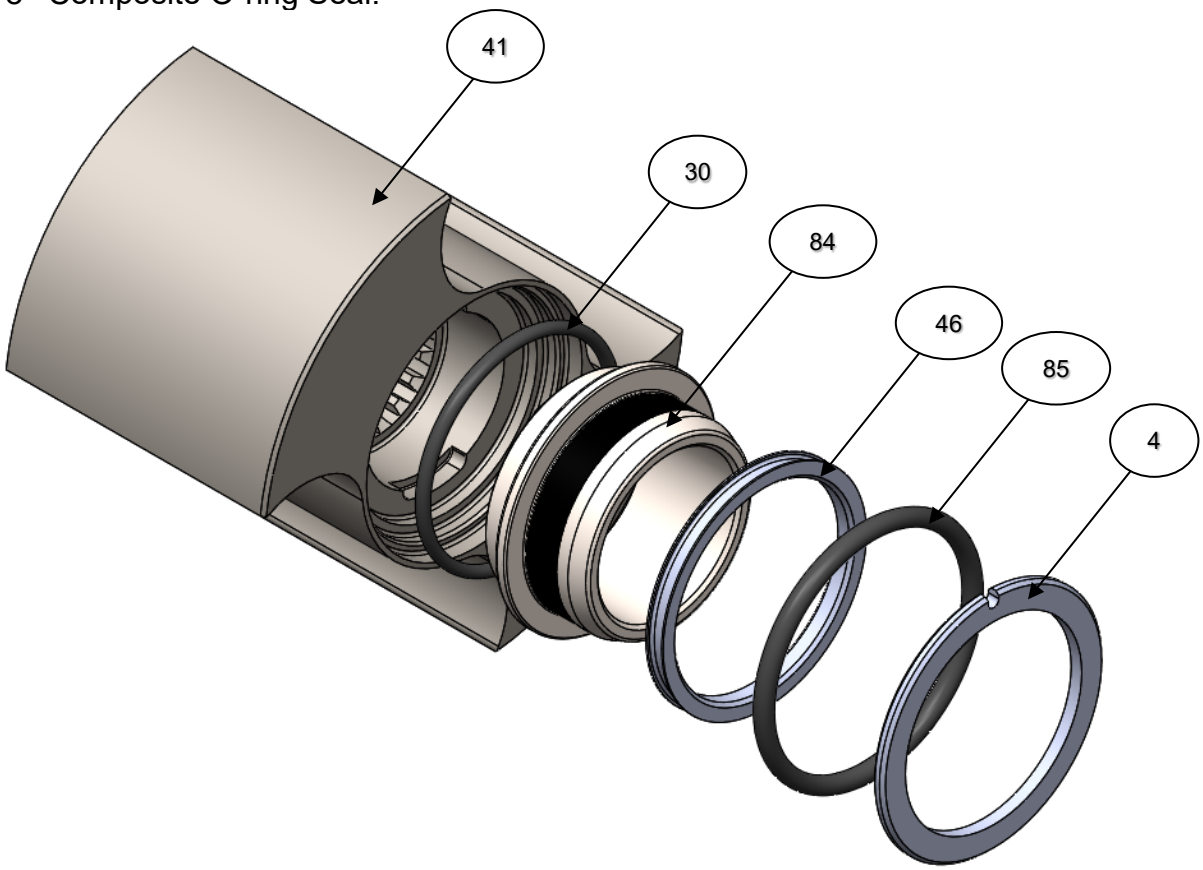
- Do not use any excessive force to install a mechanical seal. If it is difficult to position and assemble the seal, then something is wrong.

- If you drop or damage a seal, do not install it before an inspection has been carried out.

WARNING - The Composite O-ring seal is dry run capable for a limited time.

4.3.2 RTPe20 Composite O-ring Seal Removal and installation.

Fig 18 Composite O-ring Seal.

