



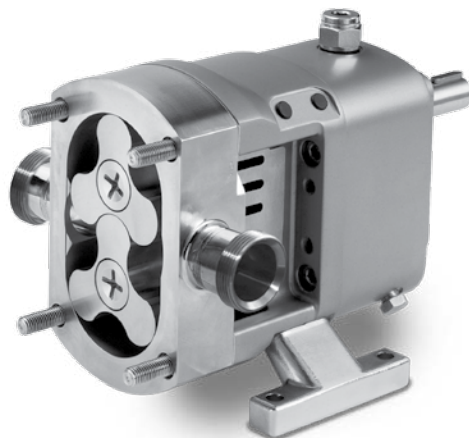
# TECHNICAL SERVICE MANUAL

## CLASSIC+ SERIES ROTARY LOBE PUMPS MODELS CP10, CP20, CP30, CP40 & CP50

SECTION	TSM 285
PAGE	1 OF 36
ISSUE	A

### CONTENTS

1.0	Safety Information.....	2	5.2	CP10, CP20, CP30 & CP40 Mechanical Seals .....	25
1.1	Risk Assessment Relating to the Use of Viking Pump Classic+ Rotary Lobe Pumps and Pump Units in Potentially Explosive Atmospheres.....	3	5.2.1	CP10, CP20, CP30 & CP40 Single Mechanical Seal Removal .....	25
2.0	Introduction.....	3	5.2.2	CP10, CP20, CP30 & CP40 Single Mechanical Seal Replacement .....	25
2.1	General.....	3	5.2.3	CP10, CP20, CP30 & CP40 Single Flushed Mechanical Seal Removal .....	26
2.2	Viking Pump Distributors.....	3	5.2.4	CP10, CP20, CP30 & CP40 Single Flushed Mechanical Seal Replacement .....	26
2.3	Receipts and Storage.....	3	5.2.5	CP10 Double Flushed Mechanical Seal Removal.....	26
2.4	Cleaning.....	3	5.2.6	CP10 Double Flushed Mechanical Seal Replacement.....	27
2.5	Pump Model Designation.....	4	5.2.7	CP20, CP30 & CP40 Double Flushed Mechanical Seal Removal.....	27
2.5.1	Atex Identification Plate.....	4	5.2.8	CP20, CP30 & CP40 Double Flushed Mechanical Seal Replacement.....	27
2.5.2	Equipment Groups & Categories.....	4	5.3	CP50 Mechanical Seals.....	28
2.6	Pump Model and Serial Number.....	4	5.3.1	CP50 Single Mechanical Seal Removal .....	28
2.7	Standard Pump Component Terms .....	5	5.3.2	CP50 Single Mechanical Seal Replacement .....	28
3.0	General.....	5	5.3.3	CP50 Single Flushed Mechanical Seal Removal .....	28
3.1	Classic+ Pumping Principal.....	5	5.3.4	CP50 Single Flushed Mechanical Seal Replacement .....	28
3.2	Classic+ Range Operating Parameters.....	5	5.3.5	CP50 Double Flushed Mechanical Seal Removal.....	29
3.3	System Design.....	6	5.3.6	CP50 Double Flushed Mechanical Seal Replacement.....	29
3.3.1	System Design and Installation.....	6	6.0	Classic+ Single O-Ring Seals.....	29
3.3.2	Installations with In-Line Cleaning Systems.....	7	6.1	General Procedures for Fitting Single O-Ring Seals .....	29
3.4	Start Up Procedure.....	8	6.2	O-Ring Seals for CP10, CP20, CP30 & CP40 Pumps.....	29
3.5	Shutdown Procedure.....	8	6.2.1	CP10, CP20, CP30 & CP40 O-Ring Seal Assembly and Removal.....	29
3.6	Routine Maintenance.....	8	6.3	O-Ring Seal for CP50 Pump.....	30
3.7	Heating and Cooling Jackets.....	8	6.3.1	CP50 O-Ring Seal Assembly and Removal.....	30
3.8	Integral Pressure Relief Valves.....	10	7.0	Flushed Product Seals Auxiliary Services .....	30
3.8.1	Setting and Operating Spring Loaded Valves.....	10	7.1	Single Mechanical Seal (for Low-Pressure Quench or Flush).....	30
3.8.2	Setting and Operating Air Loaded Integral Pressure Relief Valves.....	10	7.2	Double Mechanical Seal (for High Pressure Flush).....	30
4.0	Classic+ Disassembly and Assembly.....	12	8.0	Specifications.....	31
4.1	CP10, CP20 & CP30 Pump - Disassembly and Assembly.....	12	8.1	Clearance Chart.....	31
4.1.1	CP10, CP20 & CP30 Head and Rotor Removal.....	12	8.2	Fasteners and Torque Settings.....	32
4.1.2	CP10, CP20 & CP30 Casing Removal.....	13	8.3	Lubricants .....	33
4.1.2.1	CP10, CP20 & CP30 Casing Removal - Single Un-flushed Mechanical Seals and Single O-Ring Seals.....	13	8.4	Troubleshooting.....	33
4.1.2.2	CP10, CP20 & CP30 Casing Removal - Single Flushed or Double Flushed Mechanical Seals.....	14	8.5	Material Specifications.....	33
4.1.3	CP10, CP20 & CP30 Gearbox Disassembly.....	14	8.6	Foundation Dimensions and Weights.....	34
4.1.4	CP10, CP20 & CP30 Gearbox Assembly.....	15	8.7	Typical Noise Emission Data - CP10, CP20 & CP30 Pumps .....	35
4.1.5	CP10, CP20 & CP30 Casing, Rotor and Head Assembly.....	16	8.8	Typical Noise Emission Data - CP40 & CP50 Pumps .....	35
4.2	CP40 Pumps - Disassembly and Assembly.....	17			
4.2.1	CP40 Head and Rotor Removal .....	17			
4.2.2	CP40 Casing Removal .....	17			
4.2.2.1	CP40 Casing Removal - Single Un-flushed Mechanical Seals and O-Ring Seals .....	17			
4.2.2.2	CP40 Casing Removal - Single Flushed or Double Flushed Mechanical Seals.....	18			
4.2.3	CP40 Gearbox Disassembly.....	18			
4.2.4	CP40 Gearbox Assembly.....	19			
4.2.5	CP40 Casing, Rotor and Head Assembly.....	20			
4.3	CP50 Pumps - Disassembly and Assembly.....	21			
4.3.1	CP50 Head and Rotor Removal .....	21			
4.3.2	CP50 Casing Removal .....	21			
4.3.2.1	CP50 Casing Removal - Single Un-flushed Mechanical Seals and O-Ring Seals .....	21			
4.3.2.2	CP50 Casing Removal - Single Flushed and Double Flushed Mechanical Seals.....	21			
4.3.3	CP50 Gearbox Disassembly.....	22			
4.3.4	CP50 Gearbox Assembly.....	23			
4.3.5	CP50 Casing, Rotor and Head Assembly.....	24			
5.0	Classic+ Mechanical Seal Removal & Replacement.....	25			
5.1	General Procedures for Installing Mechanical Seals.....	25			



Classic+ Series CP20 Pump

# 1.0 SAFETY INFORMATION

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

**This information must be read fully before beginning installation, operation or maintenance and must be kept with the pump. All installation and maintenance must be undertaken by suitably trained or qualified persons only.**

**Symbol Legend :**



**Danger** - Failure to follow the listed precautionary measures identified by this symbol may result in serious injury or death.

**WARNING**

**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 this symbol.

	<b>DO NOT OPERATE PUMP IF:</b>	<b>WARNING</b>	<b>DO NOT</b> install the pump into a system where it will run dry (i.e. without a supply of pumped media) unless it is equipped with a flushed shaft seal arrangement complete with a fully operational flushing system. Mechanical seals require a thin fluid film to lubricate the seal faces. Dry running can cause excessive heat and seal failure.
	<b>DO NOT</b> place fingers, etc. into the pumping chamber or its connection ports or into any part of the gearbox if there is <b>ANY</b> possibility of the pump shafts being rotated. Severe injury will occur.	<b>WARNING</b>	Pressure gauges/sensors are recommended, next to the pump suction and discharge connections to monitor pressures.
	<b>DO NOT</b> 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 operation envelope can cause mechanical contact, excessive heat and can represent a serious risk to health and safety.		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 base plate. If pump is base plate 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 bare shaft pumps, refer to section 8.6.
	Installation and operation of the pump must always comply with health and safety regulations.		<b>DO NOT</b> attempt any maintenance or disassembly of the pump or pump unit without first ensuring that:
<b>WARNING</b>	A device must be incorporated into the pump, system, or drive to prevent the pump exceeding its stated duty pressure. It must be suitable for both directions of pump rotation where applicable. Do not allow 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 3.8).		<ul style="list-style-type: none"> <li>- The pump is fully isolated from the power source (electric, hydraulic, pneumatic).</li> <li>- The pumping chamber, pneumatic relief valve and any shaft seal support system are depressurized and purged.</li> <li>- Any temperature control devices (jackets, heat-tracing, etc.) are fully isolated, that they are depressurized and purged, and components are allowed to reach a safe handling temperature.</li> </ul>
	The mounting of the pump or pump unit should be solid and stable. Pump orientation must be considered in relation to drainage/cavity ventilation 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 and will create high temperatures and increased noise emissions. It may also be necessary to earth the pump head to avoid the build up of a potential charge difference that could cause a spark.		<b>DO NOT</b> attempt to dismantle a pressure relief valve, which has not had the spring pressure relieved, is still connected to a pressurized gas/air supply or is mounted on a pump that is operating. Serious personal injury or death and/or pump damage may occur.
	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.		<b>DO NOT</b> loosen or undo the head, 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 pressurized media.
<b>WARNING</b>	Fill all gearboxes with the recommended grades and quantities of lubricant (refer to section 3.4 and 8.3). Beware of over/under filling the gearbox as this could cause the pump to overheat and mechanical damage to occur.		Pumps and/or drives can produce sound power levels exceeding 85dB (A) under certain operating conditions. When necessary, personal protection against noise must be taken. Typical noise emission data can be found in sections 8.7 and 8.8.
<b>WARNING</b>	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 an ignition source.		Avoid any contact with hot parts of pumps and/or drives that 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.
<b>WARNING</b>	Be sure that pump rotation is correct for the desired direction of flow (refer to section 3.4).	<b>WARNING</b>	When cleaning, either manually or by an in-line cleaning method, the operator must ensure that a suitable procedure is used in accordance with the system requirements. During a in-line cleaning cycle, a pump differential pressure of between 2 and 3 bar (30 and 45 psi) is recommended to ensure suitable velocities are reached within the pump head. The exterior of the pump should be cleaned periodically.
			Surface temperature of pump is also dependent on the temperature of pumped medium.

## 1.1 RISK ASSESSMENT RELATING TO THE USE OF VIKING PUMP CLASSIC+ ROTARY LOBE PUMPS AND PUMP UNITS IN POTENTIALLY EXPLOSIVE ATMOSPHERES

### 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
Casing / Rotors / Head	Unintended mechanical contact	Rare	Ensure that operating pressures are not exceeded. Ensure that sufficient NPSH to prevent cavitation. See Chapter 1.0 / 3.3.1 Service Plan
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 / Service plan
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	Excessive 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. Seals must never run dry
Auxiliary System for Shaft Sealing	Pump liquid leakage. Build up of explosive gas	Rare	Selection of auxiliary seal system must be suitable for application. Seals must never run dry
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 pressure, 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

Classic+ rotary lobe pumps are manufactured by Johnson Pump (UK) Ltd. a subsidiary of Viking Pump Inc., Cedar Falls, USA, (a unit of the IDEX Corporation).

This manual includes all the necessary information for the Classic+ and should be read prior to beginning installation, operation, or maintenance.

Should you require any additional information regarding the Classic+ contact Viking Pump or their local authorized 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 cover, refer to section 2.6.

Should the nameplate be unreadable or missing, the serial number is also stamped on either side of the casing refer to section 2.6.

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

### 2.2 VIKING PUMP DISTRIBUTORS

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

### 2.3 RECEIPTS 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 distributor and clearly mark upon the carriers' paperwork that the goods have been received in a damaged condition, with a brief description of 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  $-10^{\circ}$  and  $40^{\circ}\text{C}$  ( $14^{\circ}\text{F}$  and  $105^{\circ}\text{F}$ ).

Further to the above, if the pump is not intended for installation or use within 18 months or more then refer to Viking Pump, or the Viking Pump authorized distributor for storage recommendations.

### 2.4 CLEANING

The Classic+ pump series is suitable for both manual cleaning and in-line cleaning, refer to section 3.3.2.

It is recommended that the exterior of the pump be cleaned periodically with a non-aggressive, non-abrasive cleaning solution.

## 2.5 PUMP MODEL DESIGNATION

The designations of pump models in the Classic+ range are as follows:

CP10S CP20S CP30S CP40S CP50S  
 CP10M CP20L CP30L CP40L CP50L  
 CP10L

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 and the casing, (refer to section 2.6, Figures 2 and 3).

For the maximum operating pressures, temperatures and speeds refer to section 3.2, Figure 6.

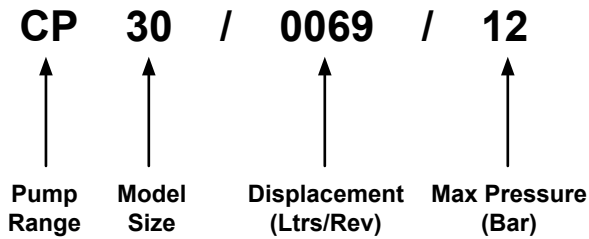


Figure 1  
 CP Designated Models Only

## 2.6 PUMP MODEL AND SERIAL NUMBER

Should you require any information regarding your Classic+ rotary lobe pump contact Viking Pump or your Viking Pump distributor, providing the pump model and serial number as stated on the pump nameplate, see Figure 2, which is fixed to the pump gearbox cover.

Should this be damaged or missing, the pump serial number is also stamped on opposite corners of the casing, (see Figure 3).

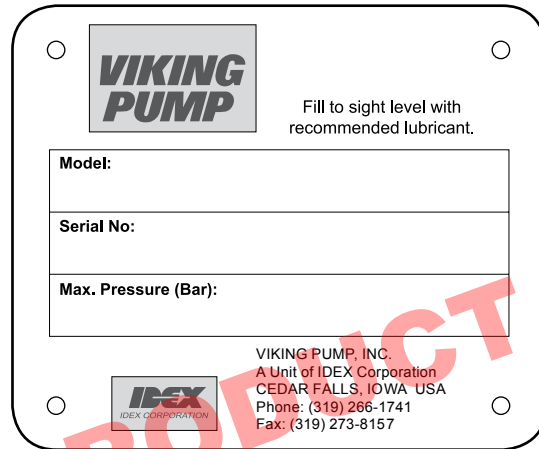


Figure 2  
 Nameplate

### 2.5.1 ATEX IDENTIFICATION PLATE

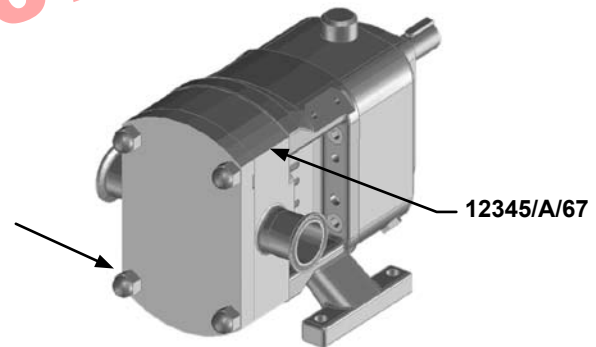
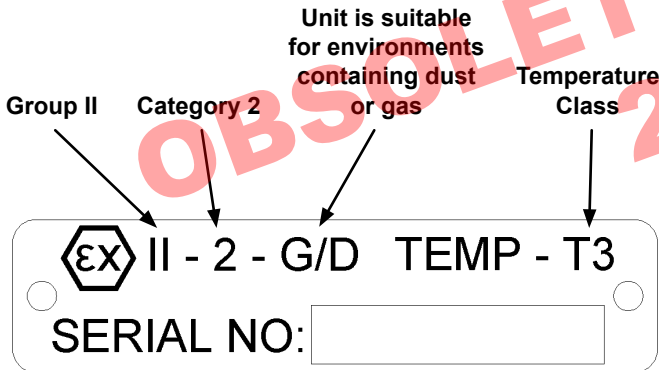


Figure 3  
 Serial Number Position on Casing

### 2.5.2 EQUIPMENT GROUPS & CATEGORIES

Equipment-groups (Annex I of the EC-Directive 94/9/EC)							
Group I (mines, mine gas & dust)		Group II (other explosive atmospheres gas/dust)					
Category M		Category 1		Category 2		Category 3	
1	2	G (gas) (Zone 0)	D (dust) (Zone 20)	G (gas) (Zone 1)	D (dust) (Zone 21)	G (gas) (Zone 2)	D (dust) (Zone 22)
for equipment providing a very high level of protection when endangered by an explosive atmosphere	for equipment providing a high level of protection when likely to be endangered by an explosive atmosphere	for equipment providing a very high level of protection when used in areas where an explosive atmosphere is very likely to occur	for equipment providing a high level of protection when used in areas where an explosive atmosphere is likely to occur	for equipment providing a normal level of protection when used in areas where an explosive atmosphere is less likely to occur			

## 2.7 STANDARD PUMP COMPONENT TERMS

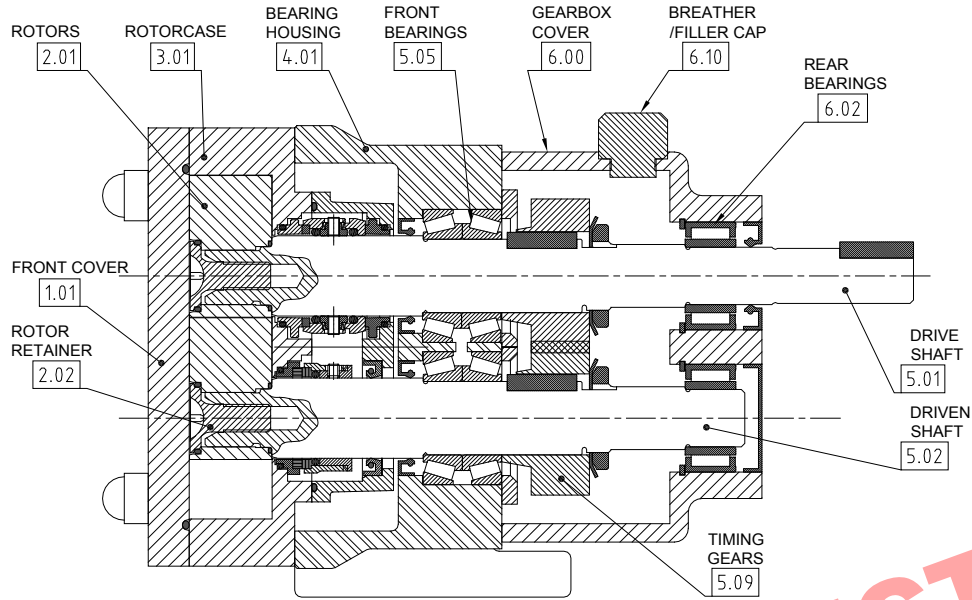


Figure 4  
Pump Component Terms

## 3.0 GENERAL

### 3.1 CLASSIC+ PUMPING PRINCIPAL

The pumping action of the rotary lobe pump principle is generated by the contra rotation of two pumping elements (rotors) within a chamber (casing) - see Figure 5. The rotors are located on shafts, which in turn are mounted within an external gearbox and supported by the bearings; the timing gears are also located on the shafts. The timing gears transfer the energy from the drive shaft to the driven shaft, synchronizing the rotors such that they rotate without contact with each other.

As the rotors pass the suction port, see Figure 5a, the cavity generated increases creating a pressure decrease, which induces the pumped medium to flow into the casing.

The pumped medium is carried around the casing by the rotors; see Figure 5b and 5c, to the discharge side of the pump, Figure 5d. Here the cavity decreases and the pumped medium is discharged from the casing, Figure 5e.

For pump component terms, see Figure 4.

