





INSTRUCTION MANUAL

ROTARY LOBE PUMPS GHP 1000, 2000, 3000





X = HIGH PRESSURE DIFF. SHAFT

1000	110	PSI
1000%	150	PSI

IM 70711-US1 S 9609

G&H RESERVES THE RIGHT TO MINOR CHANGES IN DESIGN AND FUNCTION Thank you for purchasing a G&H product.

This manual has been provided to instruct you how to operate and service this product correctly and safely. Be sure to follow all directions and instructions; failure to do so could result in personal injury or equipment damage.

This manual should be considered part of this product and should remain with it at all times for reference. (If you sell it, please be sure to include this manual with it).

Warranty is provided as part of G&H Products Corp.'s commitment to our customers who operate and maintain their equipment as this manual dictates. Failure to do so may result in loss of warranty.

Where defects appear on the product during the warranty period, G&H Products Corp. will back the product and correct the problem. Should the equipment be modified or not kept in the manner prescribed within this manual, the warranty will become null and void.

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### 1.0 General

#### 1.1 Pump Limits of Application or Use

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

Pressures of up to 150 PSI, speeds to 1000rpm and temperatures to 300°F can be obtained on this range of pumps depending on the pump model/size. These conditions cannot always be obtained simultaneously. The model type/size will be shown on the nameplate positioned on the pump.

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

For specific guidelines contact your supplier quoting :- pump model/size, serial number and system details (e.g. product, pressure, flow rate).

**Important :** Where the application requires, the pump should be side mounted to ensure self draining e.g. food media. This must be requested at the time of order, as the pump build specification will change.

#### 1.2 Pump Duty Conditions

The pump should only be used for the duty for which it has been specified. The operating pressure, speed and temperature limits have been selected at the time of order and MUST NOT be exceeded for the pump. These details are stated on the original documentation and if not available may be obtained from your supplier quoting :- pump model and serial number.

#### 1.3 Noise Levels

Depending upon the pumping system and duty condition the pump noise levels may vary. The sound pressure level measurement stated is given for typical pumps/pump units at maximum pressures/speeds. The results being taken on water at ambient temperature:-

Recorded sound pressure level :- 85 dB(A): (20µPa)

**Note :-** Readings taken in accordance with ISO3746.

#### 1.4 Utility Requirements

#### **Electrical Supply :-**

This pump may be supplied bareshaft or coupled to a drive unit for which a drive unit/electrical supply will be required.

#### Water Supply :-

Additional water supplies may be required if the pump is fitted with a product seal flushing arrangement. Consult your supplier for flush fluids compatible with products pumped.

#### Steam Supply :-

A supply of steam will be required if heating saddles and jackets are fitted.



#### 1.5 Safety Precautions

All warnings in this manual are summarized on this page.

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

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

#### INSTALLATION



: Always observe the technical data.



- : The pump **must** be electrically connected by authorized personnel. (See the motor instructions supplied with the drive unit).
- /!\ :! ^ :!
- : Never start in the wrong direction of rotation with liquid in the pump.
  - : Never put your hands or fingers inside the port connections

#### OPERATION



- : Always observe the technical data.
- : Never touch the pump or the pipelines when pumping hot liquids or when sterilizing.
- : Never stand on the pump or pipelines.



- : Never run the pump with the suction side and the pressure side blocked.
- : Always handle toxic and acidic liquids with great care.

#### MAINTENANCE



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



- : Always observe the technical data.
- : Always disconnect the pump from the drive unit and power supply when servicing the pump.
- : The pump must never be hot when servicing it.



- : The pump and pipelines must **never** be pressurized when servicing the pump.
- : Never put your hands or fingers inside the port connections.

### **READ THIS MANUAL CAREFULLY**



2

#### WARNING SIGNS :



General safety instructions are preceded by this symbol.



Electrical safety instructions are preceded by this symbol.



Take great care when using caustic agents.

#### **1.6 Health and Safety Information** Potential Safety Hazards

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

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

Electric motors - the pump may have an electric motor fitted, ensure that the relevant fire equipment is available.

#### **General First Aid**

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

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

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

The information contained here is brief.

MATERIAL	USE	MAJOR HAZARD
SILICON SEALANT	GEARBOX SEAL RETAINERS, REAR COVER, GENERAL SEALANT.	RELEASES VAPOR AT ROOM TEMPERATURE.
LIQUID GASKET SEALANT	GEARBOX SEAL RETAINERS, REAR COVER, GENERAL SEALANT.	RELEASES VAPOR AT ROOM TEMPERATURE, HIGHLY FLAMMABLE, TREAT AS FIRE HAZARD.
ANTI-SEIZE COMPOUNDS	BEARINGS	APPLIED FROM AEROSOL. RELEASES VAPOR. DISPOSE OF CONTAINER AS IF PRESSURIZED.
ADHESIVES (E.G. PERMABOND)	BEARING NUTS, ADJUSTMENT NUTS.	RELEASES VAPOR AT ROOM TEMPERATURE.
OIL AND GREASE	OIL - GENERAL LUBRICATION GREASE - PRODUCT SEALS, TIMING GEARS, GENERAL LUBRICATION.	SKIN AND EYE IRRITANT.
PLASTIC COMPOUNDS (PTFE, POLYPROPLYENE, PVC)	PTFE - 'O' RINGS, LIP SEALS, GLAND PACKING. POLYPROPLYENE - GLAND GUARDS. PVC - GLAND GUARDS.	RELEASES FUMES WHEN HEATED.
ELASTOMERIC COMPOUNDS (EP, FLUORINATED RUBBER (FPM), NITRILE, NEOPRENE	ALL - 'O' RINGS, LIP SEALS. NITRILE, POLYURETHANE - ROTORS (KNOWN AS RUBBER AND URETHANE).	RELEASES FUMES WHEN HEATED.
ARAMID FIBRE	GLAND PACKING.	EMMITS HARMFUL DUST. RELEASES FUMES WHEN HEATED.
PAINT	EXTERNAL PUMP SURFACES.	RELEASES DUST AND FUMES IF MACHINED. TREAT AS A FIRE HAZARD.