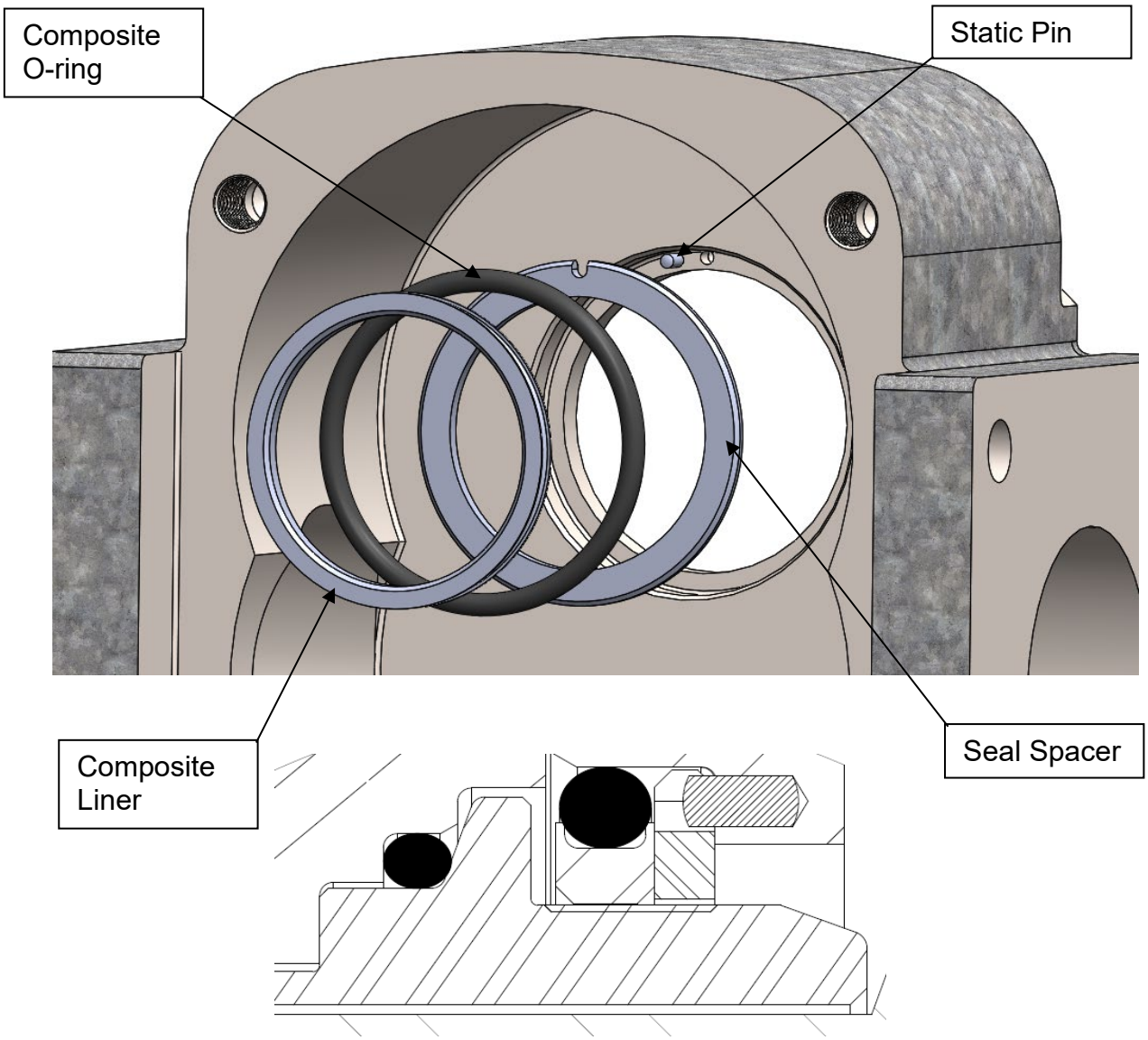


WARNING **Note: Extreme care should be taken when carrying out these procedures to ensure that the O-ring grooves, sleeve faces and O-ring are not damaged.**

- Remove the front cover screws, front cover, rotor retainer and rotor as per section 4.1.1
- The Composite O-ring & seal sleeve in the rotor are now ready for inspection and replacement if needed (Fig 18).
- During inspection of the sleeve, do not remove the black film of PTFE on the sleeve. This is part of the composite sealing during running.
- To remove the rotor sleeve, pull the sleeve out from the rotor (Fig 18).
- To remove Composite O-ring seal, push the seal spacer from the rear of rotorcase through the bore using the seal extractor tool.
- The sleeve and Composite O-ring can now be inspected and replaced if needed.