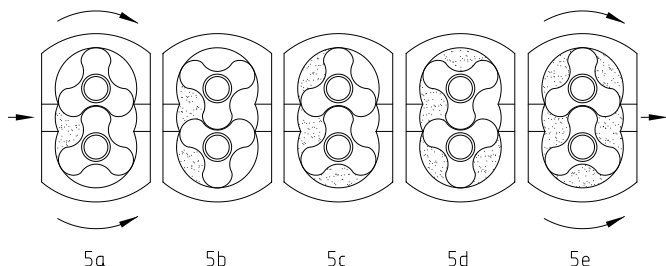


Figure 5  
Rotary Lobe Pumping Principle

### 3.2 CLASSIC+ RANGE OPERATING PARAMETERS

The maximum pressure and speed operating parameters are given in Figure 6. In practice these may be limited 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 distributor for assistance.

The operating temperature limit of the pump is determined by the rotor clearance. For the CP10, CP20, CP30 and CP40 series pumps there are three rotor clearance bands (class A, B and C), and two (class B and D) for the CP50 series pumps.

#### 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 authorized 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 distributor.

Pump Range	Theoretical Displacement			Nominal Connection Size		Max Differential Pressure		Max. Speed	Max Speed @ Max Diff. Pressure	Max Diff. Pressure @ Max Speed	
	ltr/rev	Imp.gal /100 rev	US gal /100 rev	mm	in.	bar	psi			rev/min	bar
CP10S	0.046	1.01	1.22	25	1	12	175	1400	1000	8.5	120
CP10M	0.083	1.83	2.19	38	1.5	8	120	1400	1000	5.5	75
CP10L	0.111	2.44	2.93	38	1.5	5	70	1400	1000	3.5	50
CP20S	0.202	4.44	5.34	38	1.5	12	175	1000	750	8.5	120
CP20L	0.313	6.89	8.27	50	2	7	100	1000	750	5.0	70
CP30S	0.694	15.27	18.34	50	2	12	175	750	550	8.5	120
CP30L	1.125	24.75	29.72	76	3	7	100	750	550	5.0	70
CP40S	1.800	39.60	47.56	76	3	12	175	700	520	8.5	120
CP40L	2.500	55.00	66.05	101	4	7	100	700	520	5.0	70
CP50S	3.514	77.31	92.84	101	4	12	175	650	420	8.5	120
CP50L	5.250	115.50	64.20	152	6	8	115	600	420	5.5	75

CP20/CP30 High Efficiency Operating Parameters.											
CP20S	0.202	4.44	5.34	38	1.5	7	100	1000	750	5.0	70
CP20L	0.313	6.89	8.27	50	2	4	55	1000	750	3.0	40
CP30S	0.694	15.27	18.34	50	2	7	100	750	520	5.0	70
CP30L	1.125	24.75	29.72	76	3	4	55	750	520	3.0	40

Classic+ Series	Operating Temperature Limit (°C)			
	Class A	Class B	Class C	Class D
CP10, 20, 30, 40	70	100	150	N/A
CP50	N/A	100	N/A	180

Figure 6  
Operating Parameters

### 3.3 SYSTEM DESIGN

#### 3.3.1 SYSTEM DESIGN AND INSTALLATION

When incorporating any pump into a system it is considered 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 head and rotors.
- Ventilation of the drive to prevent over heating.



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 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.

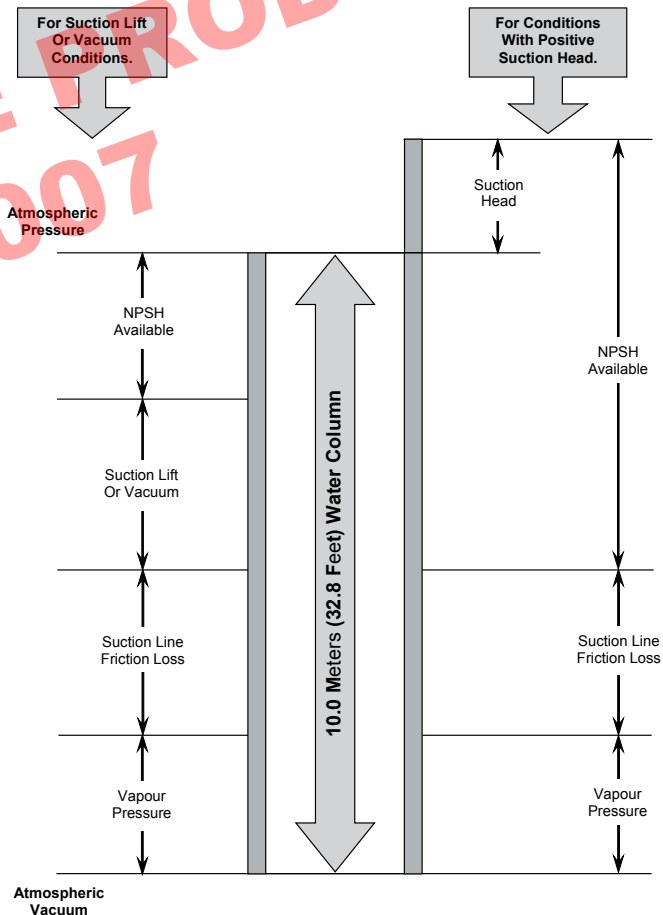


Figure 7  
NPSH

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 advice on pump or system NPSH characteristics be required contact the factory or their authorized distributor.

When installing a pump complete with base plate, motor and drive, the following guidelines must be observed:

- a) The preferred drive arrangement for any rotary lobe pump is in-line direct coupled. If an alternative is required please contact Viking Pump or your Viking Pump distributor.



- b) Flexible couplings must always 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.



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



- d) When the pump is installed in a flammable or explosive environment, or is used 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.



- e) Base plates must be secured to a flat level surface such that distortion and misalignment are avoided. Once base plates are fastened in position the drive alignment must be re-checked, (see b).

- f) 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 other similar method. Ensure all components are correctly grounded.

When installing a pump complete with base plate, motor and drive, the following guidelines must be observed:

- a) The preferred drive arrangement for any rotary lobe pump is in-line direct coupled. If an alternative is required please contact Viking Pump or your Viking Pump distributor.



- b) Flexible couplings must always 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.



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



- d) When the pump is installed in a flammable or explosive environment, or is used 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.



- e) Base plates must be secured to a flat level surface such that distortion and misalignment are avoided. Once base plates are fastened in position the drive alignment must be re-checked, (see b).

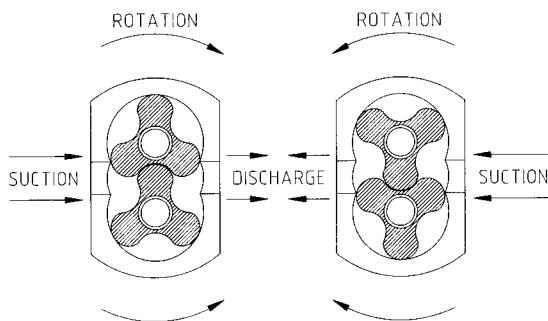
- f) When using electric motor drives, ensure that the electrical supply is compatible with the drive and controls and that the method of wiring is correct for the type of starting required by the motor i.e. Direct On Line, or other similar method. Ensure all components are correctly grounded.

### 3.3.2 Installations with CIP SYSTEMS

The Classic+ pump range is designed to be effectively cleaned by the CIP procedures recommended for in place cleaning of process plant. It is recommended that a differential pressure of 2 to 3 Bar (30 to 45 psi) be developed across the pump head during cleaning in order to develop the necessary fluid velocities required for thorough cleaning.

### 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** - For pumps fitted with flushed product seals check all auxiliary services are in place and connected and provide sufficient flow and pressure for flushing purposes, refer to section 7.0.
  - WARNING** - Ensure lubrication is provided for both pump and drive. The Classic+ is shipped **without oil** as standard and should be filled to the level of the oil sight glass - refer to section 8.3 for pump oil capacities and grades.
  - WARNING** - If an external relief valve is incorporated in the system, check that it is set correctly. For start up purposes, it is considered 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. For setting integral relief valves refer to sections 3.8.1 and 3.8.2.
  - WARNING** - Be sure both suction and discharge valves are fully opened and that pipe work is free from all obstructions. The Classic+ is a positive displacement type pump 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** - Make sure that the drive shaft rotation is correct for the direction of flow required. See Figure 8.
  - WARNING** - Be sure product is available in the suction vessel before starting the pump. This is very important for pumps fitted with un-flushed product seals, as these sealing arrangements must never be allowed to run dry.
- Before beginning operation, it is considered 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 the pump temperature and absorbed power where possible.



**Figure 8**  
**Rotation Against Suction and Discharge**

### 3.5 SHUTDOWN PROCEDURE



When shutting the pump down, stop 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.
- If installed, pneumatically operated integral relief valve has been depressurized.
- Flushed product seal auxiliary services have been isolated and depressurized.
- Pump head and piping have been drained and purged.
- Before undertaking any work on the pump refer to sections 4, 5, 6 and 7.

### 3.6 ROUTINE MAINTENANCE

- 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 8.3.

### 3.7 HEATING AND COOLING JACKETS

See Figure 9 and Figure 10.

The Classic+ can be supplied with a jacketed head and casing for circulation of a heating/cooling media.

The jacketed head and casing ports are strategically positioned such that the required thermal effect acts on the pumping chamber.

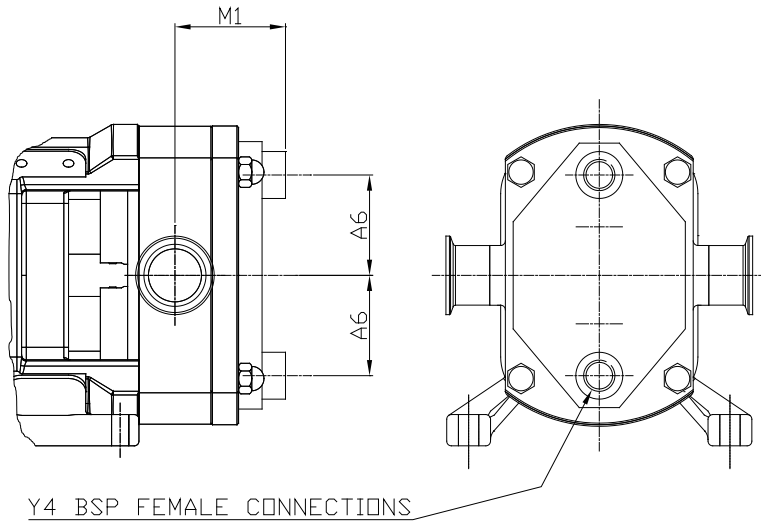


The pressure rating of the Classic+ series jacketed head and casing is 3 Bar (50 psi) and this should not be exceeded without consulting Viking Pump or your local Viking Pump distributor.

Heating/cooling of the pump head is used to maintain, rather than increase/decrease the temperature of the pumped media and should be used as part of a complete system where suction and discharge lines and vessels are also heated/cooled.

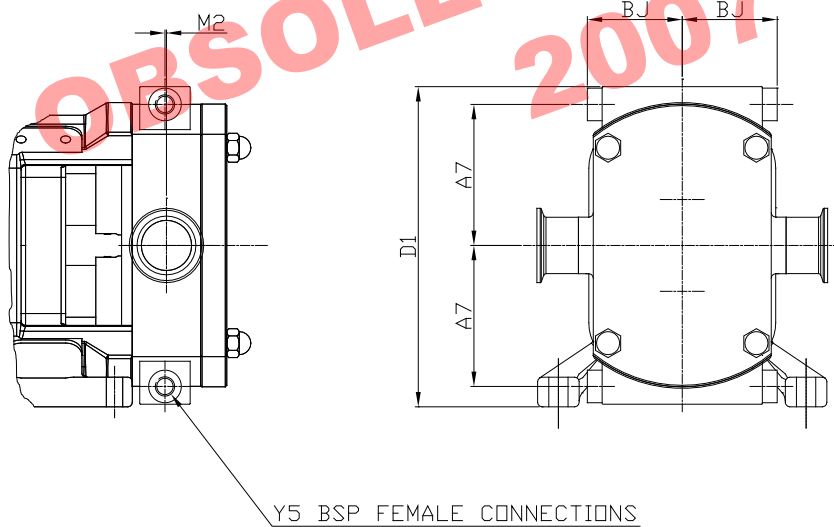
Where heating/cooling devices are employed, the heating/cooling media should be circulated 15-20 minutes prior to pump start-up and should be allowed to continue for a similar period of time after the pump has been shut down. Where an in-line cleaning cycle is employed as part of the process, then the heating/cooling media should continue to be circulated during the cleaning cycle.





**Figure 9**  
Dimensions of Jacketed Head  
for Heating/Cooling

Model	Millimeters			Inches		
	A6	M1		A6	M1	Y4
CP10/0005/12	50.0	52.0		1.97	2.05	¼"
CP10/0008/08	50.0	61.0		1.97	2.40	¼"
CP10/0011/05	50.0	61.0		1.97	2.40	¼"
CP20/0020/12	64.0	71.0		2.52	2.80	½"
CP20/0031/07	64.0	81.0		2.52	3.19	½"
CP30/0069/12	92.5	81.0		3.64	3.19	½"
CP30/0113/07	92.5	96.0		3.64	3.78	½"
CP40/0180/12	130.0	108.0		5.12	4.25	½"
CP40/0250/07	130.0	123.0		5.12	4.84	½"
CP50/0351/12	175.0	115.0		6.89	4.53	½"
CP50/0525/08	175.0	138.0		6.89	5.43	½"



**Figure 10**  
Dimensions of Jacketed Casing  
for Heating/Cooling

Model	Millimeters				Inches					
	A7	B J	D1	M2	A7	B J	D1	M2	Y5	
CP10/0005/12	70.0	56.0	156.0	3.0	2.76	2.20	6.14	0.12	¼"	
CP10/0008/08	70.0	56.0	156.0	2.0	2.76	2.20	6.14	0.08	¼"	
CP10/0011/05	70.0	56.0	156.0	7.5	2.76	2.20	6.14	0.30	¼"	
CP20/0020/12	80.0	64.0	216.0	0.0	3.15	2.52	8.50	0.00	¼"	
CP20/0031/07	80.0	64.0	216.0	1.0	3.15	2.52	8.50	0.04	¼"	
CP30/0069/12	118.0	93.0	280.0	1.0	4.65	3.66	11.02	0.04	½"	
CP30/0113/07	118.0	93.0	280.0	3.5	4.65	3.66	11.02	0.14	½"	
CP40/0180/12	156.0	125.0	352.0	2.5	6.14	4.92	13.86	0.10	½"	
CP40/0250/07	156.0	125.0	352.0	3.5	6.14	4.92	13.86	0.14	½"	
CP50/0351/12	191.0	155.0	430.0	8.0	7.52	6.10	16.93	0.31	½"	
CP50/0525/08	191.0	155.0	430.0	10.0	7.52	6.10	16.93	0.39	½"	

## 3.8 INTEGRAL PRESSURE RELIEF VALVES

See Figures 11, 12, 13 and 14.

The Classic+ models CP10, CP20, CP30 and CP40 can be supplied with integral pressure relief valves. For the CP10, CP20 and CP30 both spring and air loaded versions are available. The function of the valves can be further enhanced with the option of manual or airlift override, offering particular benefits where CIP or SIP procedures are employed. Valves incorporating this option can be opened to regulate the flow of the cleaning media through the pump chamber, thereby avoiding the need for manual cleaning or external bypass.

Where the pump is mounted onto a portable base plate, complete with motor and drive to be used as a mobile set, an integral pressure relief valve should be installed.

The Classic+ integral pressure relief valves available include:

**Spring Loaded** - see Figure 11.

- Valve can be set to the required pressure relief setting.

**Spring Loaded with Manual Lift** - see Figure 12.

- Valve can be set to the required pressure relief setting. Manual lift override can be used to open valve without disturbing pressure relief setting.

**Spring Loaded with Air Lift** - see Figure 13.

- Valve can be set to the required pressure relief setting. Airlift override, which operates on an air supply of up to 7 Bar (102 psi) depending on pressure relief setting, can be used to open valve without disturbing pressure relief setting.

**Air Loaded with Air Lift** - see Figure 14.

- Valve, which operates on an air supply of up to 7 Bar (102 psi) regulated for required setting, can be set to the required pressure relief setting. Airlift override, which operates on an air supply of up to 7 Bar (102 psi) depending on pressure relief setting, can be used to open valve without disturbing pressure relief setting.

Air actuated relief valves can be operated remotely and interfaced with other elements of the system or process control.

### WARNING

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. When the valve opens, because the volume of liquid circulating is relatively small, the temperature of the liquid 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 liquid, both of which should be avoided. For these reasons when the valve is 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 fitted is to be installed within either a pressurised system or one incorporating a vessel under vacuum then the application of the valve should be referred to Viking Pump.

The selection, setting and application of integral relief valves is influenced by the viscosity and nature of the pumped media, the pumps operating speed and the required pressure relief setting and mode of operation. For these reasons and to cover the diverse range of products, the conditions under which they are pumped and application demands, it is not practical to factory-set integral relief. Valves and the setting of the valves should be carried out on site, under the proposed duty conditions for which the pump and valve were selected.

For setting and operating Classic+ integral relief valves refer to sections 3.8.1 and 3.8.2. Before beginning the relief valve setting procedure the pump should be installed, refer to section 3.3.1, paragraph (vi), with a pressure gauge in the discharge line adjacent to the pump discharge port.

### 3.8.1 SETTING AND OPERATING SPRING LOADED VALVES

See Figures 11, 12 and 13.

- Remove cover (108). For integral relief valve with manual lift, see Figure 12; first remove nut (129) and hand wheel (111).



- Unscrew nut (107) using pry bar in holes provided to relieve spring compression. For integral relief valve with airlift, see Figure 13, the air cylinder must be exhausted prior to unscrewing the nut (107).

- Start pump. - refer to section 3.4.

- Screw in nut (107) using pry bar in holes provided until the required pressure relief setting is reached.

### WARNING

**Note:** Care should be taken not to exceed the lower of either the pump's maximum pressure rating or the system design pressure.

- Reinstall cover (108). For integral relief valve with manual lift, see Figure 12; reinstall hand wheel (111) and nut (129).

- The relief valve is now set.

For Integral Relief Valve with Manual Lift - see Figure 12.

- To operate the manual lift, turn the hand wheel (111) clockwise, which will lift the valve head (102/128). To resume normal relief valve operation, turn the hand wheel (111) counter-clockwise.

For Integral Relief Valve with Air Lift - see Figure 13.

- To actuate the airlift, connect an air supply not exceeding 7 Bar (102 psi) to the cylinder (123), connection 'B', which will lift the valve head (112). To resume normal relief valve operation, exhaust the cylinder (123).

### 3.8.2 SETTING AND OPERATING AIR LOADED INTEGRAL PRESSURE RELIEF VALVES

See Figure 14.

- Connect an air supply, not exceeding 7 Bar (102 psi), via a regulating valve to the relief valve connection 'A' in the cylinder (114). Do not turn on the air supply.

- Start the pump, refer to section 3.4.

- Using the regulating valve, gradually increase the air pressure until required pressure relief setting is reached. The air pressure must not exceed 7 Bar (102 psi).

- The relief valve is now set.

**WARNING**

**Note:** Care should be taken not to exceed the lower of either the pump's maximum pressure rating or the system design pressure.



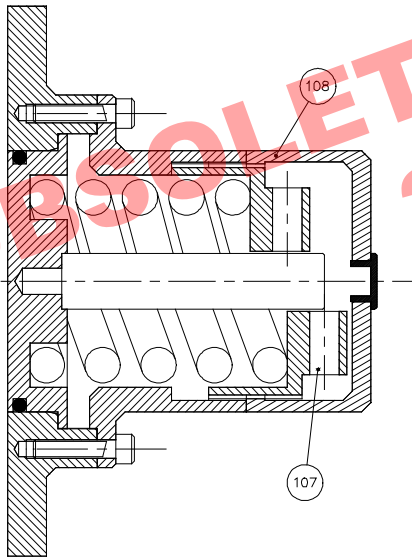
- To use the air lift system, the regulated air supply must be routed through a change-over valve in order to transfer air from the relief valve load air chamber, connection 'A', to the lift air chamber, connection 'B', while depressurizing the load chamber and vice versa. The change-over valve will actuate the air lift which will lift when the air supply is diverted to connection 'B', and will close, restoring normal relief valve operation, when the air supply is diverted back to connection 'A'.