### 2.0 Unpacking, Handling and Storage

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

#### 2.1 Documents

- 1. Check the packing list against the goods received.
- 2. Check if the pump has been delivered with an electric motor that the motor instructions are available.

#### 2.2 Unpacking

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

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

#### 2.3 Handling

Refer to the pump weights guide, prior to using any lifting gear. Use the correct lifting straps for the pump weight (or pump and drive if applicable).

The following details show how the pumps should be lifted.

**Bareshaft Pump :-** the slings should be wrapped around the ports, across the front of the pump and the drive shaft.

**Pump with Drive Unit :-** the slings should be positioned around the pump rotorcase and under the motor.

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



#### **BARESHAFT PUMP**



#### PUMP WITH DRIVE UNIT



#### 2.4 Pump Storage

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

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



### 3.0 Description of Pump or Pump Unit

#### 3.1 General Pump Description

The pump supplied is a positive displacement pump, which may be supplied with or without a drive unit (see below). The drawing below indicates various parts of the pump.



3.2 Principle of Operation

The pumps are of the positive displacement rotary type with lobed rotors. The volume at the inlet increases when the rotors rotate and the product is drawn into the pump. It is then transported in the space between the lobes and the periphery of the pump casing to the discharge side. The volume between the rotors is reduced here and the product is forced out through the outlet.





**Pump with Drive Unit** 

ITEM	DESCRIPTION
А	Gear Housing
В	Rotorcase
С	Rotors
D	Joint Ring
E	Front Cover (standard)
F	Dome Nuts
G	Oil Filler Plug

#### 3.3 Pressure Relief Valves

#### **Internal Pressure Relief Valve**

A relief valve, built into the front cover, is available. It can be used regardless of the direction of rotation.

A relief valve with an extended stem is available. It has a handwheel for manual lifting of the valve head. Rotate the handwheel clockwise for opening.

#### **Piston Pressure Relief Valve**

The piston relief valve is also available for fitting to the pump. See below.





#### 3.4 Pump Dimensions





#### CONNECTIONS

SIZE	MODELS
1.5" (38)	1015
2" (51)	1020 1120 2020
2.5" (63.5)	1125 2025
3" (76)	1130 2030 2130
4" (101.6)	3040
6" (152.4)	3160

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

-				1		<b>1</b>		1	
	OIL	1/, pt	'/² pt	b -	1 ¹ / ₄ p:	3 1/, pt	3 1/2 p	5 pt	5 pt
<b>NSNC</b>	Wt.	34 lb.	39 lb.	59 lb.	63 lb.	150 lb.	165 lb.	368 lb.	412 lb.
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	A	10 3/4	11 ^{3/} 8	14 ^{1/} 8	15	17 ⁷ / ₈	19 1/ ₈	25 ¹ / ₈	27
1	MODELS	600	610	1000	1100	2000	2100	3000	3100

See page 11 when relief valve or heating jacket are fitted.



#### **3.5 Pump Equipment Dimensions** Heating Saddle

Available on all models and on pumps fitted with relief valves.



Heating	Jacket
---------	--------

Available on standard models excluding 'X' types and pumps fitted with relief valves.



Di			MOD	ELS				
(inch)	1000	1100	2000	2100	3000	3100		
А	4 ^s	9/ ₁₆	5	⁵ / ₈		7		
В	¹⁵ / ₁₆	1 ¹ / ₄	1 ³ / ₁₆	2 ³/ ₁₆	2 %/ ₁₆	3 ³/ ₈		
C BSP	1/	8"	1/	'8"	1/4"			
D	1 ⁴ / ₁₆	1 ¹ / ₂	1 ³ / ₄	21/ ₄	2 ⁷ / ₈	3 7/ ₈		
Е	· 31	1/ ₁₆	4	³ / ₄	5 ⁵ / ₈			
F	8	³ / ₄	11	³ / ₈	14 ⁵ / ₃₂			

5	MODELS					
Uim (inch)	1000	1100	2000	2100	3000	3100
А	4 ⁵ / ₁₆		5⁵/ ₈		7	
G	2 ¹ / ₃₂		3 ¹ / ₂		5	5 1/ ₈
н	¹¹ / ₁₆		1		c	ոգ
J NPT	¹ / ₂ "		3/	4 4	C	ոգ
К	2 ¹⁵ / ₁₆	3 ³ / ₄	3 ³ / ₄	5 ¹ / ₈	6 ¹ / ₄	8 ¹ / ₈

**PRESSURE RELIEF VALVE Note :** The piston pressure relief valve (not shown) increases the pump length approximately :- 1000 = 4.72, 2000 = 5.91, 3000 = 6.89







**ENLARGED INLET PORTS** 



		DIM (inch)							
MODELS	Α	В	С	D	E	F	G	Н	J
1000	3 ⁵ / ₈	1 ¼ ₈	1 ⁷ / ₁₆	4 ⁷ / ₁₆	1 1/4	1/4	M6	2 ⁵ / ₁₆	1 ¹³ / ₁₆
1100	3 ¼	1 ⁵ / ₈	1 ⁷ / ₈	4 ¼	1 ¼	1/2	M12	2 ⁵ / ₁₆	2 ⁵ / ₈
		1 7/ ₈	2 ³/ ₁₆	4 ¼	1 1/2	1/2	M12	2 ⁵/ ₁₆	2 ⁵ / ₈
2000	4 ³ / ₁₆	1 ⁷ / ₈	2 ³/ ₁₆	5 ¼	1 ¹ / ₂	1/2	M12	3 ³/ ₈	2 ⁵ / ₈
2100	4 ³/ ₈	1 ⁷ / ₈	2 ³/ ₄	5 ¼ ₂	<b>1</b> ¹ / ₂	1	M12	3 ³ / ₈	4
		3 ¼	3 ¼ ₂	5 ³/ ₈	2 ³/ ₄	⁹ / ₁₆	M12	3 ³/ ₈	4
3000	5 % ₁₆	3 ³ / ₄	4 ³ / ₈	7 ¹ / ₂	5 ³ / ₄	9/ ₁₆	M12	5	5 ¹ / ₁₆
3100	5 ⁷ / ₈	5 ³ / ₄	6 ⁷ / ₁₆	7 1/2	5 ³ / ₄	⁵ / ₈	M12	5	7



#### 3.6 Pump and Pump Unit Weights



**BARESHAFT PUMP** 



PUMP UNIT - PUMP COMPLETE WITH DRIVE UNIT

PUMP MODEL	BARESHAFT PUMP Ibs.	PUMP WITH DRIVE UNIT Ibs.
1000	47	378
1000X	51	381
1100	51	381
1100X	55	385
2000	121	561
2000X	137	578
2100	137	578
2100X	152	592
3000	368	918
3000X	379	929
3100X	423	973

The above weights are for guidance only and will vary depending upon the specification of the pump, baseplate and drive unit.