- To install the sleeve, make sure the sleeve O-ring is placed in the rotor and the location of the two drive dogs lines up. Install the static pin using Loctite 648, then place seal spacer ensuring the slot and pin are in line. Fit composite O-ring to the liner and use lubricate on the outside O-ring then install Composite seal into seal bore ensuring the seal is pushed against the spacer. (Fig 19)

Fig 19



- To install the rotors, see section 4.2.5 Rotor clearance check – installation

4.3.3 RTPe20 Mechanical Seal.

- Remove the front cover screws, front cover, rotor retainer and rotor as per section 4.1.1

- Remove the rotary seal face and inspect or replace the O-rings as required. When installing the seal face ensure correct engagement of the two drive dogs (Fig 20).

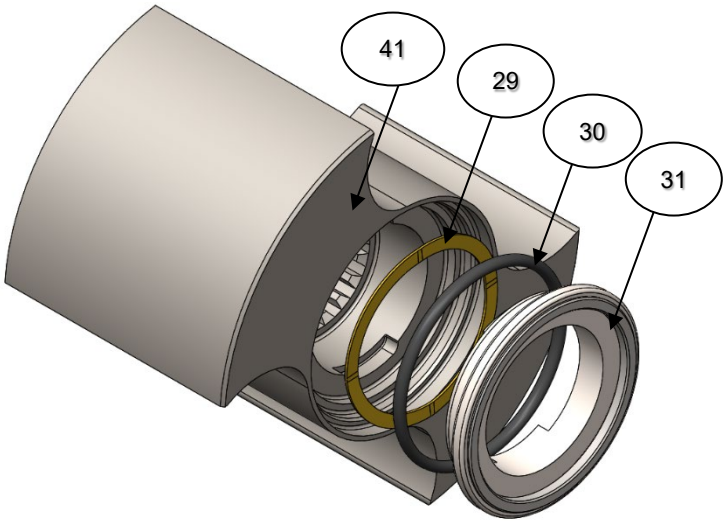
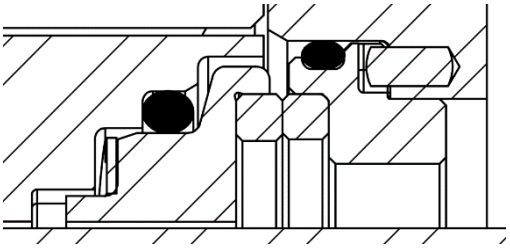
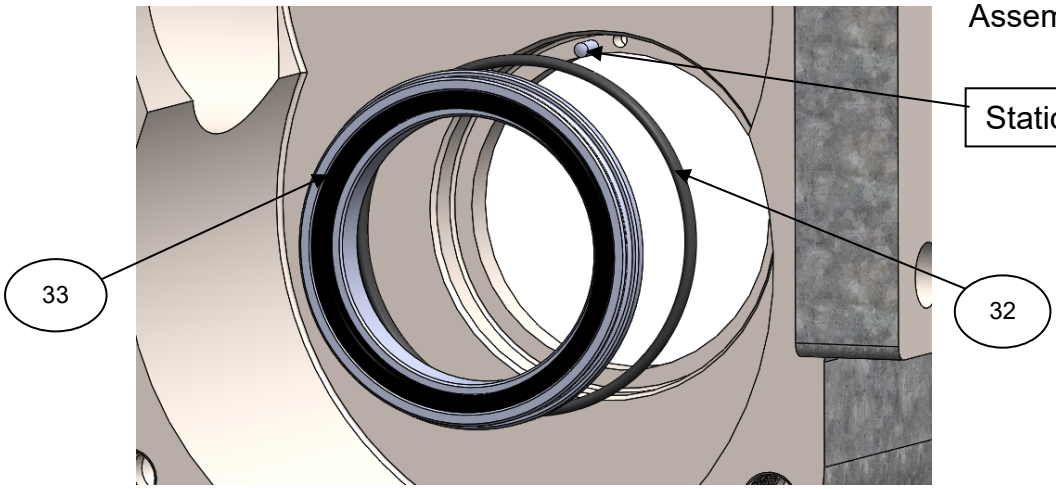