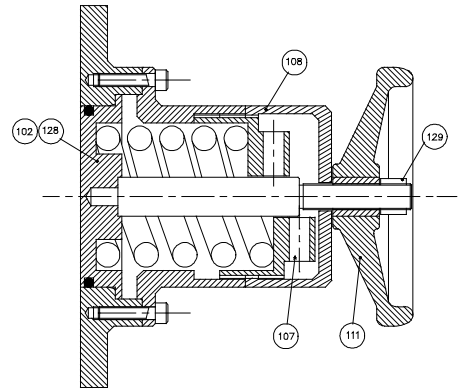
**DANGER !**



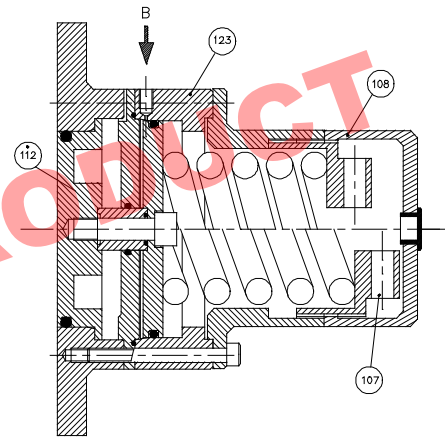
Under no circumstances should any attempt be made to dismantle a pressure relief valve which has not had the spring pressure relieved, is still connected to a pressurized air supply, or is mounted on a pump that is operating. Serious personal injury or pump damage may occur.



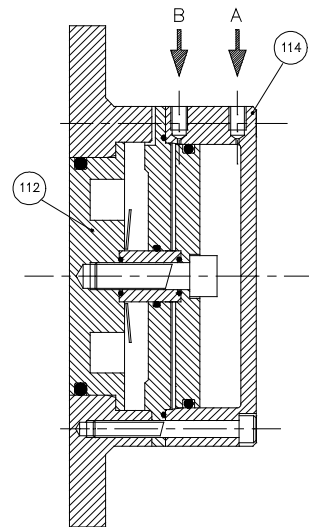
**Figure 11**  
**Spring Loaded Integral Pressure Relief Valve**  
**CP10, CP20, CP30, CP40**



**Figure 12**  
**Spring Loaded Integral Pressure Relief Valve**  
**with Manual Lift**  
**CP10, CP20 and CP30**



**Figure 13**  
**Spring Loaded Integral Pressure Relief Valve with Air Lift**  
**CP10, CP20 and CP30**



**Figure 14**  
**Air Loaded Integral Pressure Relief Valve with Air Lift**  
**CP10, CP20, CP30 and CP40**

## 4.0 CLASSIC+ DISASSEMBLY AND ASSEMBLY



Before starting any work on the pump the recommended Shutdown Procedure should be followed, refer to section 3.5.



While disassembling 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 sub-assemblies should be installed using suitable devices. Use threaded holes for the attachment of lifting eyes where appropriate.

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

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

Lipseals and O-rings are incorporated within the gearbox assembly to contain the lubricant for the bearings and timing gears. Regular inspection and correct maintenance of these items will ensure that the lubrication is sustained and the pump maximum working life is achieved. To ensure this, it is extremely important that care is taken when removing and replacing new O-rings and lipseals. When removing and replacing lipseals ensure that the location bore for the outside diameter and the seat for the back of the lipseal is not damaged as this may create a leak path for the lubricant.

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

All O-rings and sealing lips of lipseals should be lightly lubricated with an appropriate lubricant (suitable for application) before installing.

When installing lipseals do not allow the rear face to come into contact with bearings or other rotating parts.

Prior to beginning assembly, ensure all parts are clean and free from burrs or damage. Where a vice is to be used then this should be installed with protective jaws to avoid damage to components. Do not hammer or apply undue force to install or position components.

### WARNING

All fasteners are required to be tightened to the required torque setting during assembly, refer to section 8.2.



The preferred method of installing bearing cones is that they are heated to approximately 125°C (250°F) prior to installation. During this operation protective gloves should be used. Once bearing cones are installed in the correct position they should be allowed to cool before proceeding with assembly. As an alternative, bearing cones may be pressed into position providing the proper equipment is utilized and the necessary procedures are used to prevent component damage.

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

## 4.1 CP10, CP20 AND CP30 PUMP - DISASSEMBLY AND ASSEMBLY

### 4.1.1 CP10, CP20 AND CP30 HEAD AND ROTOR REMOVAL

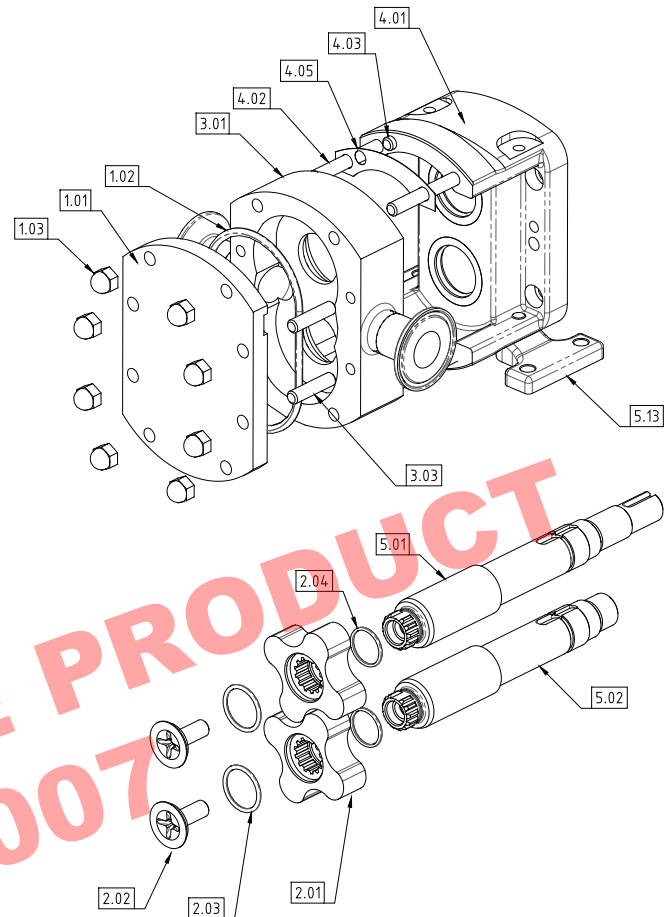


Figure 15

#### CP10 Exploded View of Casing and Rotor Assembly



- Follow recommended shutdown procedure. Refer to section 3.5.

- For CP10 Pump – refer to Figure 15.

- For CP20 Pump – refer to Figure 16.



- Gradually loosen head retaining dome nuts (1.03). Care should be taken as there may still be residual product and pressure in the pump head and as the dome nuts are loosened, this will vent to atmosphere.

- Remove dome nuts (1.03).

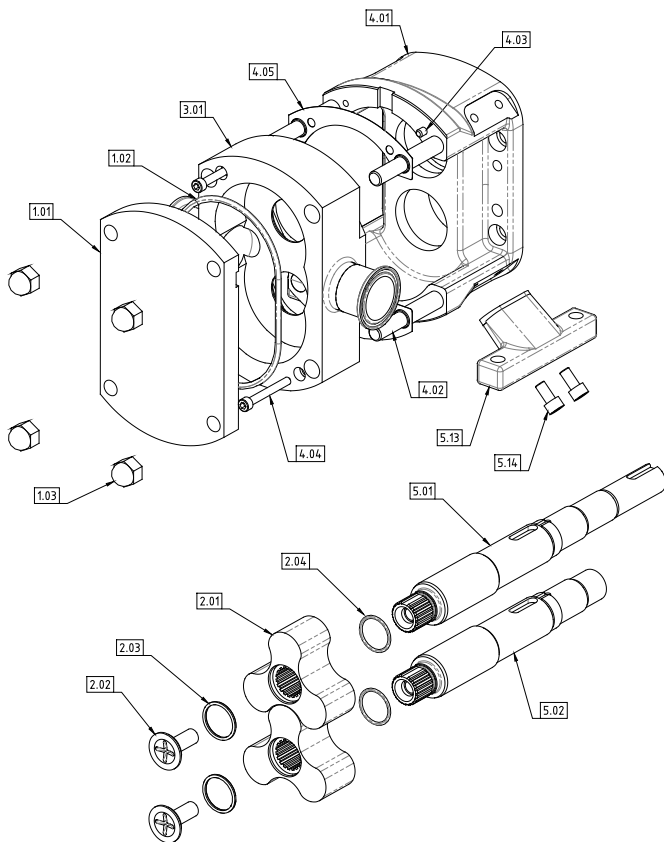
### WARNING

**Note: CP10 Pump Only - Do not rotate shafts at this stage as the casing is held in place by the head retaining dome nuts (1.03).**

- Failure to observe this will result in damage to the pump.

- Remove head (1.01) using lever slots where necessary and the head O-ring (1.02) or optional gasket (not shown).

- Remove rotor retainers' (2.02) with socket supplied (not shown).



**Figure 16**  
CP20/CP30 Exploded View of Casing  
and Rotor Assembly

**WARNING**

**Note:** The socket tool should always be used, the use of other tools may damage the retainer.

- Remove retainer O-rings (2.03).
- Remove rotors (2.01) from shafts (5.01 and 5.02).
- Remove rotor O-rings (2.04) – Not fitted on O-ring seal version of CP10.

**Note:** If the pump is fitted with O-ring Seals (instead of mechanical seals) then the O-ring seal will now be visible – Chapter 6.0 for further information.

### 4.1.2 CP10, CP20 AND CP30 CASING REMOVAL

**WARNING**

**Note:** Ensure all pipe work is disconnected before commencing casing removal.

#### 4.1.2.1 CP10, CP20 AND CP30 CASING REMOVAL FOR PUMPS FITTED WITH SINGLE UN-FLUSHED MECHANICAL SEALS AND SINGLE O-RING SEALS

#### CP10 Pump Only

(After completing section 4.1.1)

- Slide casing (3.01) from bearing housing (4.01), noting it is located on dowels (4.03), keep arch shims (4.05) in appropriate sets if they are to be reused.

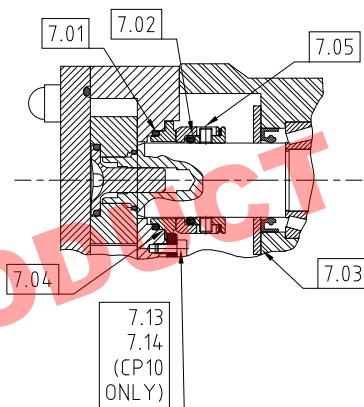
#### CP20 and CP30 Pump Only

(After completing section 4.1.1)

- Remove casing retention socket cap head screws (4.04) with appropriate metric allen key (not supplied).
- Slide casing (3.01) from bearing housing (4.01), noting it is located on dowels (4.03), keep arch shims (4.05) in appropriate sets if they are to be reused.

Single Un-Flushed Mechanical Seal as shown in Figure 17.

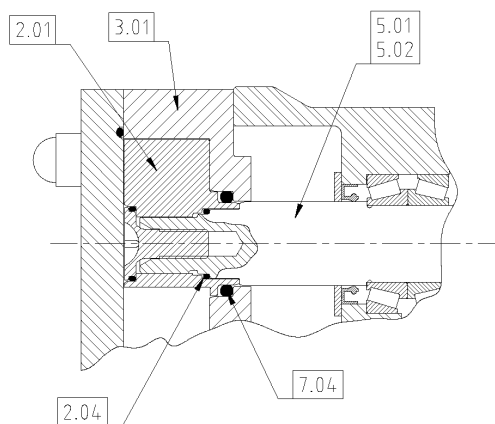
- See section 5.2.1 for removal and section 5.2.2 for replacement.



**Figure 17**  
Single Un-Flushed Mechanical Seal

Single O-ring Seal as shown in Figure 18 – see section 6.2.1 for removal and replacement.

- Remove rotor (2.01).
- Remove O-ring seal (7.04) from casing (3.01).



**Figure 18**  
O-ring Seal

### 4.1.2.2 CP10, CP20 AND CP30 CASING REMOVAL FOR PUMPS FITTED WITH SINGLE FLUSHED OR DOUBLE FLUSHED MECHANICAL SEALS.

Prior to removal of casing (3.01) for CP10, CP20 and CP30, remove seal housing screws (7.10) and separate housing (7.06) from casing (3.01) noting it is located on dowels (7.09).

#### CP10 Pump Only

(After completing section 4.1.1) - see Figure 15.

- Slide casing (3.01) from bearing housing (4.01), noting it is located on dowels (4.03), keep arch shims (4.05) in appropriate sets if they are to be reused.

#### CP20 and CP30 Only

(After completing section 4.1.1) - see Figure 16.

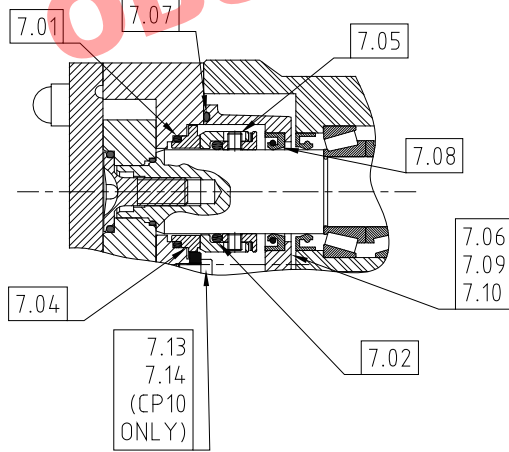
- Remove casing retention socket cap head screws (4.04) with appropriate metric allen key (not supplied).
- Slide casing (3.01) from bearing housing (4.01), noting it is located on dowels (4.03), keep arch shims (4.05) in appropriate sets if they are to be reused.

Single Flushed Mechanical Seal as shown in Figure 19.

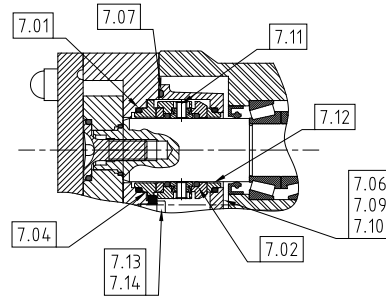
- See section 5.2.3 for removal and section 5.2.4 for replacement.

Double Flushed Mechanical Seal as shown in Figure 20 and Figure 21.

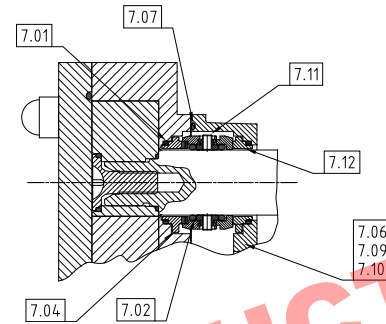
- CP10 Pump - see section 5.2.5 for removal and 5.2.6 for replacement.
- CP20 and CP30 Pumps – see section 5.2.7 for removal and 5.2.8 for replacement.



**Figure 19**  
Single Flushed Mechanical Seal



**Figure 20**  
Double Flushed Mechanical Seal - CP10



**Figure 21**  
Double Flushed Mechanical Seal - CP20 & CP30

### 4.1.3 CP10, CP20 AND CP30 GEARBOX DISASSEMBLY

(After completing 4.1.1 or 4.1.2)

**Figure 22**  
CP10 Component Parts

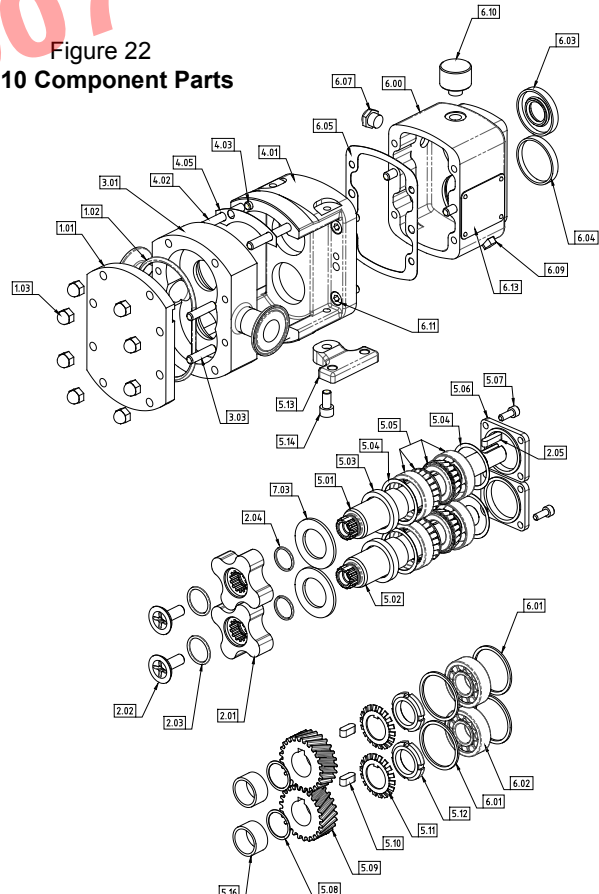
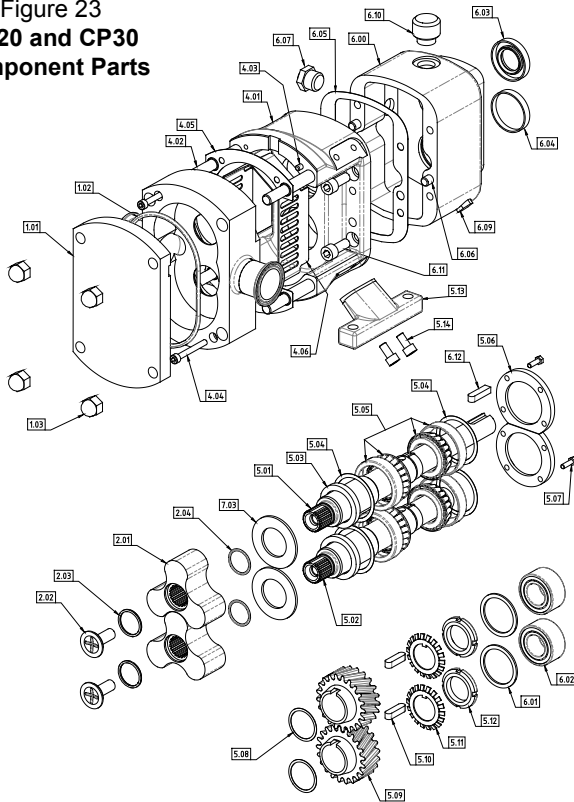


Figure 23  
CP20 and CP30  
Component Parts



Before starting disassembly of the gearbox remove product seals; refer to section 5.0 for Mechanical Seals, or section 6.0 for O-ring seals.

The following procedure describes complete disassembly of the gearbox.

- Refer to Figure 22 for CP10; Refer to Figure 33 for CP20 and CP30.
  - Remove guard (5.06).
  - Remove drive key (6.12).
  - Remove oil drain plug (6.09) and breather (6.10), drain oil into suitable container and retain if later inspection is required.
  - Remove screws (6.11) and separate gearbox cover (6.00) from bearing housing (4.01). The gearbox cover (6.00) is located on dowels (6.06)
- Note: The bearing housing (4.01) is provided with two jacking holes (tapped M8 on CP10; M10 on CP20; M12 on CP30), which can be used to separate the gearbox cover (6.00) from the bearing housing (4.01).**
- Remove gasket (6.05) from gearbox cover (6.00) or bearing housing (4.01) depending upon which part the gasket is adhered to.
  - Remove oil seal (6.03) and blanking cap (6.04) from gearbox cover (6.00).
  - Remove retaining rings (6.01) from gearbox cover (6.00) and press out bearing outer rings (6.02).
  - Remove bearing inner ring (6.02) from shafts (5.01 and 5.02).
  - **CP10 & CP20 Pumps Only** - Remove lock nuts (5.12) and tab washers' (5.11).
  - **CP30 Pumps Only** – Loosen locking screws from and lock nuts (5.12).
  - Remove timing gears (5.09) and gear keys (5.10).

- **CP10 Pumps Only** - Remove shims (5.08) and spacers (5.16), keep shims and spacers in sets and identify position.
- **CP30 Pumps Only** - Remove shims (5.08) in sets and identify position.
- Remove screws (5.07) and retainers (5.06) from bearing housing (4.01).
- Remove shafts (5.01 and 5.02) from bearing housing (4.01) Shafts (5.01 and 5.02) will be complete with bearings (5.05) and shims (5.04), keep shims in sets and identify position.
- Remove oil seals (5.03) from bearing housing (4.01).
- Remove bearing cups (5.05) and any associated shims (5.04) from bearing housing (4.01), keep bearing cups (5.05) and shims (5.04) in sets and identify position.
- Remove bearing cones (5.05) from shafts (5.01 and 5.02).