#### 3.7 Pump Displacement and Capacities

The following table details the pump capacities for the pump models. This figure will change depending upon speed, pressure, temperature and product being pumped.

PUMP MODEL	DISPLACEMENT GAL/100 REV	MAXIMUM SPEED (RPM)	MAXIMUM CAPACITY AT MAXIMUM SPEED USGPM
1000	5.05	1000	50
1000X	5.05	1000	50
1100	7.9	1000	78
1100X	7.9		78
2000	16.9	750	126
2000X	16.9	750	126
2100	28.0	750	209
2100X	28.0	750	209
3000	56.8	700	396
3000X	56.8	700	396
3100	85.6	600	512



### 4.0 System Design and Installation

#### 4.1 System Design Advice

When designing the pumping system :-

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



**DO** - protect the pump against blockage from hard solid objects e.g. nuts, bolts etc. Also protect the pump from accidental operation against a closed valve by using one of the following methods :- relief valves, pressure switch, current monitoring device.

- DO fit suction and discharge pressure gauges to monitor pressures for diagnostic purposes.
- DO install non-return valve to prevent turbining when high pressures are applied to the pump whilst it is not in use. Valves are also recommended if two pumps are to be used on manifold/common discharge lines.
- DO make the necessary piping arrangements if flushing is required for the seal or if steam is required for heating jackets.
- **DO** provide a hose cleaning facility to assist maintenance, ensuring the drive unit meets the specification for hose cleaning.
- DO NOT- subject the pump to rapid temperature changes during C.I.P. (Cleaning in Place) procedures. PUMP SEIZURE CAN RESULT FROM THERMAL SHOCK. The differential pressure across the pump should be near zero when cleaning. A suitable by-pass is recommended.



#### 4.2 Pump and Base Foundations

Depending on your requirements the pump and drive (if supplied) may arrive mounted on a baseplate. Our standard baseplates have predrilled fixing holes to accept base retaining bolts.

To provide a permanent, rigid support for securing the pump unit a foundation is required, this will also absorb vibration, strain or shock on the pumping unit.

#### **Foundation Size**

The foundation should be approximately 6 inches longer and wider than the mounting base of the unit. The depth of the foundation should be proportional to the size of the pump unit (pump complete with drive and baseplate). For example, a large pump unit foundation depth should be at least 20 times the diameter for the foundation bolts.

#### **Bolt Location Dimensions**

The location and sizes of the relevant bolting down holes can be provided on a certified drawing from your supplier.

#### **Typical Foundation Bolts**

The drawing below shows two methods for foundation bolt retaining. The sleeve allows for 'slight' lateral movement of the bolts after the foundation is poured. Use rag or paper to prevent the concrete from entering the sleeve while the foundation is poured. A minimum of 14 days is required to allow the curing of the concrete prior to operation.





#### 4.3 Installation

Before the pump is installed it is advisable to consider the following:

ALWAYS - Ensure that the mounting surface is flat to avoid distortion of the baseplate. This will cause pump/motor shaft misalignment and pump/motor unit damage.

CHECK - pump shaft to motor shaft alignment once the baseplate has been secured and adjust as necessary.



**NOTE :** Always allow at least 3 Ft for pump access/maintenance all around the pump.

WEIGHT - Consider the weight of the pump, drive and lifting gear requirements.

**ELECTRICAL-** Ensure that there is an adequate electrical supply close to the pump drive unit. This should be compatible with the electric motor selected.



#### 4.4 Coupling Misalignment

When installing the pump and drive unit, it is **essential** to ensure that the coupling is **not** twisted during installation. The main cause of misalignment is by fitting the baseplate to an uneven surface.

Check the maximum angular and parallel allowable misalignments for the couplings before operating the pump.

#### PARALLEL MISALIGNMENT



#### ANGULAR MISALIGNMENT



COUPLING TYPE	RECOMMENDED MAXIMUM PARALLEL MISALIGNMENT		MAXIMUM ANGULAR MISALIGNMENT
	SIZE	ММ	DEGREES
	1	0.2	+ 1 5°
	2	0.3	
	3	0.4	
	FL63	0.25	
	FL80		0.75°
	FL112	0.3	
TELXILOR	FL125	0.4	1.0°
	FL160	0.5	1.0
	F40	1.1	
FENAFLEY	F50	1.3	
FENAFLEX	F60	1.6	٨٥
	F70	1.9	4
	F80	2.1	
,	F90	2.4	

**NOTE :** The above table indicates the common coupling types used on the pump ranges. Details for other coupling types will be available on request.



#### 4.5 Pulley Belt Tension Adjustment

An incorrectly tensioned belt will cause belt slip and short belt life. An excessively tensioned belt will overload both belts and bearings. ALWAYS USE A BELT TENSION GAUGE FOR SETTING UP.

**ISOLATE** the drive unit and pump from all power and control supplies before attempting to work on adjusting the belts.

- 1. Measure the span length.
- 2. Calculate the required deflection: ('x')

100mm span length = 1mm deflection

therefore :

400mm span length = 4mm deflection

3. Refer to the table for recommended minimum and maximum deflection force for small pulley diameter range.

To convert Newtons to **pounds force** multiply by 0.2248.