Fig 20 Mechanical Seal



- Remove the static seal face pushing on the rear of the static seal and inspect or replace the O-rings as required using the seal extractor tool

Fig 21 – Mechanical Seal Assembly

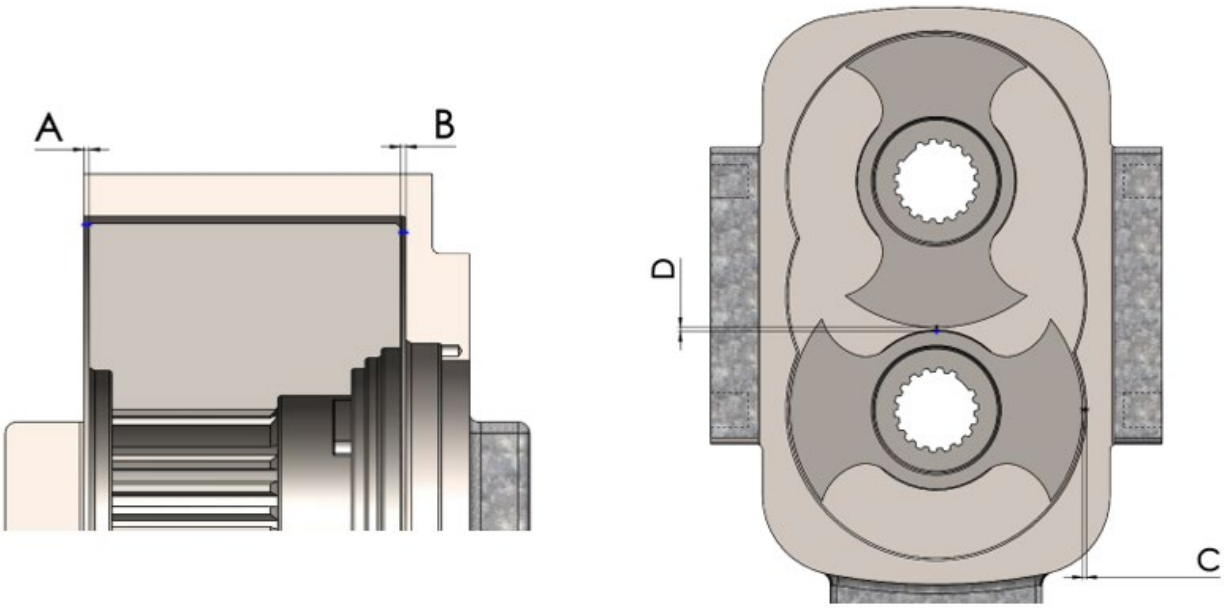


- Install the static pin using Loctite 648, when installing the static face into the rotorcase make sure that the slot in the static face lines up with the static pin in the rotorcase (Fig 21).

- To install the rotors, see section 4.2.5 Rotor clearance check – installation

5.0 Specifications.

5.1 Clearance Chart



		A		B		C		D
		Min	Max	Min	Max	Min	Max	Max
RTPe20	**Millimetres**	0.48	0.6	0.2	0.5	0.45	0.65	0.15
	Inches	0.019	0.024	0.008	0.020	0.018	0.026	0.006

5.2 Fasteners & Torque Settings.

Item	Description	Position		RTPe20
7	Socket Head Cap Screw	Gearbox / Rotorcase	Quantity / Pump Size Torque NM (ft-lbs)	4 M10 x 55 45 (33.1)
14	Socket Head Cap Screw	Timing Gear / Shaft	Quantity / Pump Size Torque NM (ft-lbs)	10 M6 x 20 16 (11.8)
35	Retainer	Rotor / Shaft	Quantity / Pump Part No. Torque NM (ft-lbs)	2 G33-2052-01 108 (79.6)
50	Screw	Front Cover / Rotorcase	Quantity / Pump Size Torque NM (ft-lbs)	4 M12 55 (40.5)
56	Hammer Drive Screw	Nameplate / Gearbox	Quantity / Pump Size Torque NM (ft-lbs)	4 - -
74	Socket Head Cap Screw	Endplate / Gearbox	Quantity / Pump Size Torque NM (ft-lbs)	10 M8 x 30 16 (11.8)
110	Socket Head Cap Screw	PRV / Front Cover	Quantity / Pump Size Torque NM (ft-lbs)	6 M8 x 40 16 (11.8)
-	Individual Shaft Rolling Torque (Product and Lip Seal Not Installed)		Rolling Torque NM (ft-lbs)	2.0 to 2.75 (1.47 to 2.02)

Notes:1. See product seal section 4.3 where applicable.
2. For position of items see section 5.6, typical basic pump build.