#### 4.1.4 CP10, CP20 AND CP30 GEARBOX ASSEMBLY

Refer to Figure 22 for CP10 or Figure 23 for CP20 and CP30.

- Install bearing cones (5.05) to shafts (5.01 and 5.02) ensuring they locate against shaft shoulder. The cones are installed as shown in Figure 24.

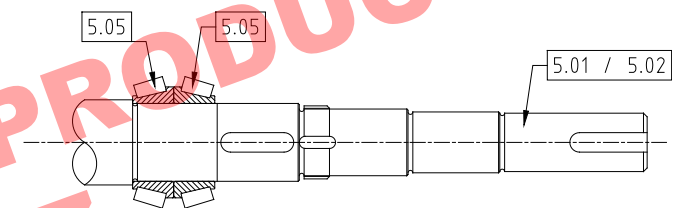
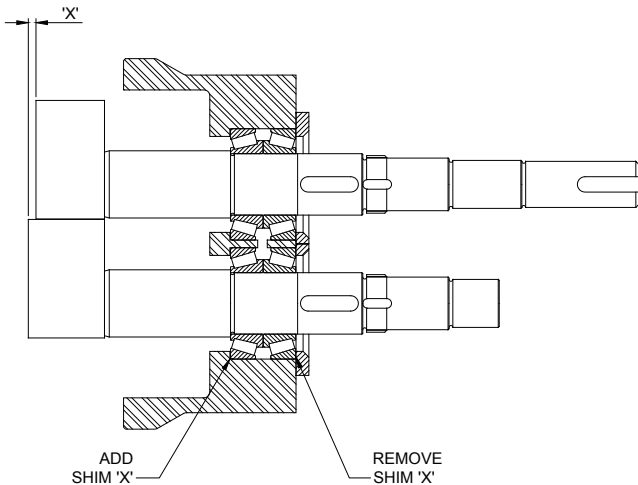


Figure 24  
Installation of bearing cones onto shafts

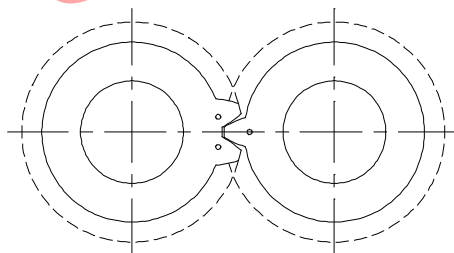
- Install two bearing cups (5.05) to bearing housing (4.01).
  - Install shafts (5.01 and 5.02) in bearing housing (4.01).
  - Install remaining bearing cups (5.05), shims (5.04) to nominal value of 0.60mm (0.024"), retainers (5.06) and secure with screws (5.07) tightened to correct torque refer to section 8.2.
  - Using a torque wrench, check the rolling torque of each shaft assembly, referring to section 8.2. If necessary, adjust amount of shim (5.04), either by adding shim (5.04) to increase rolling torque or removing shim (5.04) to decrease rolling torque, until correct rolling torque has been achieved. If shim (5.04) is adjusted ensure screws (5.07) are tightened to correct torque before final check of rolling torque.
  - Install rotors (2.01) on to shafts (5.01 and 5.02) with rotor retainers (2.02).
- WARNING** **Note: The socket tool (not shown) should always be used, the use of other tools may damage the retainer.**
- Using a depth micrometer or similar device measure any difference (X) in rotor front face alignment, see Figure 25. If a difference is found move shims (5.04) of thickness equal to the difference (X) from beneath the forward rotor's bearing retainer (5.06) and reposition under the front bearing (5.05) cup.

- After adjusting shim (5.04) check rotor front face alignment and rolling torque.
- Remove rotor retainers' (2.02) and rotors (2.01).
- **CP10 Pumps Only** - Install spacers (5.16) and gear keys (5.10) to shafts (5.01 and 5.02).
- **CP20 and CP30 Pumps Only** - Install gear keys (5.10) to shafts (5.01 and 5.02).



**Figure 25**  
**Rotor / Bearing abutment setting**

- **CP10 Pumps Only** - Timing marks and gear marks 'D' and 'L' on gears (5.09) should be visible when viewed on the drive end of the drive shaft.
- **CP20 and CP30 Pumps Only** - Timing marks and gear marks 'D' and 'L' on gears (5.09) should be visible when viewed on the drive end of the shafts (5.01 and 5.02), and the tapered shoulder on the gear (5.09) should face the bearings (5.05).

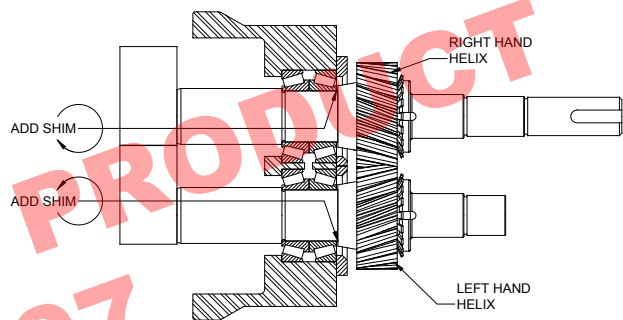


**Figure 26**  
**Timing marks on gears**

- Install gears (5.09) to shafts (5.01 and 5.02). Gear marked 'D' should be installed to drive shaft (5.01). Gear marked 'L' should be installed to lay shaft (5.02) ensuring correct alignment of timing marks, see Figure 26.
- **CP10 and CP20 Pumps Only** - Install tab washers (5.11) and lock nuts (5.12) tightened to correct torque, refer to section 8.2. Do not secure tab washers (5.11).
- **CP30 Pumps Only** - Install locknuts (5.12) and tighten to correct torque (refer to section 8.2).

Install, but do not tighten lock-screws (5.12) which are fitted in the locknuts (5.12).

- Install rotors (2.01) and rotor retainers (2.02)
- Check mesh clearance against the Clearance Chart (refer to section 8.1).
- To adjust mesh clearance shims (5.08) will need to be inserted between the spacer (5.16) and the gear (5.09). As a guide for a mesh clearance change of one unit (say 0.1mm or 0.004"), shims (5.08) of four units' thickness (say 0.4mm or 0.016") need to be inserted. Further, for clockwise movement of the rotor (when viewed from the rotor end) insert shim (5.08) in between the spacer (5.16) on the CP10; or bearing (5.05) on the CP20 and CP30; and the gear (5.09) having a right hand helix, and vice versa, see Figure 27.
- Having installed shim (5.08) ensure lock nuts (5.12) are tightened to correct torque (refer to section 8.2), before checking mesh clearance (refer to section 8.1).
- **CP10 and CP20 Pumps Only** - Having achieved optimum mesh clearances the tab washers' (5.11) can be secured.
- **CP30 Pump Only** - Having achieved optimum mesh clearances the lock screws in the locknuts (5.12) can be secured.



**Figure 27**  
**Preload setting**

- Remove rotor retainers' (2.02) and rotors (2.01).
- Install bearing (6.02) inner races to shafts (5.01 and 5.02), positioning against shoulder on shaft.
- Install inner retaining rings (6.01), bearing (6.02) outers, outer retaining rings (6.01), lipseal (6.03), blanking cap (6.04), filler plug (6.10), sight glass (6.07) and drain plug (6.09) to cover (6.00).
- Install cover (6.00) to bearing housing (4.01) with gasket (6.05), locating on dowels (6.06), and secure with screws (6.11) tightened to correct torque, refer to section 8.2.

#### **4.1.5 CP10, CP20 AND CP30 CASING, ROTOR AND HEAD ASSEMBLY**

- see Figure 15 for CP10.
- see Figure 16 for CP20 and CP30.
- Install casing (3.01) to bearing housing (4.01) locating on dowels (4.03).
- **CP10 Pump Only** - Secure casing (3.01) in position with nuts (1.03) using four temporary spacers (12mm long x 9mm bore or 0.472" long x 0.354" bore).



- **CP20 and CP30 Pumps Only.**

Secure casing (3.01) in position with socket cap head screws (4.04) using appropriate metric allen key (not supplied), tightened to correct torque, refer to section 8.2. For additional clamping whilst checking the clearances clamp the casing on the opposite corners to the socket cap screws using washers (not supplied) and nuts (1.03).

**WARNING** Note: The casing must be clamped in position as above to enable front and rear rotor clearances to be checked.

- Install rotors (2.01) to shafts (5.01 and 5.02) with retainers (2.02).
- Using a depth micrometer or similar device measure front clearance (refer to section 8.1 Clearance Chart) between the casing and rotor front faces and check that this corresponds to the appropriate clearance as indicated on the Clearance Chart.
- To adjust front clearance, remove rotors (2.01) and casing (3.01) and insert arch shims (4.05) between the casing (3.01) and bearing housing (4.01).

**WARNING** Note: It is essential that the thickness of arch shim (4.05) inserted is the same at both the top and bottom of the casing (3.01).

- Install product seals; refer to section 5.0 or 6.0.
- Install guard (5.06).
- Install casing (3.01) securing in position with temporary spacers (CP10) or socket cap head screws, washers and nuts (CP20 and CP30) as before.
- Install rotors (2.01) with O-rings (2.03 and 2.04) and retainers (2.02) tightened to correct torque, refer to section 8.2, using socket tool (not shown).
- Check all rotor clearances i.e. front, rear, top/bottom, sides and mesh. (Refer to section 8.1 Clearance Chart.)
- **CP10 Pump Only** - Remove temporary spacers retaining casing (3.01).
- **CP10, CP20 and CP30 Pumps Only** - Install head (1.01) with O-ring (1.02) or gasket and secure with nuts (1.03) tightened to correct torque, refer to section 8.2.

## 4.2 CP40 PUMPS - DISASSEMBLY AND ASSEMBLY

### 4.2.1 CP40 HEAD AND ROTOR REMOVAL

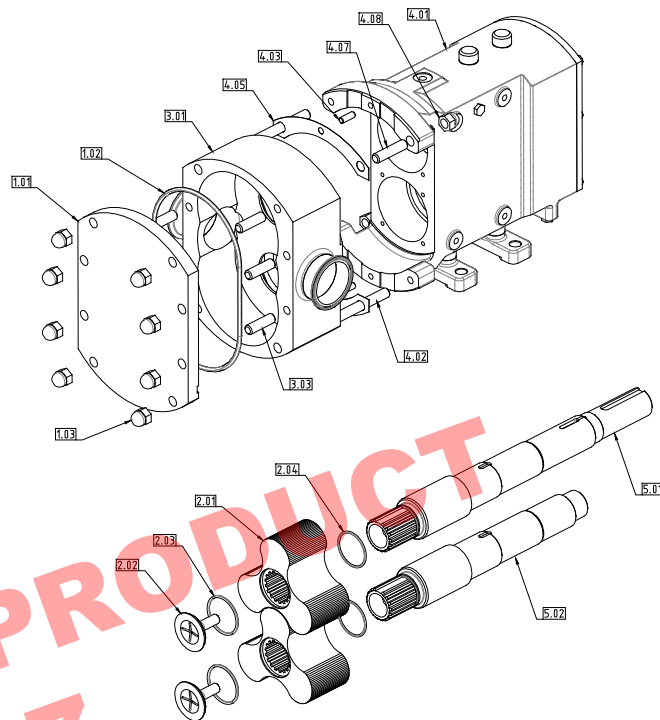


Follow recommended shutdown procedure - refer to section 3.5.

- Refer to Figure 28.
- Gradually loosen head retaining dome nuts (1.03). Care should be taken as there may still be residual product and pressure in the pump head and as the dome nuts are loosened, this will vent to atmosphere.
- Remove dome nuts (1.03).
- Remove head (1.01), using lever slots as necessary.
- Remove head O-ring (1.02).
- Remove rotor retainers' (2.02) with socket (not shown).

**Note: The socket tool supplied (not shown) should always be used to remove the retainer. The use of other tools may damage the retainer.**

- Remove retainer O-rings (2.03).
- Remove rotors (2.01) from shafts (5.01 and 5.02).
- Remove rotor O-rings (2.04).



**Figure 28**  
**Head and Casing Removal for CP40**

### 4.2.2 CP40 CASING REMOVAL

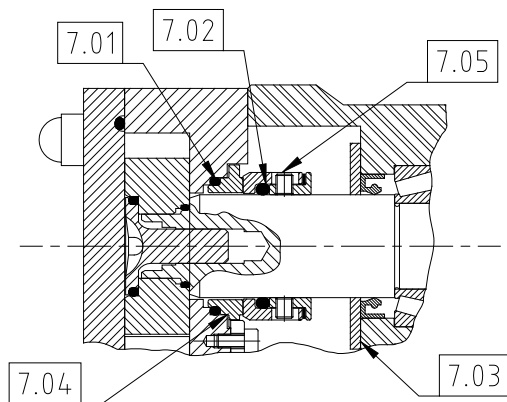


**Note: Ensure all pipe work is disconnected before commencing casing removal.**

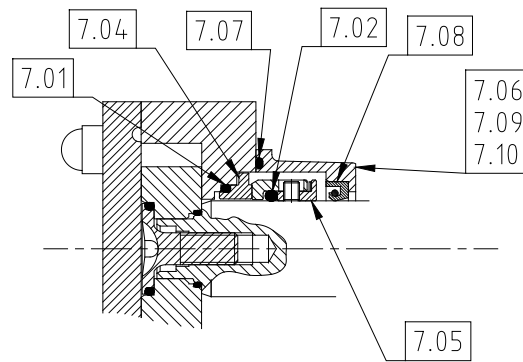
#### 4.2.2.1 CP40 CASING REMOVAL FOR PUMPS FITTED WITH SINGLE UN-FLUSHED MECHANICAL SEALS AND O-RING SEALS

(After completing 4.2.1)

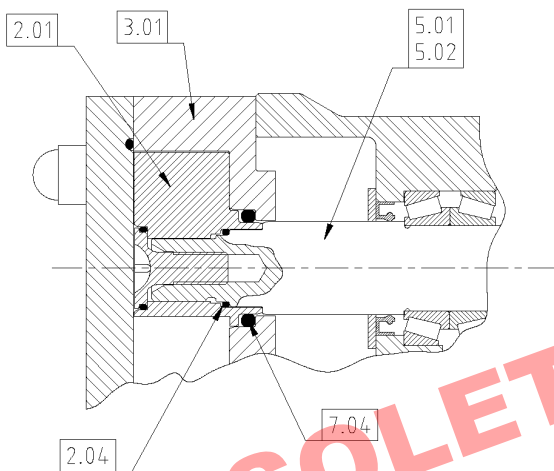
- Remove dome nuts (4.08) fastening casing (3.01) to gearbox (4.01).
- Single Un-flushed Mechanical Seal for CP40 - see Figure 29 and sections 5.2.1 for removal and section 5.2.2 for replacement.
- Slide casing (3.01) from gearbox (4.01) noting it is located on dowels (4.03), keep arch shims (4.05) in appropriate sets if they are to be reused.
- Single O-ring Seal as shown in Figure 30 – see section 6.2.1 for removal and replacement.
- Remove O-ring seal (7.04) from casing (3.01).



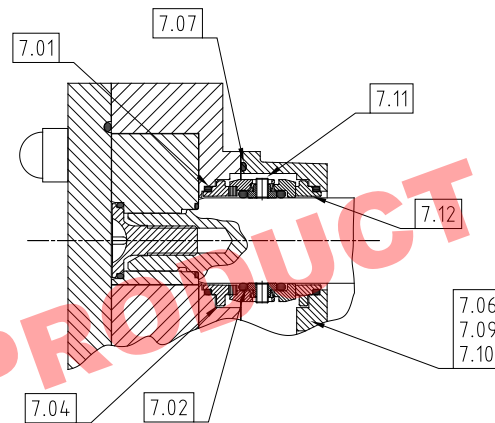
**Figure 29**  
**Single Un-Flushed Mechanical Seal – CP40**



**Figure 31**  
**Single Flushed Mechanical Seal - CP40**



**Figure 30**  
**O-ring Seal**



**Figure 32**  
**Double Flushed Mechanical Seal - CP40**

OBSOLETE PRODUCT  
2007

- Slide casing (3.01) from gearbox (4.01) noting it is located on dowels (4.03), keep arch shims (4.05) in appropriate sets if they are to be reused.

#### 4.2.2.2 CP40 CASING REMOVAL FOR PUMPS FITTED WITH SINGLE FLUSHED OR DOUBLE FLUSHED MECHANICAL SEALS

- Prior to removal of casing (3.01) remove seal housing screws (7.10) and separate housing (7.06) from casing (3.01) noting it is located on dowels (7.09).
- Slide casing from bearing housing (4.01), noting it is located on dowels (4.03), keep arch shims (4.05) in appropriate sets if they are to be re-used

Single Flushed Mechanical Seal as shown in Figure 31 and see sections 5.2.3 for removal and 5.2.4 for replacement.

Double Flushed Mechanical Seal as shown in Figure 32 and see section 5.2.7 for removal and 5.2.8 for replacement.

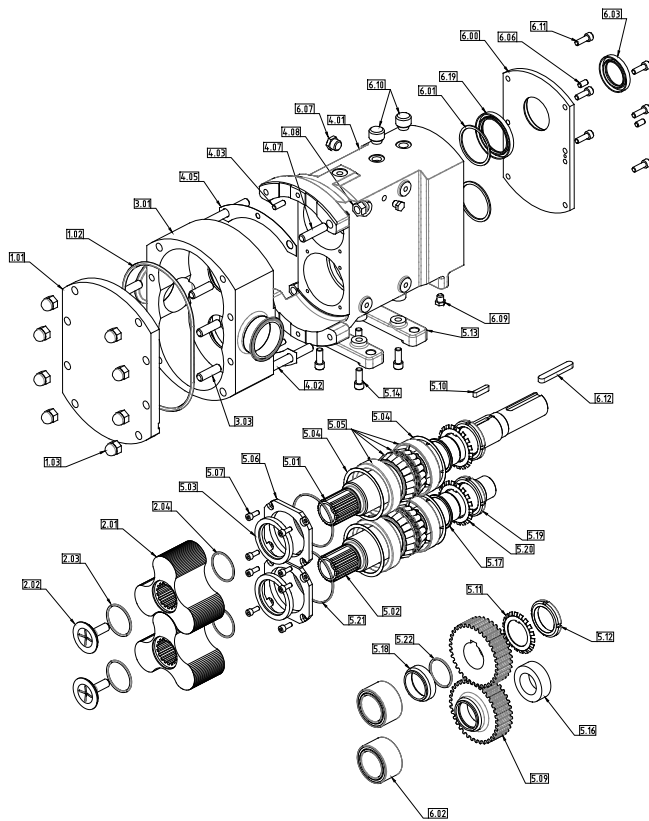
### 4.2.3 CP40 GEARBOX DISASSEMBLY

(After completing 4.3.1 and 4.3.2) - See Figure 33.

Before proceeding with disassembly of the gearbox remove product seals; refer to sections 5.0 for Mechanical Seals or section 6.0 for O-ring seals.

The following procedure describes complete disassembly of the gearbox, refer to Figure 33.

- Remove drive key (6.12), oil drain (6.09) and breather plugs (6.10), drain oil into suitable container and retain if later inspection is required.
- Remove screws (6.11) and gearbox cover (6.00). The gearbox cover (6.00) is located on dowels (6.06) and sealed with suitable liquid sealer.
- Remove oil seal (6.03) from gearbox cover (6.00).
- Loosen by 2 full turns all screws in retainer (5.16). Once this is done, the retainer may release its grip. If it does not become free, remove the two screws, which differ in color (these may also have a washer under the head). Once these screws are removed, tapped holes will be revealed. Insert two jacking M8 x 40 setscrews into the tapped holes and tighten until the retainer's grip is broken. Remove the retainer.