To convert Newtons to **kilogrammes** force multiply by 0.1020.

- 4. Use a belt tension gauge with the figures to determine the belt adjustment required.
- 5. Belt tension adjustment is achieved by adjusting the nuts on the pedestal frame.
- 6. Finally check that all nuts are re-tightened and the belts can move 'freely' by hand (depending upon pump size and system design).



BELT SECTION	SMALL PULLEY DIAMETER RANGE	RECOMMENDED DEFLECTION FORC NEWTONS	
	MM	MIN	MAX
XPZ SPZ	56 60-63 67-71 75-80 85-95 100-125 132-180	7 8 9 10 11 13 16	11 13 14 15 16 19 24
XPA SPA	80-125 132-200	18 22	27 31

**Note :** The above table indicates the common pulley types used on the pump ranges. Details for other pulley types will be available on request.

#### 4.6 Pipework

All pipework MUST be supported. The pump MUST NOT be allowed to support any of the pipework weight.

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

Always :-

- Have Short straight suction lines to reduce friction losses in the pipework thereby improving the NPSH available.
- Avoid Bends, tees and any restraints close to either suction or discharge side of pump. Use long radius bends wherever possible.
- Provide Isolating valves on each side of the pump to isolate the pump when necessary.

Pipework horizontal where applicable to reduce air locks. Include eccentric reducers on suction lines.

Coupling alignment during installation to highlight pipework alignment/ support problems.





### 5.0 Commissioning

#### 5.1 Recommended Lubricants

#### Pumps specified oil filled :-

.

The pump will <u>NOT</u> be supplied prefilled with oil therefore the table below must be used to select a recommended oil.

MAKE	GRADE		
	300°F -23°F	23°F -4°F	
Shell Macoma BP Energol Castrol Alpha Esso Spartan Mobil Compound Gulf EP Lubricant Texaco Meropa	R220 GREP220 LS220 EP220 DD HD220 220	R68 GREP68 LS68 EP68 AA HD68 68	



#### 5.2 Lubricating the Pump

#### Changing the Oil :-

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

First change - After 150 hours of operation.

Next changes - Every 3000 hours of operation.

Only use the oil types recommended by your supplier.

**Oil Filling -** Fill with oil through the filler plug to the level indicated in the sight glass.

#### **Lubrication Capacaties**

PUMP MODEL	Pints
1000	1 1/4
1100	1 1/4
2000	3 1/2
2100	3 1/2
3000	5 1/2
3100	5 1/2

#### 5.3 Flushed Seal Arrangements

It is important that:-

- The flush is correctly **connected.** (See overleaf).
- A suitable flushing fluid is used.
- The fluid is **supplied** at the **correct pressure** and **flow** rate.

#### 5.4 Connecting the Flush

The following equipment is **strongly recommended** when using a flushing system.

- **control valve** and **pressure gauge**, to enable the correct flushing pressure to be obtained and monitored. (A constant flow valve can be used).
- **isolation valve** and **check valve**, so that the flush can be turned off, and to stop any unwanted substances flowing in the wrong direction.
- A method of visibly indicating flushing fluid flow e.g. using a **Tun dish.**



#### 5.5 Flushing Pipework Layout

This arrangement is for single mechanical seals.





#### 5.6 Flushed Seal Housing Connections

The seal flushing connections are 1/8" BSP (1/4" BSP on 1000/1100).

#### 5.7 Flushing Fluid

The choice of flushing fluid is dependent upon the pumping media and duty condiitons i.e. pressure and temperature. Usually water is used for cooling or flushing water soluble products. For advice on selecting a suitable flushing fluid please contact the supplier.

#### 5.8 Flushing Pressure and Flow Rate

Single Mechanical Seal - 7.25 PSI maximum.

Any further increase in pressure will result in lip seal failure.

For guidance the pressure at the seal is approximately  $\frac{2}{3}$  of the pumping pressure.

The flushing **Flow Rate** must be adequate to ensure that the temperature limitation of the seals is not exceeded. Contact your supplier for further information.

#### 5.9 Setting the Relief Valve Pressure

- Operate the pump on product with the line valve fully open.
- Release the locking ring turn the adjusting nut clockwise to compress the spring fully.
- Close the line valve slowly until the pressure gauge registers just above the required setting.
- Turn the adjusting nut counterclockwise until the pressure begins to drop indicating flow through the relief valve.
- Tighten the locking ring.
- Open the line valve fully.





#### 5.6 Flushed Seal Housing Connections

The seal flushing connections are 1/8" BSP (1/4" BSP on 1000/1100).

#### 5.7 Flushing Fluid

The choice of flushing fluid is dependent upon the pumping media and duty condiitons i.e. pressure and temperature. Usually water is used for cooling or flushing water soluble products. For advice on selecting a suitable flushing fluid please contact the supplier.

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Single Mechanical Seal - 7.25 PSI maximum.

Any further increase in pressure will result in lip seal failure.

For guidance the pressure at the seal is approximately 2/3 of the pumping pressure.

The flushing **Flow Rate** must be adequate to ensure that the temperature limitation of the seals is not exceeded. Contact your supplier for further information.

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- Operate the pump on product with the line valve fully open.
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- Close the line valve slowly until the pressure gauge registers just above the required setting.
- Turn the adjusting nut counterclockwise until the pressure begins to drop indicating flow through the relief valve.
- Tighten the locking ring.
- Open the line valve fully.





#### 5.5 Flushing Pipework Layout

This arrangement is for single mechanical seals.





#### 5.10 Piston Pressure Relief Valve Setting

#### Setting

#### **Mechanical Operation**

Fit number of springs for relative operating pressure as listed below (all springs except 600 models supplied pre-compressed for easy assembly).



PUMP	NUMBER OF SPRINGS					
MODEL	1	2	3	4	5	6
600	2.4	3.8	5.4	6.8	8.6	-
1000	2.7	4.3	5.8	7.3	8.75	10.3
2000	2.1	2.1	5.5	7.2	8.9	10.6
3000	1.4	1.4	3.8	5.0	6.2	7.6
	Settings in Bar (Full Bleed Pressure)					

#### **Pneumatic Operation**

Connect air to  $\frac{1}{8}$ " BSP connection at the front end of the cannister assembly and apply air pressure as indicated below. (This enables remote pressure variation.)