5.3 Lubricants.

Grease The recommended synthetic gearbox grease for use in the RTPe™ is one that is intended for 'sealed' units. Suitable for operating temperatures between -20°C and 120°C (-4°F to 248°F) and a base viscosity in the region of 150 Cst at 40°C (104°F).

5.4 Tool List.

Listed below are tools required for the maintenance of the RTPe™ pump.

RTPe20

TYPE	SIZE OR RANGE
HEXAGON (ALLEN) KEY	5 MM
HEXAGON (ALLEN) KEY	8 MM
COMBINATION SPANNER	19 MM & 24MM
SOCKET	24MM
TORQUE WRENCH	ADJUSTABLE TO MIN. 135 NM (99.57 FT IB)
DEPTH MICROMETER	0 - 25 MM (0 - 1")
FEELER GAUGE SET	0.03 MM TO 0.50 MM (0.0012" TO 0.0197")
ROLLING TORQUE METER	0 - 5 NM (0 - 3.69 FT-LB)
SOFT-FACED MALLET	
STEEL HAMMER	SMALL

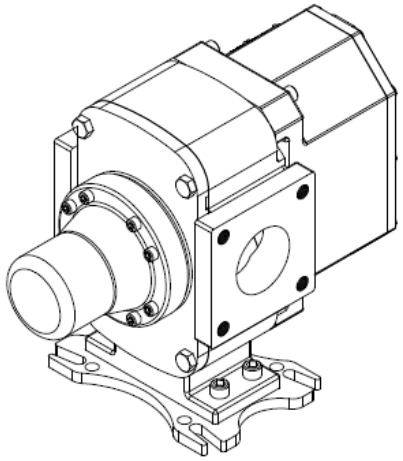
5.5.1 RTPe20 Foundation Dimensions – Basic Pump Metric (1” Female Drive)