**Figure 33**  
**CP40 Components**

- Remove lock nut (5.12) and tab washer (5.11).
- Remove timing gears (5.09), gear key (5.10), O-ring (5.22), spacer (5.18) and lipseal (6.19).
- Support pump with shafts in the vertical position with rotor end up.
- Remove guard (4.06) and slingers (7.03) – (only fitted on single un-flushed mechanical and single o-Ring seal pumps).
- Remove screws (5.07).
- Remove bearing retainers' (4.01), O-rings (5.21) and shims (5.04), keep shims (5.04) in sets and identify position.
- Remove lipseals (5.03) from bearing retainers' (5.06).
- Remove shafts (5.01 and 5.02) from gearbox (4.01). Shafts (5.01 and 5.02) will be complete with bearings (5.05), spacers (5.18), lock nuts (5.19), lock washers (5.20) and bearing inner races (6.02).
- Remove bearing cups (5.05) from gearbox (4.01), keep any further shims (4.05) in sets and identify position.
- Remove lock nuts (5.19), lock washers (5.19), spacers' (5.18) and bearing cones (5.05) from shafts (5.01 and 5.02).
- Remove retaining rings (6.01) and bearing outers (6.02) from gearbox (4.01).

## 4.2.4 CP40 GEARBOX ASSEMBLY

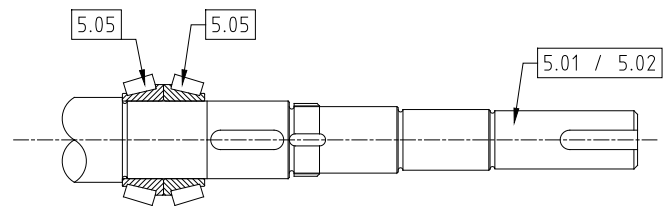
Refer to Figure 33.

- Install bearing cones (5.05) to shafts (5.01 and 5.02) ensuring they locate against the shaft shoulder. The cones are installed as shown in Figure 34.

- Install spacers (5.17), tab washers (5.20) and lock nuts (5.14) to shafts (5.01 and 5.02) tightening to correct torque, refer to section 8.2. Secure tab washers.
- Install bearing (6.02) inner races to shafts (5.01 and 5.02) positioning against shoulder on shaft.
- Install bearing (6.02) outer races and retaining rings (6.01) to gearbox (4.01).
- Install two bearing cups (5.05) to gearbox (4.01).
- Support gearbox (4.01) in a vertical position and install shafts (5.01 and 5.02) to gearbox (4.01).
- Install remaining bearing cups (5.05), shims (5.04) to nominal value of 0.6mm (0.024"), O-rings (5.21), retainers (5.06) and secure with screws (5.07) tightening to correct torque, refer to section 8.2.
- Using a torque wrench, check rolling torque of each shaft assembly, refer to section 8.2, if necessary adjust amount of shim (5.04) either by adding shim (5.04) to increase rolling torque or removing shim (5.04) to decrease rolling torque until correct rolling torque has been achieved. If shim is adjusted ensure screws (5.07) are tightened to correct torque before final check of rolling torque.
- Install rotors (2.01) onto shafts (5.01 and 5.02) with rotor retainers (2.02).

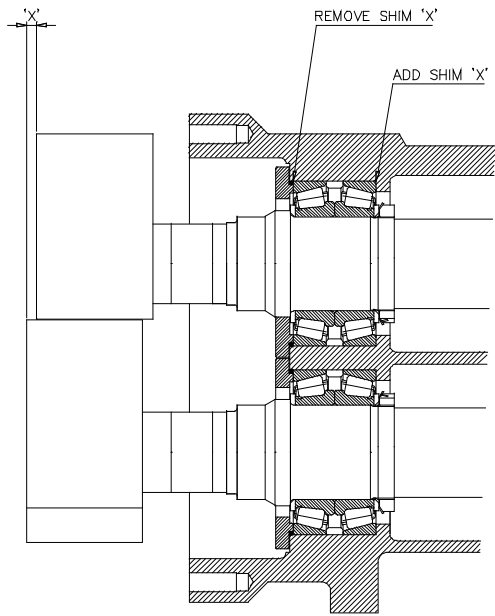
**WARNING** Note: The socket tool (not shown) should always be used to remove the retainer. The use of other tools may damage the retainer.

- Using a depth micrometer or similar device measure any difference (X) in rotor front face alignment, see Figure 35. If a difference is found move shims (5.04) of thickness equal to the difference (X) from beneath the lower rotors bearing retainer (5.06) and reposition under the front bearing (5.05) cup.



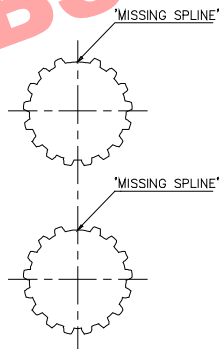
**Figure 34**  
**Installation of bearing cones onto shafts**

- After adjusting shim (5.04) check rotor front face alignment and rolling torque.
- Remove rotor retainers' (2.02) and rotors (2.01).
- Install lipseals (5.03) to bearing retainers' (5.06).
- Return pump to normal horizontal mounting position.
- Install lipseal (6.19) to gearbox (4.01). Install spacer (5.18) and O-ring (5.22) to drive shaft (5.01). Install gear key (5.10) to drive shaft (5.01).
- Install timing gears (5.09) to shafts (5.01 and 5.02).
- Install tab washer (5.11) and lock nut (5.12) tightening to correct torque - refer to section 8.2. Secure tab washer (5.11).
- Rotate shafts (5.01 and 5.02) so as to position the gaps made by the missing splines in the vertically uppermost positions, see Figure 36.

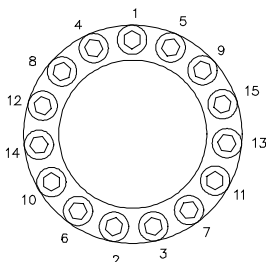


**Figure 35**  
**Rotor face alignment**

- Lubricate retainer (5.16) with oil and mount to timing gear (5.09). Do not tighten.
- Install rotors (2.01) and rotor retainers (2.02) to shafts (5.01 and 5.02).
- Check rotor mesh clearance against Clearance Chart - refer to section 8.1. To adjust the mesh clearance rotate shafts (5.01 and 5.02). Having achieved optimum mesh clearance, retainer (5.16) can be tightened to correct torque, refer to section 8.2, taking note of typical tightening sequence, see Figure 37.



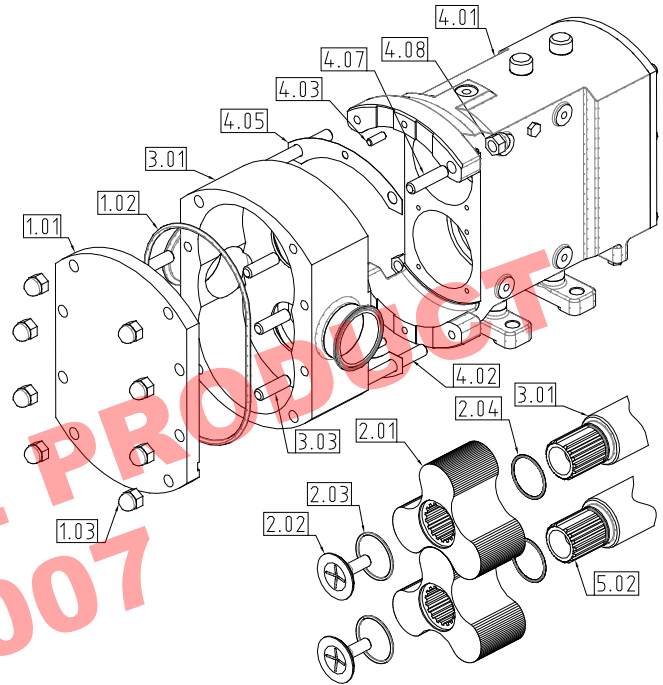
**Figure 36**  
**Missing spline alignment**



**Figure 37**  
**Retainer Tightening Sequence**

- After tightening of retainer (5.16) check mesh clearance, refer to section 8.1, Clearance Chart.
- Remove rotors (2.01) and retainers (2.02).
- Install oil seal (6.03) to gearbox cover (6.00).
- Apply liquid sealant (Loctite 573 or similar) to sealing area of gearbox cover (6.00) and install to gearbox (4.01), locating on dowels (6.06) and securing with screws (6.11), tightened to correct torque, refer to section 8.2.

## 4.2.5 CP40 CASING, ROTOR AND HEAD ASSEMBLY



**Figure 38**  
**CP40 Casing Assembly**

- Fit shaft slingers and guard (if fitted, depending upon seal configuration).
- Install casing (3.01) to gearbox (4.01) locating on dowels (4.03) and secure with nuts (4.08) tightened to correct torque, refer to section 8.2.
- Install rotors (2.01) and rotor retainers (2.02). Using a depth micrometer or similar device measure front clearance (refer to section 8.1, Clearance Chart), between the casing and rotor front faces and check that this corresponds to the appropriate clearance.
- To adjust front clearance remove rotor retainers' (2.02), rotors (2.01), nuts (4.08) and casing (3.01) and insert arch shims (4.05) between the casing (3.01) and gearbox (4.01).

**Note:** It is essential that the thickness of arch shims (4.05) inserted is the same at both the top and bottom of the casing.

- Install product seals; refer to section 5.0 or section 6.0.
- Install casing (3.01) to gearbox (4.01), noting it locates on dowels (4.03), securing with dome nuts (4.08).
- Install rotors (2.01) with O-rings (2.03 and 2.04) and retainers (2.02) tightening to correct torque, refer to section 8.2, using socket tool supplied (not shown).
- Check all rotor clearances, front, rear, top/bottom, sides' and mesh, refer to section 8.1, Clearance Chart.
- Install head (1.01) with O-ring (1.02) and secure with nuts (1.03) tightened to correct torque, refer to section 8.2.

## 4.3 CP50 PUMPS - DISASSEMBLY AND ASSEMBLY

### 4.3.1 CP50 HEAD AND ROTOR REMOVAL

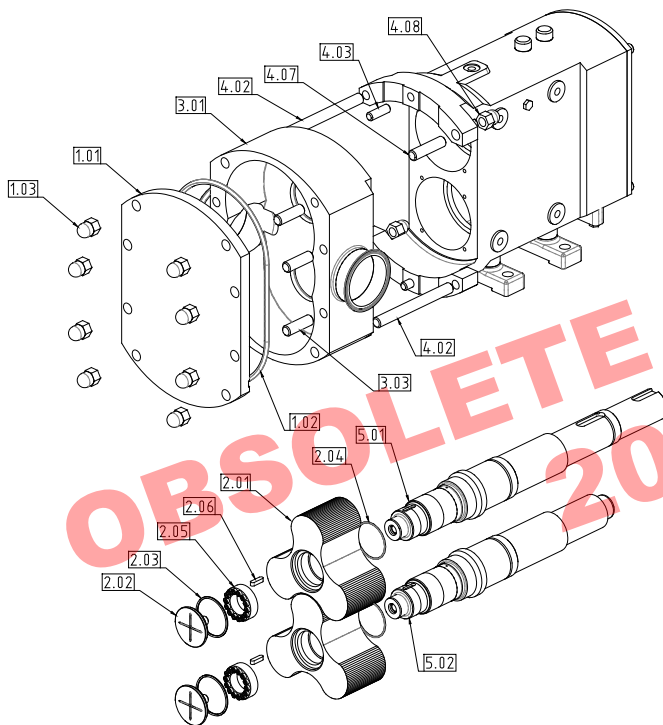


Figure 39  
Head and Rotor Components



Follow recommended shutdown procedure - refer to section 3.5.

- Refer to Figure 39.
- Gradually loosen head retaining dome nuts (1.03). Care should be taken as there may still be residual product and pressure in the pump head and as the dome nuts are loosened, this will vent to atmosphere.
- Remove dome nuts (1.03).
- Remove head (1.01), using lever slots where necessary and the head O-ring (1.02).

- Remove rotor caps (2.02) with tool (supplied, not shown).

#### WARNING

**Note: The tool provided should always be used to remove the rotor cap. The use of other tools may damage the rotor cap.**

- Remove rotor cap O-rings (2.03).
- Loosen by 2 full turns all screws in rotor retainer (2.05). Once this is done the retainer may release its grip. If it does not, loosen further the screws until the assembly becomes free to remove.

(On some brands of locking device there are two screws that are different in color (these may also have a washer under the head). Once these screws are removed tapped holes will be revealed. By inserting two jackscrews (M8 x 40 setscrews), into the tapped holes and tightening, the retainer's grip is broken. Remove the retainers' (2.05).

- Remove rotors (2.01) from shafts (5.01 and 5.02).
- Remove O-rings (2.04) and keys (2.06).

### 4.3.2 CP50 CASING REMOVAL

#### WARNING

**Note: Ensure all pipe work is disconnected before commencing casing removal.**

#### 4.3.2.1 CP50 CASING REMOVAL FOR PUMPS FITTED WITH SINGLE UN-FLUSHED MECHANICAL SEALS AND O-RING SEALS

(After completing 4.3.1)

- Remove dome nuts (4.08).
- Slide casing (3.01) from gearbox (4.01), noting it is located on dowels (4.03).

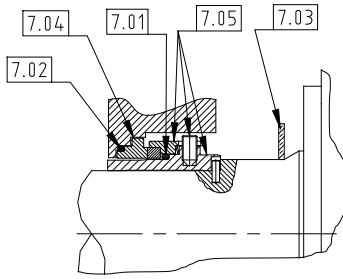
Single Un-flushed Mechanical Seals as shown in Figure 40 and see sections 5.3.1 for removal and 5.3.2 for replacement.

Single O-ring Seal for CP50 see Figure 41 and see section 6.3.1 for removal and replacement.

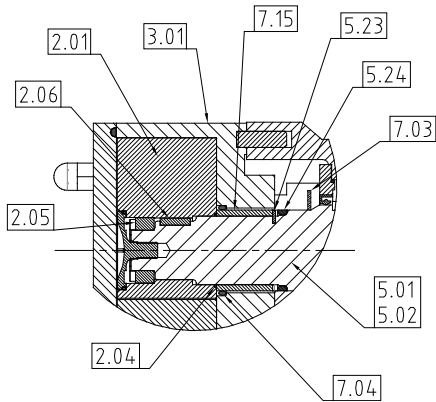
- Remove O-ring seal (7.04) from casing (3.01).
- Slide casing (3.01) from gearbox (4.01) noting it is located on dowels (4.03).

#### 4.3.2.2 CP50 CASING REMOVAL FOR PUMPS FITTED WITH SINGLE FLUSHED AND DOUBLE FLUSHED MECHANICAL SEALS

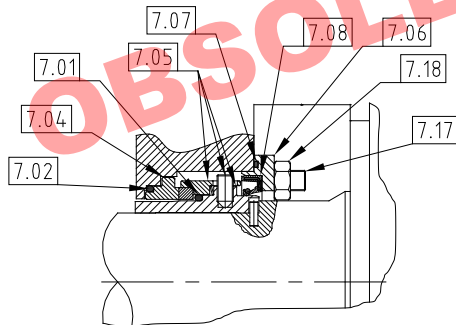
- Refer to Figure 42 for Single flushed mechanical seal for CP50.
- Refer to Figure 43 for Double flushed mechanical seal for CP50.
- Prior to removal of casing (3.01), remove seal housing nuts (7.18) from studs (7.17) and separate housing (7.06) from casing (3.01).
- Remove dome nuts (4.08).
- Slide casing from bearing housing (4.01), noting it is located on dowels (4.03).



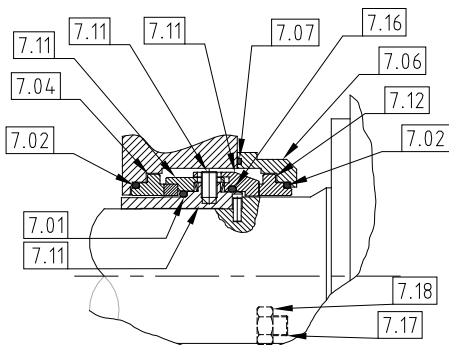
**Figure 40**  
Single Un-flushed Mechanical Seal – CP50



**Figure 41**  
Single O-ring Seal CP50



**Figure 42**  
Single Flushed Mechanical Seal for CP50



**Figure 43**  
Double Flushed Mechanical Seal for CP50

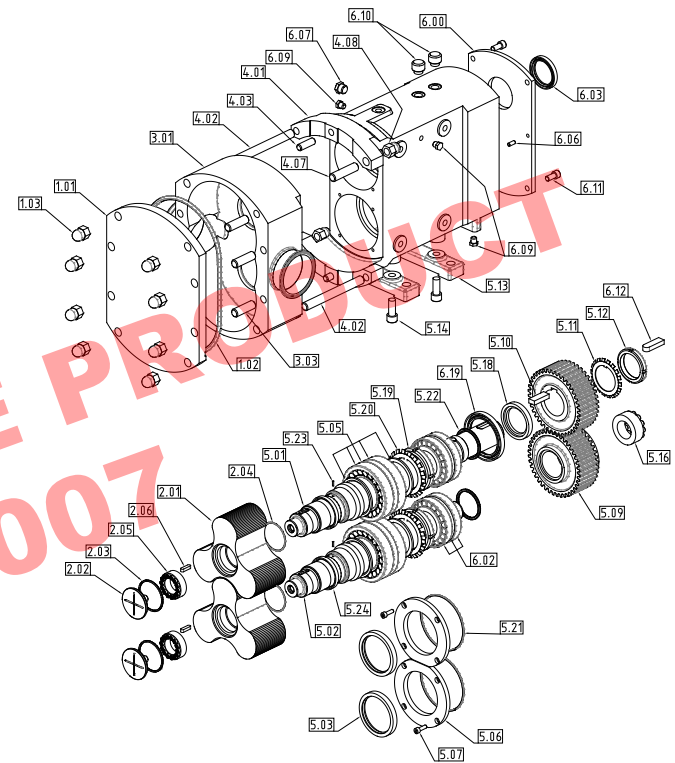
### 4.3.3 CP50 GEARBOX DISASSEMBLY

(After completing 4.3.1 and 4.3.2)

Before proceeding with disassembly of the gearbox remove product seals; refer to section 5.3 for Mechanical Seals and 6.3 for O-ring Seals.

The following procedure describes complete disassembly of the gearbox, refer to Figure 44.

- Remove guard (4.06) and shaft slingers (7.03) if fitted.
- Remove drive key (6.12).
- Remove oil drain plugs (6.09) and breather plugs (6.10), drain oil into suitable container and retain (inspection may later be required).



**Figure 44**  
CP50 Components

- Remove screws (6.11) and gearbox cover (6.00). The gearbox cover (6.00) is located on dowels (6.06) and sealed with suitable liquid sealant.
- Remove oil seal (6.03) from gearbox cover (6.00).
- Loosen by two full turns all screws in retainer (5.16) on the lay shaft (5.02). Once this is done the retainer may release its grip. If it does not become free identify and remove the three screws which differ in color (these may also have a washer under the head). Once these screws are removed tapped holes will be revealed. Insert three jackscrews (M10 x 40 setscrews), into the tapped holes and tighten until the retainer's grip is broken. Remove the retainer.
- Remove lock nut (5.12) and tab washer (5.11), then remove timing gears (5.09), gear key (5.10), spacer (5.18), O-ring (5.22) and lipseal (83).

- Support pump with shafts in the vertical position with rotor end up.
- Remove screws (5.07), and then remove bearing retainers' (5.06) and O-rings (5.21), then remove lipseals (5.03) from bearing retainers' (5.06).
- Remove shafts (5.01 and 5.02) from gearbox (4.01). Shafts (5.01 and 5.02) will be complete with pins (5.23), spacers (5.24), bearings (5.05), spacers (5.05), tab washers (5.20), lock nuts (5.19), bearings (6.02) and spacers (6.02).
- Remove bearings (6.02) complete with spacers (6.02) from shafts (5.01 and 5.02) keep them in matched sets and identify position.
- Remove lock nuts (5.19) and tab washers' (5.07).
- Remove bearings (5.05) complete with spacers (5.05) from shafts (5.01 and 5.02), keep them in matched sets and identify position.
- Remove shaft sleeve drive pins (5.23) from shafts (5.01 and 5.02), remove spacers (5.24), note fitting position.

#### 4.3.4 CP50 GEARBOX ASSEMBLY

The following procedure describes the assembly of the gearbox, refer to Figure 44.