#### To Remotely Open Valve

Connect air to 1/8" BSP connection of pump cover. (For 600 models on side of cannister assembly.)



To manually open valve fit lever lift assembly on spindle under the top circlip.



#### 5.11 Valve Disassembly and Assembly



#### Disassembly

To remove cannister assembly from pump cover compress assembly either by applying lever lift or clamping in a vice.



Pull out retaining wire located at bottom of cannister assembly.

Release clamp - cannister assembly can now be removed.

To remove valve head slide sideways from locating groove.

To fit reverse procedure and centralise valve head.

To disassemble cannister assembly remove circlip(s) at top of cannister and withdraw piston with springs (if fitted).

#### Assembly

Reverse above procedure ensuring locating pin is engaged in hole.

It is important that when fitting springs they are equally spaced to ensure even loading of the piston. When fitting only one or five springs the spare spring pocket left vacant should be adjacent to the bar of the valve head.

Replace retaining wire using pliers in 30mm steps.



#### 5.12 Steam Jackets and Saddles

Careful attention should be taken when piping up and connecting to steam jackets and saddles. (see below)



Connection for steam, hot/cold fluid entry and exit.

If new steam jackets and saddles are being fitted use Hermatite instant gasket (or equivalent).



All new pumps supplied with jackets and saddles are hydrostatically tested. A certificate can be provided on request.

Prior to operation a hydrostatic test should be completed on the new steam jackets and saddles. Pumps supplied are hydrostatically tested at the time of manufacture. If they have to be replaced for any reason it is recommended for safety that this test be carried out before use:

Hydrostatic test pressure (water) :- 87 PSI Maximum working pressure :- 50 PSI



### 6.0 Start Up, Shut Down and Cleaning in Place

6.1	Pump Start-Up Checklist	YES	NO
1.	Has the pipework system been flushed through to purge welding slag and any other hard solids?		
2.	Have all <b>obstructions</b> been removed from the pipework or pump?		
3.	Are the pump <b>connections</b> and pipework joints <b>tight</b> and <b>leak-free</b> ?		
4.	Is there <b>lubrication</b> in the <b>pump</b> and <b>drive</b> unit?		
5.	If your product <b>seals</b> require <b>flushing</b> has the flushing supply been fitted?		
6.	Are the pipework valves open?		
7.	Are all safety guards in place?		
8.	Start then stop the pump, is the product <b>flowing</b> in the correct <b>direction</b> ?		
9.	Are the pump <b>speed/pressure</b> settingsbelow the pump maximum limitations?		
10.	Is the location of the 'stop' button clear?		

#### All Answers should be 'Yes' before proceeding

If there are any pumping problems refer to the Trouble Shooting Chart



#### 6.2 Pump Shut Down Procedure

- 1. Turn the pump off.
- 2. Isolate the pump/drive unit from all power and control supplies.
- 3. Close the pipework valves to isolate the pump.
- 4. If the pump is to be disassembeld refer to the disassembly section.

#### 6.3 Direction of Rotation

The direction of flow is dictated by the direction of rotation of the drive shaft. Reversing the direction of rotation will reverse the flow direction. Top and bottom shaft drive pumps have opposite flow directions as illustrated.



**TOP SHAFT DRIVE** 



**BOTTOM SHAFT DRIVE** 



#### 6.4 Cleaning in Place (CIP)

The pump can be manually cleaned or cleaned in place (CIP). The following is an example of a typical CIP procedure. However specific advice for each application should be sought from the pump suppliers.





NEVER touch the pump or pipes as they will be extremely HOT!



**DO NOT** subject the pump to rapid temperature changes during CIP procedures, as pump seizure can result from thermal shock. A suitable by-pass is recommended.



ALWAYS use rubber gloves and protective goggles when handling caustic agents.



ALWAYS store/discharge cleaning agents in accordance with current rules/directives.



### 7.0 Maintenance and Inspection

#### 7.1 Maintenance and Schedule

It is advisable to install pressure gauges on either side of pump so that any problems within the pump/pipework will be highlighted.

#### Your weekly schedule should include :

- CHECKING THE **OII Level IN** THE GEARCASE (IF APPLICABLE)
- CHECKING THE Mechanical Seals FOR LEAKAGE AND REPLACING AS NECESSARY
- CHECKING THE Packed Glands TO CONTROL LEAKAGE
- CHECKING THE OII Seals FOR
  LEAKAGE
- CHECK Pumping Pressures

#### 7.2 Recommended Spare Parts

The following table details the recommended spare parts which should be retained within your maintenance stock. (Refer to the Exploded drawings and parts list at the end of this manual).

Item No	Description	Quantity
6	Oil Seal	2
7	Bearing Outer	2
8	Bearing Inner	2
12	Shim Set	1
13	Bearing Cup	4
14	Bearing Cone	4
18	Shim Set	1
21	Oil Seal	2
27	Shim Set	· 1
33	Rotor Nut	2
34	Joint Ring	1
38	Strip Bearing	2
	Product Seals	2

#### 7.3 Maintenance Tools

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

Allen wrenches Wrenches Socket set Wooden wedge Soft mallet Cleaning hose A heavy duty vice A press and pressing tools Lifting gear Liquid gasket



### 8.0 Disassembly

#### 8.1 Before Disassembling the Pump

Before starting to disassemble the pump ALWAYS:-



#### Isolate -

pump/drive unit from all power and control supplies.



#### Close -

pipework valves to isolate the pump



#### Purge -

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



#### **Disconnect** -

the pump from the drive unit.

# Read this Section first before Continuing to Disassemble the Pump



#### 8.2 Disassembling Pump Head and Replacing Shaft Seals

#### Disassembly

- 1. Disconnect the pipe connections from the rotorcase.
- Unscrew dome nuts 36 and remove front cover 35. If stuck, loosen with soft mallet at overlap at top and bottom. Do not pry off.