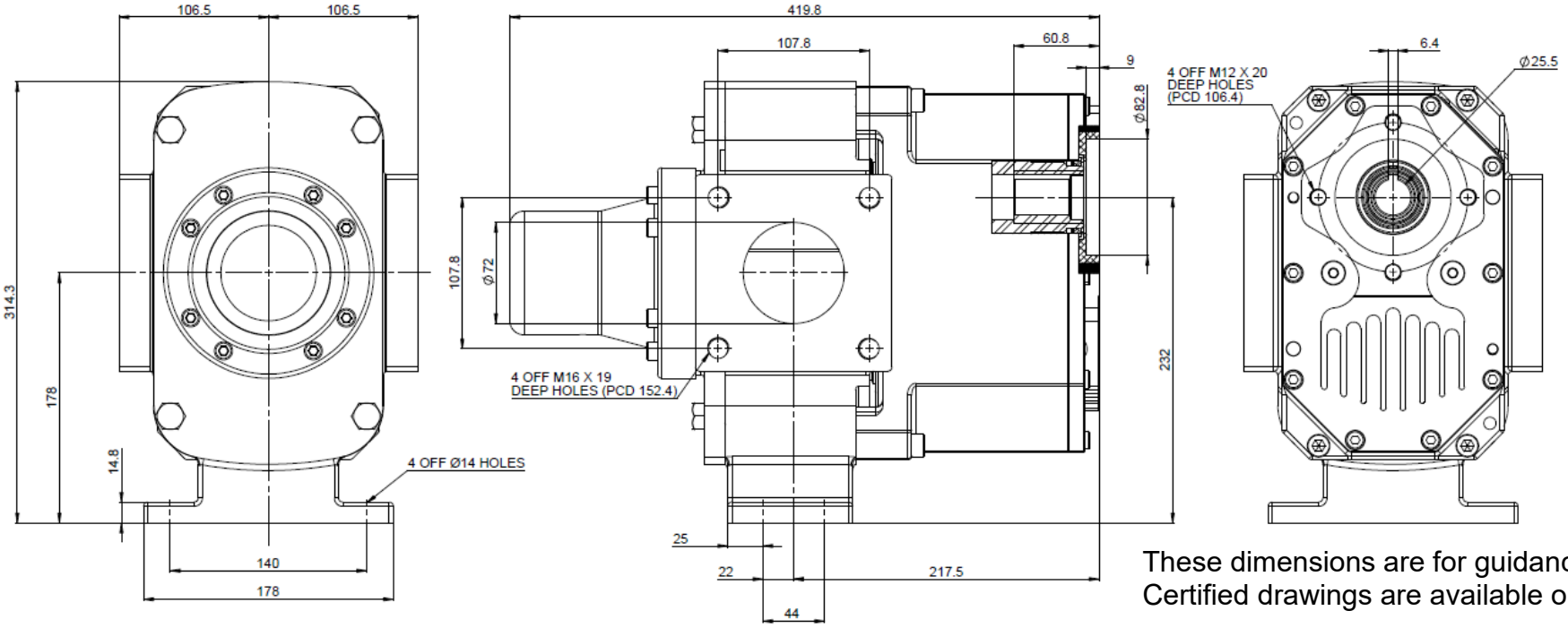
INSTALLATION DETAILS

PUMP INFORMATION

PUMP MODEL	RTPe20/0100/08
INLET CONNECTION	3" ASA/ANSI 150 lb RF FLANGE
OUTLET CONNECTION	3" ASA/ANSI 150 lb RF FLANGE
SPECIAL FEATURES	SPRING LOADED PRV
	1" FEMALE DRIVE INSERT