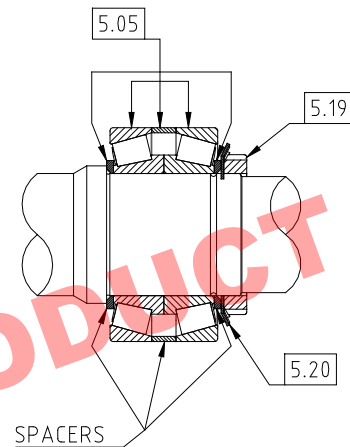
- Install bearings (5.05) complete with spacers (5.05) to shafts (5.01 and 5.02) ensuring correct positioning of all components as either removed in 4.3.3. Above or supplied as new replacement set, see Figure 45.
- Install spacers (5.24), product seal sleeves (28 or 66), rotor keys (78) and rotors (41) to shafts (5.01 and 5.02) and secure with rotor retainers (35) using tool (58).
- Install tab washers (5.07) and lock nuts (5.19) tightening to correct torque, refer to section 8.2. Secure tab washers.

**Note: Ensure that the cups of the rear most bearings (5.05) are in position on inner races before proceeding.**

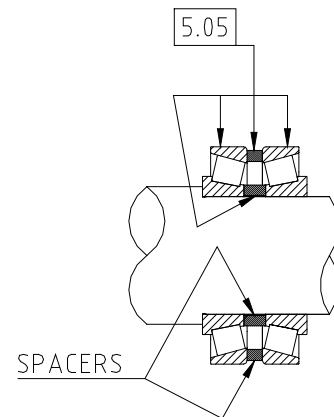
- Install bearings (6.02) complete with spacers (6.02) to shafts (5.01 and 5.02) ensuring correct positioning of all components as either removed in 4.3.3 above or as supplied as new replacement set, see Figure 46.
- Support gearbox (4.01) in a vertical position and install shafts (5.01 and 5.02) to gearbox (4.01).
- If not already installed install cups of front most bearings (5.05).
- Install lipseals (5.03) to bearing retainers' (5.09).
- Install retainers' (5.09) and O-rings (5.21) and secure with screws (5.07) tightening to correct torque, refer to section 8.2.
- Return pump to normal horizontal mounting position.
- Install lipseal (6.19) to gearbox (4.01). Install O-ring (5.22), spacer (5.18) and key (5.10) to drive shaft (5.01).
- Install timing gears (5.09) to shafts (5.01 and 5.02).
- Install tab washer (5.11) and lock nut (5.12) tightening to correct torque, refer to section 8.2. Secure tab washer (5.11).
- Rotate shafts (5.01 and 5.02) such that keyways for rotor keys are vertically upwards.
- Lubricate retainer (5.16) with oil and install to timing gear (5.09). Do not tighten.

**Note: Pins (5.23) should not be installed at this stage.**

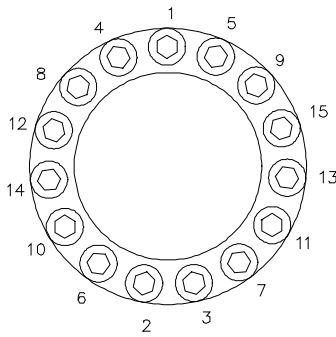
- Clamp gear (5.09) to shaft (5.02) using tool (supplied) and associated stud and nut, ensuring that two screws in retainer (5.16) are visible through holes in tool.
- Check rotor mesh clearance against Clearance Chart, refer to section 8.1. Adjustment of mesh clearance is made by rotating the shafts (5.01 and 5.02). Having achieved optimum mesh clearance, partially tighten visible screws in retainer (5.16), to clamp gear in place. Remove tool and associated studs and nuts. Fully tighten screws in retainer (5.16) to correct torque, refer to section 8.2, taking note of typical tightening sequence, see Figure 47.
- After tightening of retainer (5.16) check rotor mesh clearance; refer to section 8.1 (Clearance Chart).



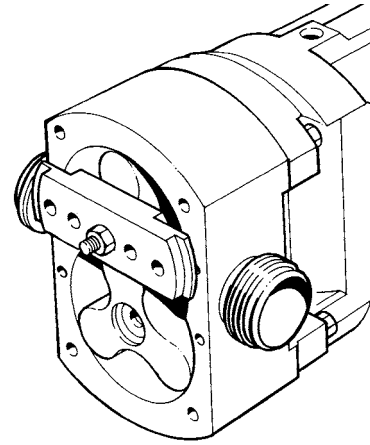
**Figure 45**  
**Front Bearing Assembly - CP50**



**Figure 46**  
**Rear Bearing Assembly - CP50**



**Figure 47**  
**Retainer Tightening Sequence**



**Figure 48**  
**Rotor Clamping Tool Fitment**

- Install oil seal (6.03) to gearbox cover (6.00).
- Apply liquid sealant (Loctite 573 or similar) to sealing area of gearbox cover (6.00) and install to gearbox (4.01), locating on dowels (6.06) and securing with screws (6.11), tightened to correct torque, refer to section 8.2.
- Install drive key (6.12).
- Install drain plugs (6.09) and breather plugs (6.10).
- Remove rotor retainers (2.02) using tool, rotors (2.01) and spacers (5.24)

### 4.3.5 CP50 CASING, ROTOR AND HEAD ASSEMBLY

Referring to Figure 33 and Figure 44.

- Install spacers' (5.24) and product seal sleeves (7.15) to shafts (5.01 and 5.02).

**Note: Pins (5.23) should not be installed at this stage.**

- Install casing (3.01) to gearbox (4.01) locating on dowels (4.03) and secure with dome nuts (4.08) tightened to correct torque, refer to section 8.2.
- Install rotors (2.01) to shafts (5.01 and 5.02).
- Clamp one rotor (2.01) to shaft (5.01 or 5.02) using tool and associated stud and nut see Figure 48.
- Using a depth micrometer or similar device, measure front clearance; refer to section 8.1, Clearance Chart, between the casing and clamped rotors front face and check that this corresponds to the appropriate clearance as indicated on the Clearance Chart. Note any discrepancy in front clearance.
- Remove tool and associated stud and nut (shown above).
- Repeat clamping and front clearance measurement for other rotor (again note any discrepancy in front clearance).
- Remove tool and associated stud and nut.
- Remove rotors (2.01), casing (3.01) and product seal sleeves (7.15).
- If any discrepancies were noted in front clearances, between rotors and front face of casing, then spacers (5.24) will require machining to shorten them to achieve the correct front clearance, refer to section 8.1.

**Note: If it is found that the measured front clearance is greater than that shown in the Clearance Chart, refer to section 8.1, then new spacers (5.24) will need to be obtained and machined to the correct lengths to achieve correct front clearance.**

- Be sure faces of spacers' (5.24) are parallel after machining.
- After any machining of spacers' (5.24), check front clearances for both rotors, refer to section 8.1, Clearance Chart.
- Install spacers (5.24) to shafts (5.01 and 5.02) ensuring they are correctly located.
- Install pins (5.23) to shafts (5.01 and 5.02) using a liquid retainer (Loctite 648 or similar).
- Install product seals; refer to section 5.3 and 6.3.
- Install casing (3.01) to gearbox (4.01) locating onto dowels (4.03) and securing with dome nuts (4.08) tightened to correct torque, refer to section 8.2.
- Install O-rings (2.05) and rotors (2.01) to shafts (5.01 and 5.02).
- Lubricate retainers' (53) with oil and install to shafts (5.01 and 5.02).
- Clamp one rotor (2.01) to shaft (5.01 or 5.02) using tool and associated stud and nut, see Figure 48, ensuring that two of the screws in retainer (2.05) are visible through holes in tool.
- Moderately tighten visible screws in retainer (2.05) in clamped rotor to lock rotor in position. Remove tool and associated stud and nut, tighten fully screws in retainer (2.05) to correct torque, refer to section 8.2, taking note of typical tightening sequence, see Figure 47.
- Repeat clamping and retainer (2.05) tightening procedure for other rotor.
- Remove tool and associated stud and nut.
- Install O-rings (2.03) and retainers (2.02) tightening to correct torque refer to section 8.2, using tool.
- Check all rotor clearances, front, rear, top/bottom, sides' and mesh, refer to section 8.1, Clearance Chart.
- Install head (1.01) with O-ring (1.02) and secure with nuts (1.03) tightened to correct torque, refer to section 8.2.



## 5.0 CLASSIC+ MECHANICAL SEAL REMOVAL & REPLACEMENT

### 5.1 GENERAL PROCEDURES FOR INSTALLING MECHANICAL SEALS

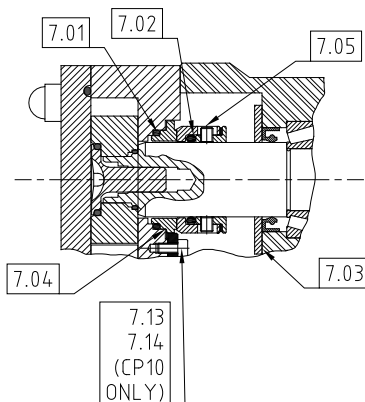
“Quick summary” of mechanical seal installation

- Mechanical seals are precision-engineered assemblies incorporating finely lapped seal faces and seats. They must be handled with care and will not give optimum performance unless installed carefully and according to instructions.
- When mechanical seals are to be reused, ensure 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 lipseals.
- Be sure 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.
- Be sure that seal faces are undamaged and the O-rings are not cut, swollen or cracked.
- All O-rings should be lightly lubricated with a suitable lubricant (silicon grease, soap etc.) before installation but ensure there is no excessive amount of lubricant especially around the seal face area.
- Ensure when installing seals with brittle faces and seats 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** - Do not run a mechanical seal dry.

## 5.2 CP10, CP20, CP30 AND CP40 MECHANICAL SEALS

### 5.2.1 CP10, CP20, CP30 AND CP40 SINGLE MECHANICAL SEAL REMOVAL



**Figure 49**  
Single Un-flushed Mechanical Seal

- Remove head (1.01), rotor retainers (2.02), O-rings (2.04) and casing (3.01), refer to section 4.1.2.1 (CP10, CP20 and CP30) or section 4.2.2.1 (CP40).
- Loosen but do not remove screws in rotary cartridge assembly (7.05) which secure rotary seal cartridges to shafts (5.01 and 5.02).
- Remove rotary seal cartridges (7.05) with O-ring (7.02) from shafts (5.01 and 5.02).
- Remove stationary seal seats (7.04) and O-rings (7.01) from casing (3.01).

### 5.2.2 CP10, CP20, CP30 AND CP40 SINGLE MECHANICAL SEAL REPLACEMENT

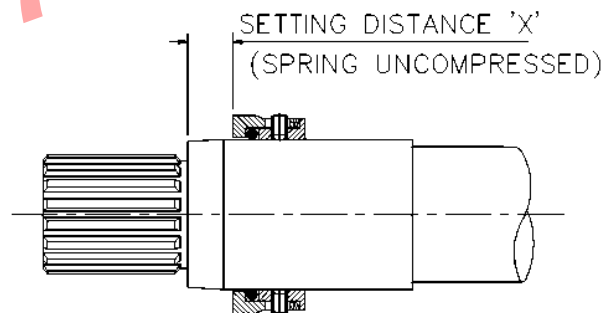
Refer to Figure 50 for CP10, CP20, CP30 and CP40

- Install O-rings (7.01) to stationary seal seat (7.04).
- Install stationary seal seats (7.04) to casing (3.01) ensuring correct location of O-rings (7.01).

**WARNING** Note: On CP10 models the stationary seal seat (7.04) has a location recess which fits over the anti-rotation washer (7.13).

**WARNING** Note: On CP20, CP30 and CP40 models the stationary seal seat (7.04) has a triangular shape, which must locate fully into the casing (3.01) bore.

- Install rotary seal cartridges (7.05) with O-ring (7.02) to shafts (5.01 and 5.02) positioning to correct setting distance, see Figure 50 and tighten screws (7.05) to correct torque, refer to section 8.2.



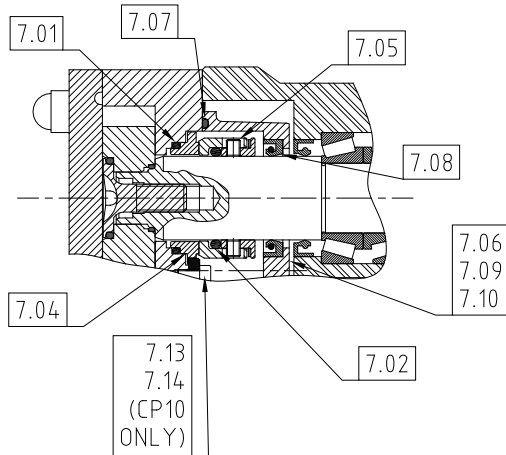
Pump Model	X (mm)	X (inches)
CP10	14.3	0.5630
CP20	10.8	0.4252
CP30	13.4	0.5276
CP40	17.5	0.6890

**Figure 50**  
Setting Distance for Seals

- Install casing (3.01), O-rings (2.04), rotors (2.01), O-rings (2.03), rotor retainers (2.02) and head (1.01), refer to sections 4.1.4 (CP10, CP20 and CP30) or 4.2.5 (CP40).

## 5.2.3 CP10, CP20, CP30 AND CP40 SINGLE FLUSHED MECHANICAL SEAL REMOVAL

Refer to Figure 51 for CP10, CP20, CP30 and CP40



**Figure 51**  
**Single Flushed Mechanical Seal**

- Remove head (1.01), rotor retainers' (2.02), O-rings (2.03), rotors (2.01), O-rings (2.04) and casing (3.01), refer to sections 4.1.2.1 and 4.1.2 (CP10, CP20 or CP30) or 4.2.2.1 (CP40).
- Loosen but do not remove screws in rotary seal cartridge assemblies (7.05), which secure rotary seal cartridges to shafts (5.01 and 5.02).

**Note: Access to screws in rotary seal cartridge (7.05) is through the flush pipe connections of housing (7.06).**

- Remove rotary seal cartridges (7.05) with O-ring (7.02) from shafts (5.01 and 5.02).
- Remove housing(s) (7.06) complete with lipseals (7.08) and O-Ring(s) (7.07) from shafts (5.01 and 5.02).
- Remove lipseals (7.08) and O-ring (s) (7.07) from housing(s) (7.06).
- Remove stationary seal seats (7.04) and O-rings (7.01) from casing (3.01).

## 5.2.4 CP10, CP20, CP30 AND CP40 SINGLE FLUSHED MECHANICAL SEAL REPLACEMENT

Refer to Figure 51 for CP10, CP20, CP30 and CP40

- Install O-rings (7.01) to stationary seal seats (7.04).
- Install stationary seal seats (7.04) to casing (3.01) ensuring correct location of O-rings (7.01).

**WARNING**

**Note: On CP10 models the stationary seal seat (7.04) has a location recess which fits over the anti-rotation washer (7.13).**

**WARNING**

**Note: On CP20, CP30 and CP40 models the stationary seal seat (7.04) has a triangular shape, which must locate fully into the casing (3.01) bore.**

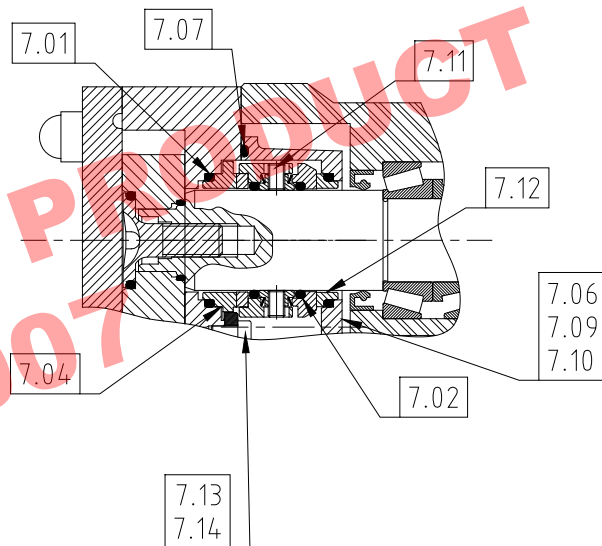
- Install lipseals (7.08) and O-rings (7.07) to housing(s) (7.06).
- Install housing(s) (7.06) to shafts (5.01 and 5.02).
- Install rotary seal cartridges (7.05) to shafts (5.01 and 5.02) positioning to correct setting distance, see Figure 50 and tightening screws in rotary seal cartridge assemblies (7.05) to correct torque, refer to section 8.2.

**Note: Access to screws in rotary cartridge seal assemblies (7.05) is through the flush pipe connections of housing (7.06).**

- Install casing (3.01), O-rings (2.04), rotors (2.01), O-rings (2.03), rotor retainers (2.02) and head (1.01), refer to sections 4.1.4 (CP10, CP20 and CP30) or 4.2.5 (CP40).
- Secure housing(s) (7.06) to casing (3.01) with screws (7.10) ensuring correct location onto dowels (7.09).

## 5.2.5 CP10 DOUBLE FLUSHED MECHANICAL SEAL REMOVAL

Refer to Figure 52.



**Figure 52**  
**Double Flushed Mechanical Seal**

- Remove head (1.01), rotor retainers' (2.02), O-rings (2.03), rotors (2.01), O-rings (2.04) and casing (3.01), refer to sections 4.1.1 and 4.1.2.
- Loosen but do not remove screws (7.11), which secure rotary seal cartridge assemblies (7.11) to shafts (5.01 and 5.02).

**Note: Access to screws (7.13) is through the flush pipe connections of housing (7.06)**

- Remove rotary seal cartridges (7.11) with O-rings (7.02) from shafts (5.01 and 5.02).
- Remove housing (7.06) complete with O-ring (7.07), stationary seal seats (7.12) and O-rings (7.01) from shafts (5.01 and 5.02).
- Remove stationary seal seats (7.12), O-rings (7.01) and O-ring (7.07) from housing (7.06).
- Remove stationary seal seats (7.04) and O-rings (7.01) from casing (3.01).

## 5.2.6 CP10 DOUBLE FLUSHED MECHANICAL SEAL REPLACEMENT

Refer to Figure 52

- Install O-rings (7.01) to stationary seal seats (7.04 and 7.12).
- Install stationary seal seats (7.04) to casing (3.01) ensuring correct location of O-rings (7.01).

**WARNING** Note: The stationary seal seat (7.04) has a location recess which fits over the anti-rotation washer (7.13).

- Install O-rings (7.01) to stationary seal seats (7.11).
- Install stationary seal seats (7.11) to housing (7.06) ensuring correct location of O-ring (7.01).
- Install housing (7.06) to shafts (5.01 and 5.02).
- Clean faces of outboard seal (7.11 and 7.12) use a soft tissue and suitable solvent based cleaner for best results.
- Install rotary seal cartridges (7.11) with O-ring (7.02) to shafts (5.01 and 5.02).

**Note:** For pumps installed with flange type casing (3.01) connections, it may be easier to set the position of the rotary seal cartridge (7.11) onto the shafts (5.01 and 5.02) using the setting distance, see figure 50, before installing the casing (3.01). Screws in rotary seal cartridge assemblies (7.11) must be tightened to the correct torque refer to section 8.2.

- Install casing (3.01), O-rings (2.04), rotors (2.01), O-rings (2.03), rotor retainers (2.02) and head (1.01) - refer to section 4.1.4.
- Secure housing (7.06) to casing (3.01) with screws (7.10) ensuring correct location onto dowels (7.09).
- Rotate pump shafts by two or three full revolutions.
- If not already tightened, tighten screws (7.11) to correct torque, refer to section 8.2.

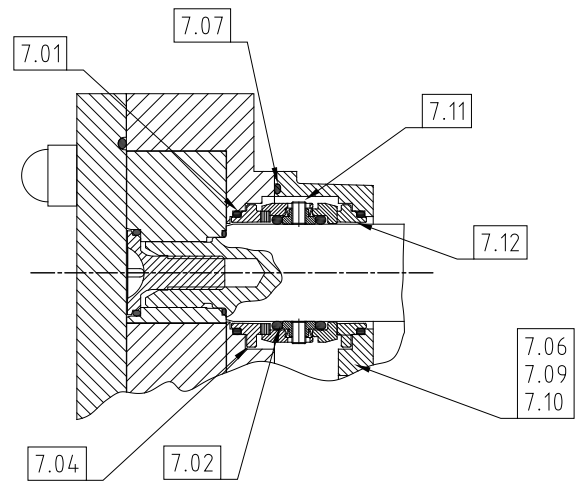
**Note:** Access to screws (7.11) is through the flush pipe connections of housing (7.06)

## 5.2.7 CP20, CP30 AND CP40 DOUBLE FLUSHED MECHANICAL SEAL REMOVAL

- Remove head (1.01), rotor retainers' (2.02), O-rings (2.03), rotors (2.01), O-rings (2.04) and casing (3.01), refer to sections 4.1.1 and 4.1.2 (CP20/CP30) or sections 4.2.1 and 4.2.2 (CP40).
- Loosen but do not remove screws in rotary seal cartridge assemblies (7.11), which secure rotary seal cartridge assemblies (7.11) to shafts (5.01 and 5.02).