3. Unscrew locking screws (when fitted) and rotor nuts 33. Insert a **wooden** wedge in order to prevent rotation.



4. Remove rotors 122. Do not prise from behind if they fit tight on the shaft. Remove rotorcase nuts 30 and tap rotorcase 31 10mm (0,40") forwards. This will release the rotors.

**Note :** If seal plates are fitted these must be released first.



5. Remove rotorcase 31. Make sure that arch shims 27 at top and bottom are retained by 'O' ring 28 on studs 29 at the back of the rotorcase.

**Note :** Release seal housings first, if fitted.



**Note :** If the seals are to be reused ensure that they are marked top and bottom.

6. Remove stationary seal rings 78 and 'O' rings 79 out of the rotorcase **by hand**.

**Note :** For flushed, internal and other special seals, see separate section for procedure.

7. Pull rotating seal rings 77, 'O' rings 76 and springs 75 off the shaft. Retainers 85 remain on the shaft.

**Note :** For models 3000, the rotary components are all pre-assembled and the whole assembly must be removed by loosening the retaining screws. First scribe a line on the shaft behind the retainer for repositioning.







#### 8.3 Front Oil Seals

At this stage front oil seals 21 are accessible and can be replaced. To remove drive pointed tool (i.e. screw driver) into oil seal and prise out. Ensure shafts are not damaged. To remove from shaft, spring retainers 85 must first be loosened and taken off (note position for resetting).

When replacing oil seal leave a 2mm (0,1") edge when the oil seal is replaced.





6.

#### 8.4 Assembly of Shaft Seals

If spring retainers 85 have been removed, replace them to the scribed line.

HANDLE ALL SEAL COMPONENTS WITH CARE. REMOVE THE PROTECTIVE COVER FROM NEW SEAL FACES. CLEAN THE FA-CES TO REMOVE ALL OIL OR GREASE. USE A NON-DEPOSITING TYPE OF CLEAN-ING AGENT!

If lubricating of 'O' rings is necessary, use only silicone grease. Ensure that no grease is transferred to the seal faces.

- 1. Place springs 75 on (in) retainer 85.
- 2. Push rotary seal rings 77 with 'O' rings 76 onto shafts and retainers 85. Make sure that pins inside the rings fit into slots on the retainers.

**Note :** For 3000 models fit assembled components to previously scribed line.



3. Fit 'O' rings 79 and stationary seal rings 78 in rotorcase 31. Ensure drive pins are correctly aligned with slot in the rotorcase.



4. Fit rotorcase 31 on gear housing 1. Make sure that shims 27 are still on the studs. TAKE CARE NOT TO DAMAGE THE SEALS.

> On larger pumps it is recommended to support the rotorcase. Check that rotorcase dowels 5 are positioned correctly.

5. Tighten the rotorcase firmly with nuts 30.



The seals should return to the original setting but check that there is a gap of approximately 1mm (0,039") between rotating seal ring 77 and spring retainer 85.

Rotate shafts to check free movement.



7. Replace rotors 122. Line them up with the missing spline on the shaft. Tighten rotor nuts 33 fully by sharply hitting the wrench with a hammer. Insert a **wooden** wedge in order to prevent rotation. Then tighten locking screws when fitted.

Check that the front clearances are correct.



Replace cover 35. Ensure that 'O' ring 34 is correctly positioned. Tighten with dome nuts 36.

PTFE (Teflon) cover 'O' rings, require reforming by immersion in very hot water.

Rotate shafts to check free movement.

9. Connect inlet and outlet pipes.

8.

### 9.0 Assembly

#### 9.1 Re-assembly of Cartridge Assembly

1. Assemble the bearing inner cones with rollers (14) on shaft. Press hard against the shaft shoulder. The large diameters of the bearings should face each other.



2. Press one bearing outer race (13) to the bottom of each bearing housing (15) bore. Large diameters outwards.



3. Insert on shaft - splined end first - followed by the second bearing outer race. Secure by screwing retaining plate (16) in position and tighten evenly.

> (If no torque wrench is available, tighten until the shaft is firm without spinning freely). Repeat for second shaft.



- 4. Measure gap 'A' under retaining plates (16). Fit equivalent shims (18) around the screws. Retighten screws (17). Check torque.
- 5. Fit rotors (122) on the shafts. Check alignment of front faces and measure difference 'B'.



 If adjustment is required, press out the shaft 0.040" (10 mm) and insert split shimming to measurement 'B'.





#### 9.1 Re-assembly of Cartridge Assembly (Contd)

7. Replace keys 24 and 25 in the shafts. Ensure tight fit. Fit on timing gears (11) using the original shimming between gear face and inner race. Check that the timing marks on gears (11) mesh correctly.

Maximum permitted gear backlash: See item 6 under "DISASSEMBLY".



8. Fit shaft nuts (9) behind gears (11). Check that rotors (122) rotate freely.

Correct any error by adding split shims 12 between gear face and inner race as follows:





To increase 'R' add shims to shaft 'X'. To increase 'L' add shims to shaft 'Y'.

Models	1000	2000	3000
'R' or 'L'	0.003"	0.003"	0.003"
increase	(0.075mm)	(0.075mm)	(0.075mm)
Shimming required	0.009"	0.010"	0.012"
	(0.23mm)	(0.25m)	(0.30mm)

9. Fully tighten shaft nuts (9) and nut grub screws. Press rear inner bearings races onto the shafts in original position and oil seals in bearing housing leaving a 2mm proud.

**Note :** Check shafts for damage where the oil seal will run.



#### 9.2 GHP 2100 Hydraulic Drive

The GHP 2100 pump may be supplied to facilitate a hydraulic drive. If the rear plate is removed for any reason it must be resealed with hermetite gasket sealant.





#### 9.3 Re-assembly of Gear Housing Assembly

1. Press rear bearing outer races (7) into the gear housing.

Models	1000	2000	3000
E	0.35" (9)	0.50"(13)	0.50"(13)
7	E		

 Coat the mating faces of bearing housing (15) and gear housing (1) with oil resistant sealant and screw in position, using original dowel pins (19). Make sure that the drive shaft is in the original position.