Pump Weight:- 58kg



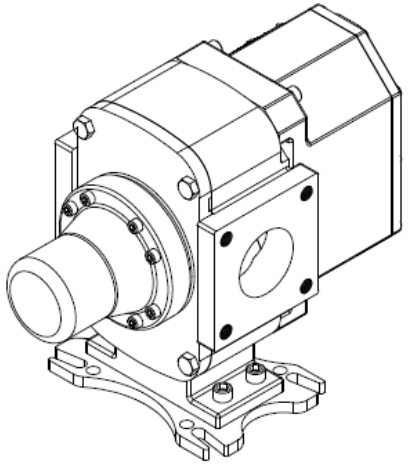


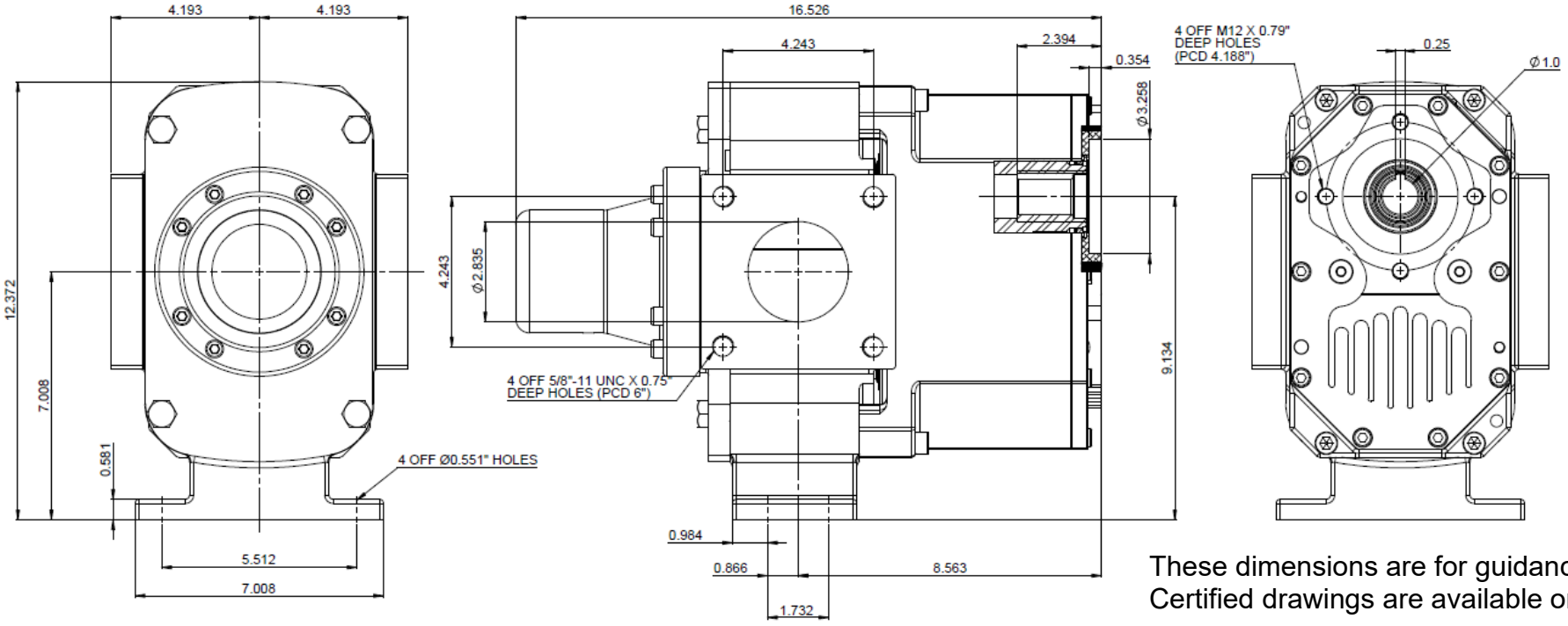
These dimensions are for guidance only – Certified drawings are available on request

5.5.2 RTPe20 Foundation Dimensions – Basic Pump Inch (1” Female Drive)

INSTALLATION DETAILS	
PUMP INFORMATION	
PUMP MODEL	RTPe20/0100/08
INLET CONNECTION	3" ASA/ANSI 150lb RF FLANGE
OUTLET CONNECTION	3" ASA/ANSI 150lb RF FLANGE
SPECIAL FEATURES	SPRING LOADED PRV
	1" FEMALE DRIVE INSERT