**Note:** Access to screws (7.11) is through the flush connections of housings (7.06).

- Remove rotary seal cartridge assemblies (7.11) with O-ring (32) from shafts (5.01 and 5.02).
- Remove housings (7.06) from shafts (5.01 and 5.02) complete with stationary seal seats (7.12), O-rings (7.01) and O-rings (7.07).



**Figure 53**  
**Double Flushed Mechanical Seal**

- Remove stationary seal seats (7.04), O-rings (7.01) and O-rings (7.07) from housings (7.06).
- Remove stationary seal seats (7.04) and O-rings (7.01) from casing (3.01).

## 5.2.8 CP20, CP30 AND CP40 DOUBLE FLUSHED MECHANICAL SEAL REPLACEMENT

Refer to Figure 53.

- Install O-rings (7.01) to stationary seal seats (7.04).
- Install stationary seal seats (7.04) to casing (3.01) ensuring correct location of O-rings (7.01).

**WARNING** Note: The stationary seal seats (7.04) have a triangular shape which must locate fully into the casing (3.01) bore.

- Install O-rings (7.01) to stationary seal seats (7.12).
- Install stationary seal seats (7.12) to housings (7.06) ensuring both correct locations of O-ring (7.01) and stationary seal seats (7.04) in housings (7.06).

**WARNING** Note: The stationary seal seats (7.12) have a triangular shape which must locate fully into the housing (7.06) bore.

- Install housings (7.06) to shafts (5.01 and 5.02).
- Clean faces of outboard seal (7.11 and 7.12) use a soft tissue and a suitable solvent based cleaner for best results.
- Install rotary seal cartridge assemblies (7.11) to shafts (5.01 and 5.02).

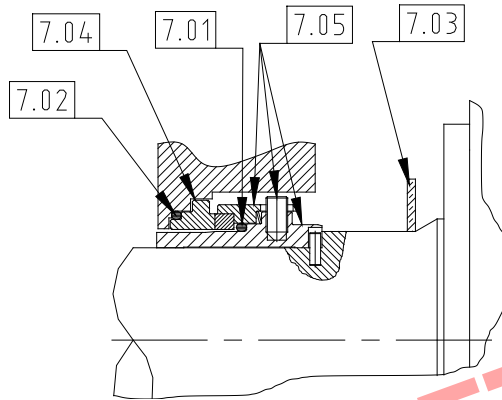
**Note:** For pumps installed with flange type casing (3.01) connections, it may be easier to set the position of the rotary seal cartridge (7.11) onto the shafts (5.01 and 5.02) using the setting distance, see Figure 50, before installing the casing (3.01). Screws in rotary seal cartridge assemblies (7.11) must be tightened to the correct torque refer to section 8.2.

- Install casing (3.01), O-rings (2.04), rotors (2.01), O-rings (2.03), rotor retainers (2.02) and head (1.01) refer to sections 4.1.4 (CP20/CP30) or 4.2.5 (CP40).
- Secure housings (7.06) to casing (3.01) with screws (7.10) ensuring correct location onto dowels (7.09).
- Rotate pump shafts by two or three full revolutions.
- If not already tightened, tighten screws in rotary seal cartridge assemblies (7.11) to correct torque, refer to section 8.2.

**Note:** Access to screws in rotary seal cartridge assemblies (7.11) is through the flush connections of housings (7.06).

## 5.3 CP50 MECHANICAL SEALS

### 5.3.1 CP50 SINGLE MECHANICAL SEAL REMOVAL



**Figure 54**  
Single Un-Flushed Mechanical Seal CP50

- Remove head (1.01), rotor caps (2.02), O-rings (2.03), retainers' (2.05), rotors (41), O-rings (2.04) and casing (3.01), refer to sections 4.3.1 and 4.3.2.
- Remove rotary seal cartridge assemblies (7.11) with O-ring (7.01) from shafts (5.01 and 5.02) by simply sliding off. Do not loosen screws in rotary seal cartridge assemblies (7.05).
- Remove stationary seal seats (7.04) and O-rings (7.02) from casing (3.01).

### 5.3.2 CP50 SINGLE MECHANICAL SEAL REPLACEMENT

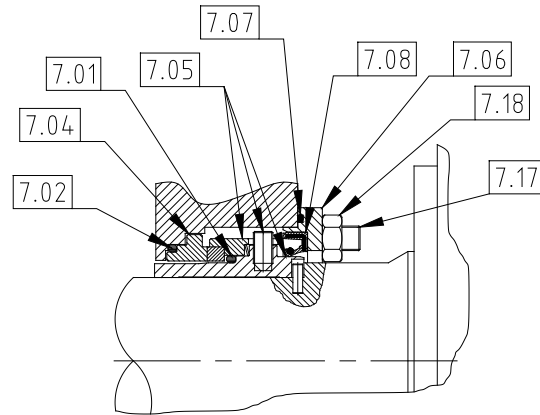
- Install O-rings (7.02) to stationary seal seats (7.04).
- Install stationary seal seats (7.04) to casing (3.01) ensuring correct location of O-rings (7.02).

**WARNING** Note: The stationary seal seat (7.04) has a triangular shape, which must locate fully into the casing (3.01), bore.

- Install rotary seal cartridge assemblies (7.11) with O-ring (7.01) to shafts (5.01 and 5.02) ensuring engagement of drive slots with pins (5.23) in shafts (5.01 and 5.02).
- Install casing (3.01), O-rings (2.04), rotors (2.01), retainers (2.05), O-rings (2.03), rotor caps (2.02) and head (1.01) - refer to section 4.3.5.

### 5.3.3 CP50 SINGLE FLUSHED MECHANICAL SEAL REMOVAL

Refer to Figure 55.



**Figure 55**  
Single Flushed Mechanical Seal CP50

- Remove head (1.01), rotor caps (2.02), O-rings (2.03), retainers (2.05), rotors (2.01), O-rings (2.04) and casing (3.01) refer to sections 4.3.1 and 4.3.2.
- Remove rotary seal cartridge assemblies (7.05) with O-ring (7.01) from shafts (5.01 and 5.02) by simply sliding off. Do not loosen screws in rotary seal cartridge assemblies (7.05).
- Remove housings (7.06) complete with lipseals (7.08) and O-rings (7.07) from shafts (5.01 and 5.02).
- Remove lipseals (7.08) and O-rings (7.07) from housings (7.06).
- Remove stationary seal seats (7.04) and O-rings (7.02) from casing (3.01).

### 5.3.4 CP50 SINGLE FLUSHED MECHANICAL SEAL REPLACEMENT

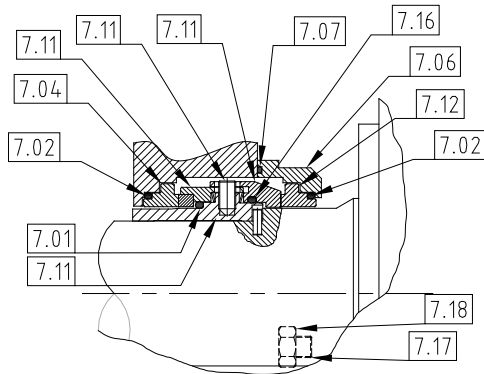
Refer to Figure 55

- Install O-rings (7.02) to stationary seal seats (7.04).
- Install stationary seal seats (7.04) to casing (3.01) ensuring correct location of O-rings (7.02).

**WARNING** Note: The stationary seal seat (7.04) has a triangular shape, which must locate fully into the casing (3.01), bore.

- Install lipseals (7.08) and O-rings (7.07) to housings (7.06).
- Install housings (7.06) to shafts (5.01 and 5.02).
- Install rotary seal cartridge assemblies (7.05) with O-ring (7.01) to shafts (5.01 and 5.02) ensuring engagement of drive slots with pins (5.23) in shafts (5.01 and 5.02).
- Install casing (3.01), O-rings (2.04), rotors (2.01), retainers (2.05), O-rings (2.03), rotor caps (2.02) and head (1.01) - refer to section 4.3.5.
- Secure housings (7.06) to casing (3.01) with nuts (7.18).

### 5.3.5 CP50 DOUBLE FLUSHED MECHANICAL SEAL REMOVAL



**Figure 56**  
Double flushed mechanical seal CP50

- Remove head (1.01), rotor caps (2.02), O-rings (2.03), retainers (2.05), rotors (2.01), Orings (2.04) and casing (3.01), refer to sections 4.3.1 and 4.3.2.
- Remove rotary seal cartridge assemblies (7.11) with O-rings (7.01) and (7.16) from shafts (5.01 and 5.02) by simply sliding off. Do not loosen screws in rotary seal cartridge assemblies (7.11).
- Remove housings (7.06) from shafts (5.01 and 5.02) complete with stationary seal seats (7.04), O-rings (7.02) and O-rings (7.07).
- Remove stationary seal seats (7.04), and O-rings (7.07) from housings (7.06).
- Remove stationary seal seats (7.04) and O-rings (7.02) from casing (3.01).

### 5.3.6 CP50 DOUBLE FLUSHED MECHANICAL SEAL REPLACEMENT

Refer to Figure 56.

- Install O-rings (7.02) to stationary seal seats (7.04).
- Install stationary seal seats (7.04) to casing (3.01) ensuring correct location of O-rings (7.02).

**WARNING** Note: The stationary seal seat (7.04) has a triangular shape, which must locate fully into the casing (3.01), bore.

- Install O-rings (7.02) to stationary seal seat (7.04).
- Install stationary seal seats (7.04) to housings (7.06) ensuring correct locations of O-rings (7.02) and stationary seal seats (7.04) in housings (7.06).

**WARNING** Note: The stationary seal seat (7.04) has a triangular shape, which must locate fully into the housing (7.06), bore.

- Install housings (7.06) to shafts (5.01 and 5.02).
- Clean faces of outboard seal (7.11 and 7.04) use a soft tissue and a suitable solvent based cleaner for best results.
- Install rotary seal cartridge assemblies (7.11) with O-ring (7.01) and (7.16) to shafts (5.01 and 5.02) ensuring engagement of drive slots with pins (5.23) in shafts (5.01 and 5.02).

- Install casing (3.01), O-rings (2.04), rotors (2.01), retainers (2.05), O-rings (2.03), rotor caps (2.02) and head (1.01), refer to section 4.3.5.
- Secure housings (7.06) to casing (3.01) with nuts (7.18).

## 6.0 CLASSIC+ SINGLE O-RING SEALS

### 6.1 GENERAL PROCEDURES FOR FITTING SINGLE O-RING SEALS

"Quick Summary" of O-Ring seal installation.

- O-ring seals are a simple but effective means of shaft sealing. They will provide optimum performance only if installed carefully in accordance to the following instructions below and sections 6.2 and 6.3.
- Remove any sharp corners and burrs that could damage O-rings.
- Always inspect for wear, the diameter on the rotor where the O-ring seal is located.
- Be sure that all seal component fitting bores, housings, followers, sleeves etc. are thoroughly cleaned before installation.
- All O-rings should be lightly lubricated with an appropriate lubricant (suitable for application) before installation.

**WARNING** Note: Do not run an O-ring seal dry.

### 6.2 O-RING SEALS FOR CP10, CP20, CP30 AND CP40 PUMPS

#### 6.2.1 CP10, CP20, CP30 AND CP40 O-RING SEAL ASSEMBLY AND REMOVAL

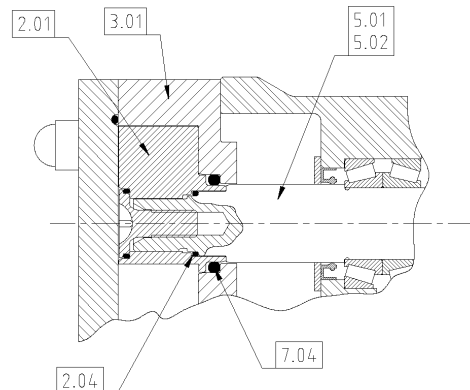


- Before assembly or disassembly of the seals, ensure pump is fully shutdown, refer to section 3.5.

- Install O-ring (7.04) into the casing (3.01).
- Install O-ring (2.04) onto shaft (5.01 and 5.02).

**Note:** During installing of the rotors to shafts care must be taken not to damage or unseat the O-ring seal when inserting the rotor (2.01) into O-ring (7.04).

- To disassemble reverse the above procedure.



**Figure 57**  
O-Ring Seal for a CP10, CP20, CP30 and CP40

## 6.3 O-RING SEAL FOR CP50 PUMP

### 6.3.1 CP50 O-RING SEAL ASSEMBLY AND REMOVAL

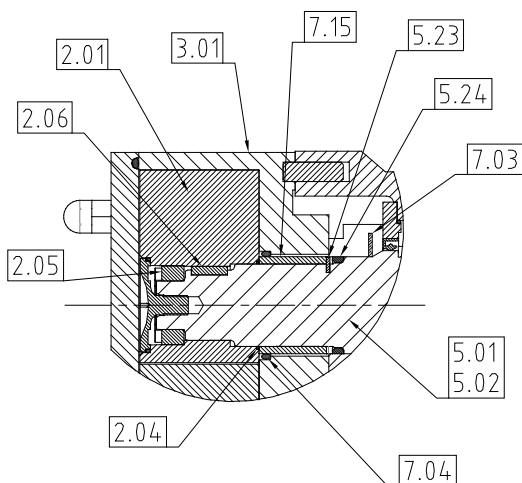


Figure 58  
CP50 O-ring Seal



- Before assembly or disassembly of the seals, ensure pump is fully shutdown, refer to section 3.5.

- Install O-ring (7.04) into the casing (3.01).
- Install rotary seal sleeves (7.15) onto shafts (5.01 and 5.02), ensuring engagement of slots in rotary seal sleeves (7.15) and drives pins (5.230)
- Install O-ring (2.04) onto shaft (5.01 and 5.02).

**Note:** During installing of the rotors to shafts care must be taken not to damage or unseat the O-ring seal when inserting the rotor (2.01) into O-ring (7.04).

- To disassemble reverse the above procedure.

## 7.0 FLUSHED PRODUCT SEALS AUXILIARY SERVICES

### i) Terminology.

#### a) "Quench"

- To provide a liquid barrier that is not induced to flow through the seal area by any external means.

#### b) "Flush"

- To provide a liquid barrier that is induced to flow through the seal area by an external means.

### ii) Quench or Flush Media

#### WARNING

The media used for quenching or flushing a seal area must be fully compatible with the pumped media, and the relevant materials of construction of the pump.



Special consideration must be given to the temperature limitations of the media to ensure that no hazards are created, e.g. risk of fire or explosion.

## 7.1 SINGLE MECHANICAL SEAL (FOR LOW-PRESSURE QUENCH OR FLUSH)

See Figure 17 (CP10), Figure 27 (CP20, CP30, CP40) and Figure 50 (CP50).

Refer to section 4.3.3.

This seal arrangement requires a supply of media to the outboard side of the mechanical seal to quench or flush the seal area. The nature of the pumped media and the specific duty conditions will determine whether a quench or a flush is required.

A quench provides a static head. The quench media vessel should be mounted a minimum of 0.5m (1.5 Feet) above the pump, preferably directly above the seal area. The interconnecting pipe work should be as straight as possible, avoiding horizontal runs, and with the minimum number of bends and restrictions.

For a suitable flush, the media must be supplied at a flow rate of 4.5 Liters per minute per shaft seal.

#### WARNING

**Note:** The limiting flush or quench pressure in any application is 0.7 Bar (10 psig).

## 7.2 DOUBLE MECHANICAL SEAL (FOR HIGH PRESSURE FLUSH)

See Figure 18 (CP10) and Figure 28 (CP20, CP30, CP40) and Figure 51 (CP50)

Refer to section 4.3.4.

This seal arrangement requires a supply of media to be circulated between the inboard and outboard mechanical seals.

The flush media must be supplied at a flow rate of 4.5 Liters per minute per shaft seal assembly.

The flush pressure must be a minimum of 1 Bar (15 psi) greater than the maximum discharge pressure created by, or the maximum suction pressure applied to, the pump, whichever is the greater.

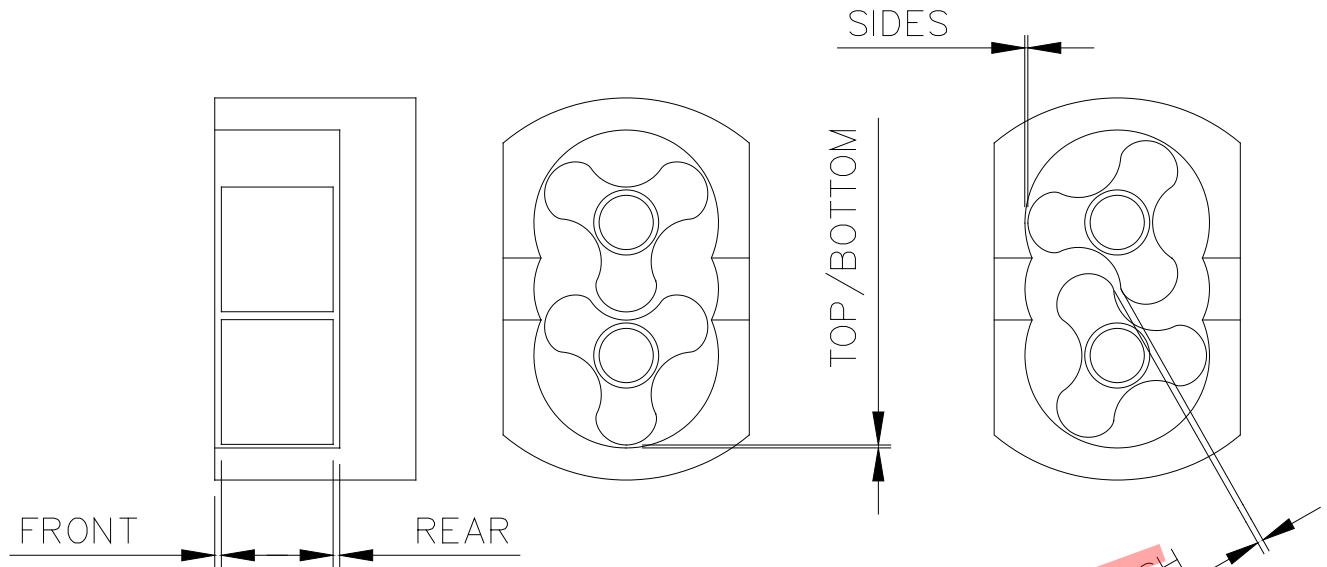
#### WARNING

**Note:** The limiting flush pressure in any application is 13 Bar (188 psig).

**Note:** The liquid supply connections to flushed seals are made using the threaded ports on the sides of the seal housings (two per seal, except CP10 & CP20 models, which have common seal housings encompassing both shaft seals). For models CP30 to CP50 inclusive, one port on each housing should be used for flush 'in' and the other for flush 'out'. The pipe work should be arranged to provide an independent flush to each seal.