3. Fit oil seals (6). Do not damage the lips.



4. Fit rotorcase (31) and rotors (122). Check that rotor tip clearances to casing are correct for points A and B by rotating shafts.

See under "ADJUSTMENT OF ROTOR CLEARANCES".



- 5. If any adjustment is required, remove the two dowelpins (19) between gear housing and bearing housing.
- 6. Re-assemble with bearing housing screws (20) lightly tightened.
- 7. Reset rotor to casing clearances by tapping the bearing housing to the correct position. Then fully tighten screws (20).
- 8. Remove rotorcase (31) and rotors. Ream the dowel pin holes to fit oversize pins.

Standard	³ / ₈ "
Oversize	10mm or ¹³ / ₃₂ "



- Refit pump head and shaft seals as in previous instructions under "DIS-ASSEMBLY PUMP HEAD AND RE-PLACING SHAFT SEALS".
- 10. Refill with correct oil. See under lubrication section.
- 11. Check free rotation.

#### 9.4 Adjustment of Rotor Clearances

The pumps are manufactured with close running clearances which must be maintained. These vary according to model size, operating temperature and rotor form according to the table below.



	STANDARD STAINLESS STEEL ROTORS									
		TOP/BOTTOM	CLEARANCE	RADIAL C	EARANCE	FRONT CLEARANCE				
Models Class			4		3					
		Inch (X10)	mm	Inch (X10 ⁻³ )	mm	Inch (X10 ⁻³ )	mm			
	Α	4.0 - 7.0	0.10-0.18	8.0 - 10.0	0.20 - 0.25	5.0 - 8.0	0.15 - 0.20			
8	В	5.0 - 7.0	0.13 - 0.18	10.0 - 12.0	0.25 - 0.30	7.0 - 10.0	0.20 - 0.25			
ŏ	С	6.0 - 8.0	0.15 - 0.20	11.0 - 13.0	0.28 - 0.33	7.0 - 11.0	0.20 - 0.28			
	D	7.0 - 9.0	0.18 - 0.23	12.0 -14.0	0.30 - 0.36	8.0 -11.0	0.23 - 0.28			
	A	6.0 - 8.0	0.15 - 0.20	11.0 - 13.0	0.28 - 0.33	6.0 - 9.0	0.18 - 0.23			
0	В	8.0 - 10.0	0.20 - 0.25	13.0 - 15.0	0.33 - 0.38	9.0 - 12.0	0.25 - 0.30			
¥	С	9.0 - 11.0	0.23 - 0.28	14.0 - 16.0	0.36 - 0.41	10.0 - 13.0	0.28 - 0.33			
-	D	10.0 - 12.0	0.25 - 0.30	15.0 -17.0	0.38 - 0.43	11.0 - 14.0	0.30 - 0.36			
	A	7.0-9.0	0.18 - 0.23	12.0 - 14.0	0.30 - 0.36	7.0 - 9.0	0.18-0.23			
00	В	10.0 - 13.0	0.25 - 0.33	15.0 - 17.0	0.38 - 0.43	10.0 -12.0	0.25 - 0.30			
20	С	12.0 -14.0	0.30 - 0.36	17.0 - 19.0	0.43 - 0.48	11.0 -13.0	0.28 <b>-</b> 0.33			
	D	13.0 -15.0	0.33 - 0.38	18.0 - 20.0	0.46 - 0.51	12.0 -14.0	0.30 - 0.36			
	А	11.0 - 14.0	0.28 - 0.36	16.0 - 18.0	0.41 - 0.46	9.0 - 11.0	0.23 - 0.28			
8	В	16.0 - 19.0	0.41 - 0.48	21.0-23.0	0.54 - 0.58	14.0 - 16.0	0.36 - 0.41			
5	С	17.0 - 20.0	0.43 - 0.51	22.0 - 24.0	0.56 - 0.61	15.0 - 18.0	0.38 - 0.46			
	D	18.0 - 20.0	0.46 - 0.51	23.0 - 25.0	0.58 - 0.64	17.0 -19.0	0.43 - 0.48			
	A	10.0 - 15.0	0.25 - 0.38	18.0 - 21.0	0.46 - 0.51	11.0 - 14.0	0.23 - 0.36			
8	В	14.0 - 19.0	0.36 - 0.48	22.0 - 25.0	0.56 - 0.64	17.0 - 20.0	0.43 - 0.51			
Õ	С	16.0 - 20.0	0.41 - 0.51	24.0 - 27.0	0.61 - 0.69	19.0 - 22.0	0.48 - 0.56			
.,	D	17.0-22.0	0.43 - 0.56	25.0 - 28.0	0.64 - 0.71	20.0 - 23.0	0.51 - 0.58			
	A	12.0 - 17.0	0.30 - 0.43	20.0 - 23.0	0.51 - 0.58	12.0 - 15.0	0.30 - 0.38			
8	В	16.0-21.0	0.41 - 0.54	24.0-27.0	0.61 - 0.69	21.0 - 24.0	0.54 - 0.61			
Ē	C	18.0 - 23.0	0.46 - 0.64	26.0 - 29.0	0.66 - 0.74	24.0 - 27.0	0.61 - 0.69			
	D	19.0 -24.0	0.48 - 0.61	27.0 - 30.0	0.69 - 0.76	26.0 - 29.0	0.66 - 0.74			
Class		Temperature F	Range							
А		20-70°C (70-	160°F)							

0.025mm (0.	001") = Purple
-------------	----------------

0.038mm (0.0015") = Red (1000 only)

0.050mm (0.002") = Transparent

0.127mm (0.005") = Pale blue

0.254mm (0.010") = White

Adjustment is made by adding or removing arch shims (27), located between the back face of rotorcase and the gear housing, top and bottom. Refit retaining 'O' ring (28) on the studs.