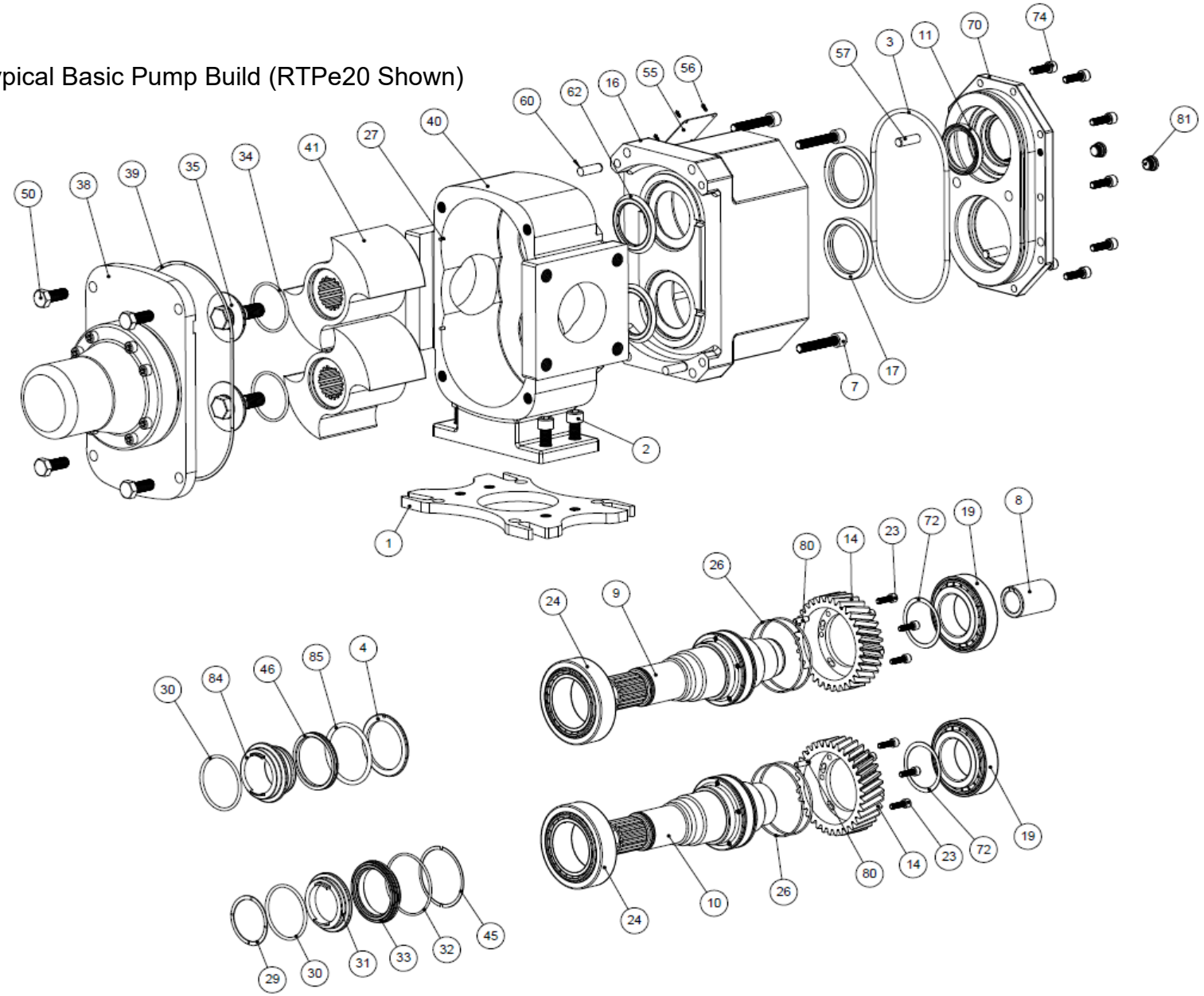
Pump Weight:- 128lbs





These dimensions are for guidance only – Certified drawings are available on request

5.6 Typical Basic Pump Build (RTPe20 Shown)



5.7 Trouble Shooting

No Flow	Irregular Flow	Under Capacity	Pump Overheats	Motor Overheats	Excessive Rotor Wear	Excessive Seal Wear	Noise / Vibration	Seizure	Pump Stalls On Start UP	Causes	Action
■										Incorrect Direction Of Rotation.	Reverse Motor.
■										Pump Not Primed.	Expel Gas From Suction Line / Pump Chamber & Prime.
■	■	■					■			Insufficient NPSH Available.	Increase Suction Line & Static Suction Head Diameter. Simplify Suction Line & Reduce Length. Reduce Pump Speed & Product Temperature.
	■	■					■			Product Vaporising In Suction Line.	
	■	■					■			Air Entering Suction Line.	Remake Pipework Joints.
■	■	■					■			Gas In Suction Line.	Expel Gas From Suction Line / Pump Chamber.
	■	■					■			Insufficient Static Suction Head.	Raise Product Level To Increase Static Suction Head.
			■	■			■		■	Product Viscosity Too High.	Decrease Pump Speed / Increase Product Temperature.
		■								Product Viscosity Too Low.	Increase Pump Speed / Increase Product Temperature.
		■	■		■		■		■	Product Temperature Too High.	Cool Product / Pumping Chamber.
				■					■	Product Temperature Too Low.	Heat Product / Pumping Chamber.
					■	■	■	■		Unexpected Solids In Product	Clean System / Fit Strainer On Suction Side Of Pump.
		■	■	■	■		■	■	■	Discharge Pressure Too High	Check For Blockages / Simplify Discharge Line.
			■	■	■		■	■		Rotorcase Strained By Pipework.	Check Pipe Alignment / Support Pipework.
				■			■			Pump Speed Too High	Decrease Pump Speed.
		■								Pump Speed Too Low	Increase Pump Speed
			■	■	■	■	■	■		Seal Flush Inadequate	Increase Seal Flush To Required Pressure / Flow.
			■	■	■	■	■	■	■	Bearing / Timing Gear Wear	Replace Worn Components.

5.8 RTPe™ Service History.

Pump Serial No:

Date	Comments

5.9 Notes.

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