# 8.0 SPECIFICATIONS

## 8.1 CLEARANCE CHART



Millimeters x 0.01											
Pump Model	Rotor Class	Max Temp °C	Front		Rear		Top/Bottom		Side		Nominal Mesh
			Min	Max	Min	Max	Min	Max	Min	Max	
CP10S	A	70	7	9	3	10	5	13	13	19	18
	B	100	9	11	5	12	7	14	15	21	18
	C	150	11	13	7	14	9	16	17	23	18
CP10M	A	70	10	12	6	13	8	15	17	22	18
	B	100	12	14	9	16	10	17	18	24	18
	C	150	15	17	11	18	13	20	21	27	18
CP10L	A	70	13	15	9	16	11	18	19	25	18
	B	100	16	18	13	20	13	20	21	27	20
	C	150	20	22	17	24	16	24	24	30	20
CP20S	A	70	14	16	10	17	15	25	23	31	20
	B	100	16	18	13	20	18	28	25	33	25
	C	150	18	20	14	21	20	30	28	36	25
	D	180	19	21	15	22	23	33	31	39	25
CP20L	A	70	15	17	16	23	23	33	30	38	25
	B	100	19	21	19	26	29	39	37	45	28
	C	150	21	23	22	29	32	42	39	47	28
	D	180	23	25	25	32	36	46	43	51	28
CP30S	A	70	18	20	17	24	22	35	30	40	28
	B	100	22	24	21	28	27	40	35	46	35
	C	150	24	26	24	31	33	46	40	51	35
	D	180	27	29	26	33	37	50	45	55	35
CP30L	A	70	24	26	25	32	44	58	51	63	35
	B	100	29	31	30	37	47	61	54	66	38
	C	150	33	35	33	40	53	67	60	72	38
CP40S	A	70	32	37	28	39	30	45	46	57	38
	B	100	35	40	32	43	35	51	51	63	40
	C	150	40	45	38	49	42	57	57	69	40
CP40L	A	70	40	45	40	53	45	55	61	68	40
	B	100	49	54	46	59	50	65	66	78	45
	C	150	55	60	53	66	59	74	75	86	45
CP50S	B	100	43	46	41	54	41	64	66	86	45
	D	180	58	61	56	69	41	64	66	86	55
CP50L	B	100	50	53	48	62	51	74	76	86	55
	D	180	65	68	63	77	51	74	76	86	55

Inches x 0.001											
Pump Model	Rotor Class	Max Temp °F	Front		Rear		Top/Bottom		Side		Nominal Mesh
			Min	Max	Min	Max	Min	Max	Min	Max	
CP10S	A	150	2.76	3.54	1.18	3.94	1.97	5.12	5.12	7.48	7.09
	B	210	3.54	4.33	1.97	4.72	2.76	5.51	5.91	8.27	7.09
	C	300	4.33	5.12	2.76	5.51	3.54	6.30	6.69	9.06	7.09
CP10M	A	150	3.94	4.72	2.36	5.12	3.15	5.91	6.69	8.66	7.09
	B	210	4.72	5.51	3.54	6.30	3.94	6.69	7.09	9.45	7.09
	C	300	5.91	6.69	4.33	7.09	5.12	7.87	8.27	10.63	7.09
CP10L	A	150	5.12	5.91	3.54	6.30	4.33	7.09	7.48	9.84	7.09
	B	210	6.30	7.09	5.12	7.87	5.12	7.87	8.27	10.63	7.87
	C	300	7.87	8.66	6.69	9.45	6.30	9.45	9.45	11.81	7.87
CP20S	A	150	5.51	6.30	3.94	6.69	5.91	9.84	9.06	12.20	7.87
	B	210	6.30	7.09	5.12	7.87	7.09	11.02	9.84	12.99	9.84
	C	300	7.09	7.87	5.51	8.27	7.87	11.81	11.02	14.17	9.84
	D	356	7.48	8.27	5.91	8.66	9.06	12.99	12.20	15.35	9.84
CP20L	A	150	5.91	6.69	6.30	9.06	9.06	12.99	11.81	14.96	9.84
	B	210	7.48	8.27	7.48	10.24	11.42	15.35	14.57	17.72	11.02
	C	300	8.27	9.06	8.66	11.42	12.60	16.54	15.35	18.50	11.02
	D	356	9.06	9.84	9.84	12.60	14.17	18.11	16.93	20.08	11.02
CP30S	A	150	7.09	7.87	6.69	9.45	8.66	13.78	11.81	15.75	11.02
	B	210	8.66	9.45	8.27	11.02	10.63	15.75	13.78	18.11	13.78
	C	300	9.45	10.24	9.45	12.20	12.99	18.11	15.75	20.08	13.78
	D	356	10.63	11.42	10.24	12.99	14.57	19.69	17.72	21.65	13.78
CP30L	A	150	9.45	10.24	9.84	12.60	17.32	22.83	20.08	24.80	13.78
	B	210	11.42	12.20	11.81	14.57	18.50	24.02	21.26	25.98	14.96
	C	300	12.99	13.78	12.99	15.75	20.87	26.38	23.62	28.35	14.96
CP40S	A	150	12.60	14.57	11.02	15.35	11.81	17.72	18.11	22.44	14.96
	B	210	13.78	15.75	12.60	16.93	13.78	20.08	20.08	24.80	15.75
	C	300	15.75	17.72	14.96	19.29	16.54	22.44	22.44	27.17	15.75
CP40L	A	150	15.75	17.72	15.75	20.87	17.72	21.65	24.02	26.77	15.75
	B	210	19.29	21.26	18.11	23.23	19.69	25.98	25.98	30.71	17.72
	C	300	21.65	23.62	20.87	25.98	23.23	29.13	29.53	33.86	17.72
CP50S	B	210	16.93	18.11	16.14	21.26	16.14	25.20	25.98	33.86	17.72
	D	350	22.83	24.02	22.05	27.17	16.14	25.20	25.98	33.86	21.65
CP50L	B	210	19.69	20.87	18.90	24.41	20.08	29.13	29.92	33.86	21.65
	D	350	25.59	26.77	24.80	30.31	20.08	29.13	29.92	33.86	21.65

## 8.2 FASTENERS & TORQUE SETTINGS

Item	Description	Position	Pump Model						
			CP10	CP20	CP30	CP40	CP50		
1.03	Dome Nut	Head / Casing	Quantity / Pump	8	4	4	10	10	
			Size - mm	M8	M12	M12	M16	M20	
			Torque Nm	28	101	101	115	150	
			Torque lbf ft	20.650	74.488	74.488	84.813	110.625	
2.02	Rotor Retainer	Rotor / Shaft	Quantity / Pump	2	2	2	2	2	
			Size - mm	D13-2051-01	D23-2051-01	D33-2051-01	D43-2051-01	D53-2051-01	
			Torque Nm	27	30	40	60	50	
			Torque lbf ft	19.913	22.125	29.500	44.250	36.875	
2.05	Ring Feder Retainer	Rotor / Shaft	Quantity / Pump					2	
			Size - mm	N/A	N/A	N/A	N/A	-	
			Torque Nm					15	
			Torque lbf ft						
3.03	Stud	Head / Casing	Quantity / Pump	4	N/A	N/A	6	6	
			Size - mm	M8 x 31			M16 x 55	M16 x 70	
			Torque Nm	30			130	160	
			Torque lbf ft	22.125			95.875	118	
4.02	Stud	Bearing Housing / Head	Quantity / Pump	4	4	4	N/A	N/A	
			Size - mm	M8	M12	M12			
			Torque Nm	30	107	107			
			Torque lbf ft	22.125	78.913	78.913			
4.04	Socket Cap Head Screw	Casing / Bearing Housing	Quantity / Pump	N/A	2	N/A	N/A	N/A	
			Size - mm		M6				
			Torque Nm		16				
			Torque lbf ft		11.8				
5.01	Drive Shaft	Bearing Housing / Gearbox Housing	Rolling Torque Nm	0.4 - 0.6	1.2 - 1.5	4 - 5	5 - 6	N/A	
			Rolling Torque lbf ft	0.295 - 0.442	0.885 - 1.106	2.950 - 3.687	3.687 - 4.425		
5.02	Driven Shaft	Bearing Housing / Gearbox Housing	Rolling Torque Nm	0.4 - 0.6	1.2 - 1.5	4 - 5	5 - 6	N/A	
			Rolling Torque lbf ft	0.295 - 0.442	0.885 - 1.106	2.950 - 3.687	3.687 - 4.425		
5.07	Socket Cap Head Screw	Bearing Retainer	Quantity / Pump	8	N/A	N/A	8	8	
			Size - mm	M6 x 16			M8 x 20	M8 x 25	
			Torque Nm	16			29	29	
			Torque lbf ft	11.800			21.388	21.388	
5.07	Hex Head Screw	Bearing Retainer	Quantity / Pump	N/A	8	N/A	N/A	N/A	
			Size - mm		M5 x 16				
			Torque Nm		9.5				
			Torque lbf ft		7.006				
5.12	Locknut	Timing Gear / Shaft	Quantity / Pump	2	2	2	1	1	
			Size - mm	M25	M30	D33-0141-04	M55	M65	
			Torque Nm	25	35	55	50	50	
			Torque lbf ft		25.813	40.563			
5.12	Grub Screw	Timing Gear / Locknut	Quantity / Pump	N/A	N/A	6	N/A	N/A	
			Size - mm			M8 x 8			
			Torque Nm			20			
			Torque lbf ft			14.750			
5.14	Socket Cap Head Screw	Feet	Quantity / Pump	2	4	4	4	4	
			Size - mm	M8 x 16	M8 x 16	M10 x 25	M12 x 30	M16 x 40	
			Torque Nm	39	39	45	80	180	
			Torque lbf ft		28.763	33.188			
5.16	Ring Feder Retainer	Timing Gear / Shaft	Quantity / Pump	N/A	N/A	N/A	1	1	
			Size - mm						
			Torque Nm				34	34	
			Torque lbf ft						
5.19	Locknut	Shaft / Bearing	Quantity / Pump	N/A	N/A	N/A	2	2	
			Size - mm				M60	M80	
			Torque Nm				50	60	
			Torque lbf ft				36.875	44.250	
6.11	Socket Cap Head Screw	Gearbox Halves	Quantity / Pump	4	4	6	N/A	N/A	
			Size - mm	M8 x 20	M10 x 25	M12 x 25			
			Torque Nm	39	57	100			
			Torque lbf ft		42.038	73.750			
6.11	Socket Cap Head Screw	Rotor Cover / Gearbox	Quantity / Pump	N/A	N/A	N/A	4	4	
			Size - mm					M10 x 30	M12 x 25
			Torque Nm					60	70
			Torque lbf ft						
6.15	Hammer Drive Screw	Nameplate	Quantity / Pump	4	4	4	4	4	
			Size - mm						
			Torque Nm						
			Torque lbf ft						
7.11	Grub Screw	Rotary Seal Cartridge	Quantity / Pump	6 or 8	6 or 8	6 or 8	6	N/A	
			Size - mm	M5	M5	M6	M8		
			Torque Nm	1.5	1.5	4	9.5		
			Torque lbf ft		1.106	2.950			



### 8.3 LUBRICANTS

Gearbox oil recommended for use with Classic+ is an 'EP (Extreme Pressure) grade gear lube' for the following temperature ranges.

- EP150 -2 – 0°C (0 – 32°F)
- EP220 0 – 30°C (32 - 85°F)
- EP320 30°C (85°F) and higher

Approximate lubricant capacities for the Classic+:

Pump Model	Mounting Attitude with Suction and Discharge ports in:			
	Horizontal Plane		Vertical Plane	
	Liters	US Pints	Liters	US Pints
CP10	0.25	0.44	To be advised - Fill to Sight Glass level (see below)	
CP20	0.50	0.88	To be advised - Fill to Sight Glass level (see below)	
CP30	1.00	1.76	To be advised - Fill to Sight Glass level (see below)	
CP40* (Top Cavity)	0.75	1.32	To be advised - Fill to Sight Glass level (see below)	
CP40* (Bottom Cavity)	1.75	3.08	To be advised - Fill to Sight Glass level (see below)	
CP50* (Top Cavity)	0.60	1.05	To be advised - Fill to Sight Glass level (see below)	
CP50* (Bottom Cavity)	0.80	1.41	To be advised - Fill to Sight Glass level (see below)	

\* **Note:** The CP40 and CP50 have two gearbox cavities that should be subject to the same maintenance program.

Always add oil to the level of the sight glass. The sight glass must be located in the uppermost position on the side of the gearbox.

### 8.4 TROUBLESHOOTING

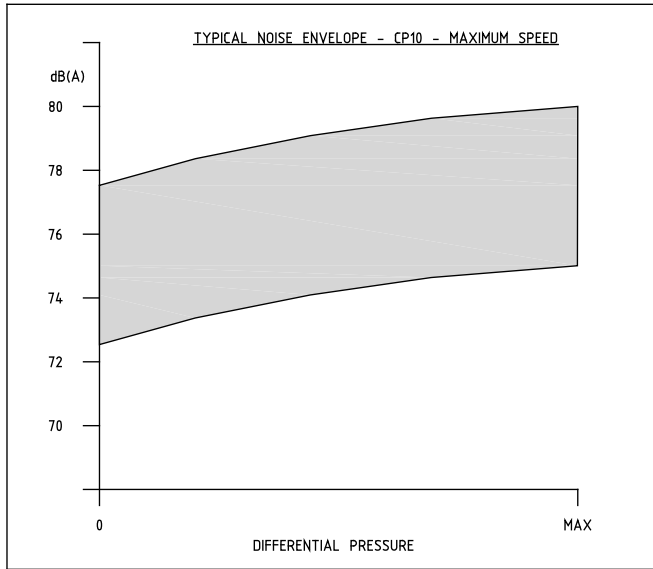
Causes	Action																
	Reverse Motor	Expel Gas From Suction Line / Pump Chamber & Prime	Increase Line Diameter & Static Suction Head. Simplify Suction Line & Reduce Length. Reduce Pump Speed & Product Temperature	Remake Piping Joints	Expel Gas From Suction Line / Pump Chamber	Raise Product Level to Increase Static Suction Head	Decrease Pump Speed / Increase Product Temperature	Increase Pump Speed / Decrease Product Temperature	Cool Product / Pumping Chamber	Heat Product / Pumping Chamber	Clean the System / Fit Strainer on Suction Side of Pump	Check for Blockages / Simplify Discharge Line	Check Pipe Alignment / Support Piping	Decrease Pump Speed	Increase Pump Speed	Increase Seal Flush to Required Pressure / Flow	Replace Worn Components
Pump Stalls on Startup																	
Seizure																	
Noise / Vibration																	
Excessive Seal Wear																	
Excessive Rotor Wear																	
Motor Overheats																	
Pump Overheats																	
Under Capacity																	
Irregular Flow																	
No Flow																	

### 8.5 MATERIAL SPECIFICATIONS

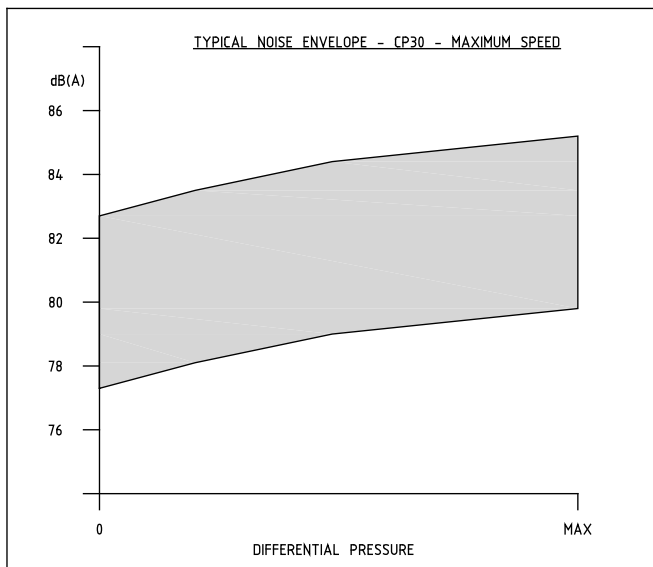
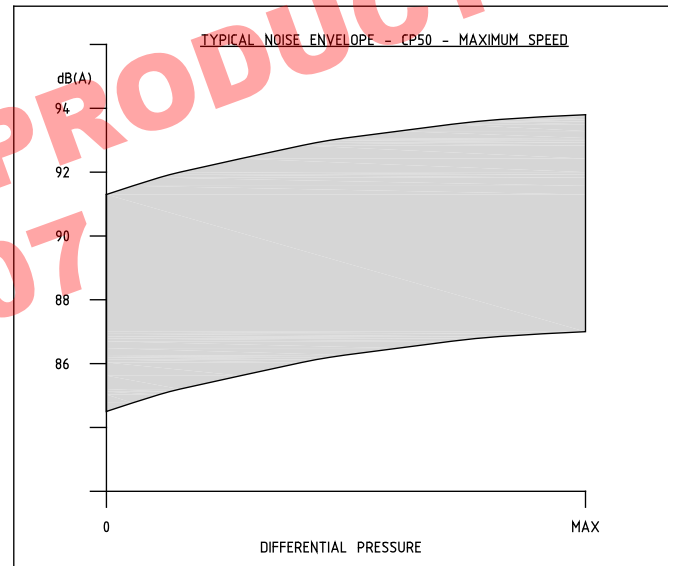
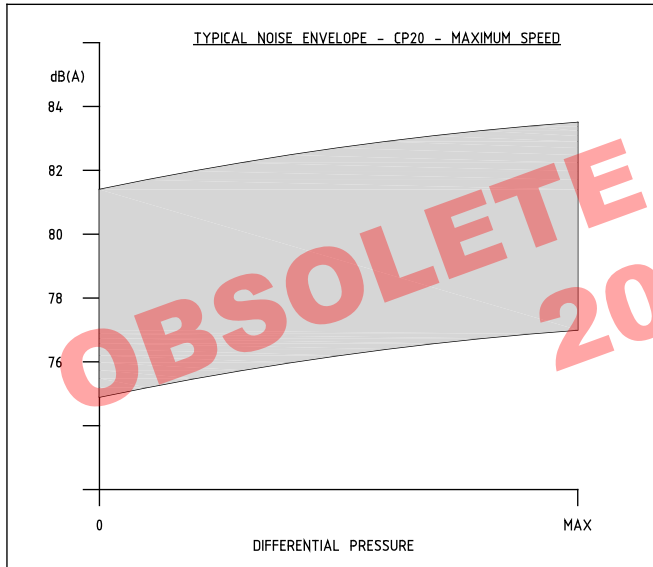
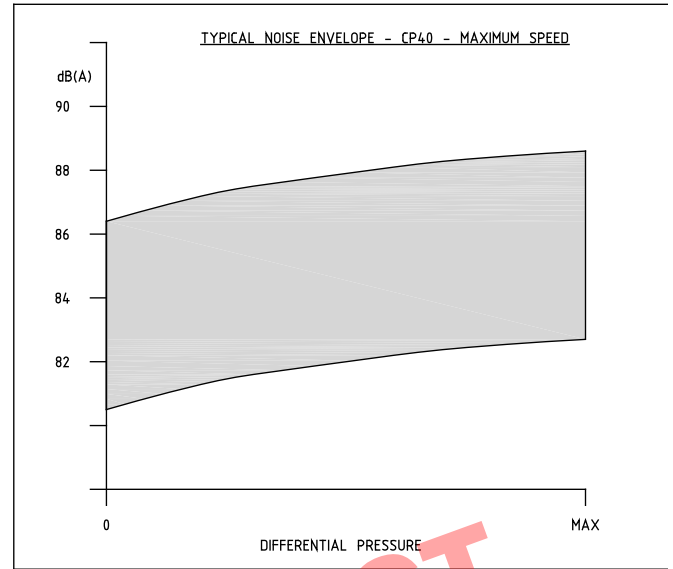
Pump Model	Casing	Front Cover	Rotors	Rotor Retainers	Shafts	Shaft Sleeves	Gearbox	Bearing Housing	Gearbox Cover
CP10	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	N/A	Cast Iron	Cast Iron	N/A
CP20	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	N/A	Cast Iron	Cast Iron	N/A
CP30	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	N/A	Cast Iron	Cast Iron	N/A
CP40	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	N/A	Cast Iron	N/A	Mild Steel
CP50	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	Cast Iron	N/A	Mild Steel



## 8.7 TYPICAL NOISE EMISSION DATA - CP10, CP20 AND CP30 PUMPS



## 8.8 TYPICAL NOISE EMISSION DATA - CP40 AND CP50 PUMPS



OBSOLETE PRODUCT  
2007



# TECHNICAL SERVICE MANUAL

CLASSIC+ SERIES ROTARY LOBE PUMPS  
MODELS CP10, CP20, CP30, CP40 & CP50

SECTION	TSM 285
PAGE	36 OF 36
ISSUE	A



## WARRANTY

Viking warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from Viking. If, during said warranty period, any products sold by Viking prove to be defective in workmanship or material under normal use and service, and if such products are returned to Viking's factory at Cedar Falls, Iowa, transportation charges prepaid, and if the products are found by Viking to be defective in workmanship or material, they will be replaced or repaired free of charge, FOB. Cedar Falls, Iowa.

Viking assumes no liability for consequential damages of any kind and the purchaser by acceptance of delivery assumes all liability for the consequences of the use or misuse of Viking products by the purchaser, his employees or others. Viking will assume no field expense for service or parts unless authorized by it in advance.

Equipment and accessories purchased by Viking from outside sources which are incorporated into any Viking product are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any.

THIS IS VIKING'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No officer or employee of IDEX Corporation or Viking Pump, Inc. is authorized to alter this warranty.

OBSOLETE 2007