70 - 100°C (160 - 212°F)

100 - 130°C (212 - 265°F)

130-150°C (265-300°F)





В

С

D

### 10.0 Pinned and Flushed Externally Mounted Mechanical Seal

#### 10.1 Disassembly

- Important : Loosen fully seal housing (87) before removing the rotorcase.
- Pull rotating seal rings (77), 'O' rings (76) and springs (75) off the shafts. Remove spring retainers (85) by loosening lock screws (86) (scribe a line, see below). Sizes 1000/1100 and 3000/3100 : loosen the lock screws through the flushing holes in the seal housing. On the other sizes the back parts of the seal housings are loosened from the front housings. The lock screws are then accessible.

#### 1000/1100, 2000/2100

First scribe a line on the shafts in front of retainer (85), so that the new parts can easily be fitted in the correct positions.

**Note :** On sizes 3000 the rotating parts are preassembled and the whole units removed by loosening lock screws (86) through the flushingholes in seal housings.

#### 3000/3100

First scribe a line on the shafts in front of rotating seal rings (77) so that the new parts can easily be fitted in the correct positions.

 Remove the seal housings from the shafts and 'O' rings (88) and (99) (not on 1000/1100). Also remove lipseals (95) from seal housings; should the seals need replacing.

If the seals are <u>correctly</u> positioned. The distance between spring retainer (85) and rotating seal ring (77) should be approx. 1mm. The line can also be scribed during assembly according to the dimensions in the table under item 3.



#### 10.2 Assembly

1. Place 'O' rings (88 and 89) (not 99 on 1000/1100) in their grooves in the seal housings.

Fit lipseals (95) in the seal housings. **Note :** Only when fitting **new** lipseals.

KNOCK THE LIPSEALS INTO POSITION BY MEANS OF A SUITABLE TOOL. i.e. A PIECE OF PIPE. DO NOT DAMAGE THE SEALS. **Note :** NO SPRINGS SHOULD BE FITTED IN LIPSEALS.

- Check that dowel pins (94) (not on 2000/ 2100) and (98) (not on 1000/1100) are fitted on the seal housings. (When converting a pump, the pins are delivered loose with the conversion set.)
- 3. Scribe a line according to the table below (unless a line was scribed during disassembly).

SIZES	A (see fig 1)
1000/1100	1.160"
2000/2100	1.082"
3000	0.732"
3100	0.677"



Sizes 1000/1100, 2000/2100

Place seal housings (87) and spring retainers (85) on the shafts.

**Note :** Place the fronts of the retainers on the scribed lines and tighten them with lock screws (86). Sizes 1000/1100 : Tighten the lock screws through the flushing holes in the seal housings.

#### Size 3000/3100

Place seal housings (87) and the rotating seal units on the shafts.

**Note :** Place the fronts of rotating seal rings (77) on the scribed lines and tighten them with lock screws (86) through the flushing holes in the seal housings.

4. Tighten heel studs (93) in the gear casing (2000/2100).

Check that 'O' rings (88) and (99) (not 99 on 1000/1100) are correctly positioned.

- 5. Tighten front seal housings (96) to the rotorcase (not 1000/1100).
- 6. Fit the rotorcase on the gear housing and tighten it **properly**.
- Tighten back seal housings (87) to the front housings (clamped tight on 2000/ 2100).

Sizes 1000/1100 : Tighten the seal housings to the rotorcase.

8. Check the distance (approx. 1mm) between spring retainer (85) and rotating seal rings (77) through the flushingholes.



### 11.0 Faults, Causes and Remedies

	_	_			-		~~~	-	-	****	-	****	-				-		_		-	_			_	-	_	-	1	<b>T</b>		T
REMEDIES	Reverse motor.	Expell gas from supply line and pumping chamber and introduce Notici.	Increase supply line diameter. Increase suction head. Simplify supply line configuration and reduce length. Reduce access	Decrease product temperature - check effect of Increased viecceity on excitation and parmitted power lineuts.	Remake pipework joints. Adjust or repeck gland.	Expeliges from supply line and pumping chamber and introduce floats.	Raise product level. Lower outlet position. Increase eubmanyerce of expty line.	Service fittings.	Decrease pump speed. Increase product temperature.	Increase pump speed. Decrease product temperature.	Cool the product pumping chamber.	Heat the product pumping chamber. (Check with pump maker).	Clean the system. Fit strainer to supply line.	Check for obstructions. Service system and revise to prevent problem recurring. Simplify delivery line.	Slacken and re-adjust gland.	Adjust gland. See not on packed glands under Tratallation and Matinterance" heading.	Check that fluid flows freely into gland. Increase flow rate.	Decrease pump speed.	Increase pump speed.	Check alignment of pipes. Fit floatble pipes or expansion fittings. Support pipework.	Re-tension to maker's recommendations.	Check flange alignment and ajust mountings accordingly.	Fit lock washen to stack fasteners and ra-fighten.	Refer to pump maker for advice and replacement perts.	Rafer to pump maker for advice and replacement parts.	Refer to pump makar's instructions.	Check rated and duty pressures. Refer to pump maker.	Fit new companients.	Check pressure setting and re-adjust if necessary. Examine and clean secting suffices, Recises worn parts.	Check for wher seeling surfaces, guides etc - replace as necessary.	Readjust spring compression. Valve should lift about 10% above duty pressure.	
	-	ณ	•	4	50	8	~	8	8	₽	=	5	13	14	5	16	17	18	18	8	21	8	ន	24	25	26	27	88	8	8	3	
CAUSES	Incorrect direction of rotation.	Pump un-primed.	Insufficiant NPSH available.	Product vapourising in eupply line.	Air entering supply line.	Gas in supply line.	Insufficient head above supply veenet outlet.	Foot valve strainer obstructed or blocked.	Product viscoshy above rated figure.	Product viscosity below rated figure.	Product temperature above rated figure.	Product temperature below rated figure.	Unexpected solids in product.	Delivery pressure above rated figure.	Giand over-tightened.	Giand under-tightened.	Gland fluetring inadequate.	Pump speed above rated figure.	Pump speed below rated figure.	Rotorcase strained by pipework.	Beit drive stipping.	Flexible coupling missigned.	Insecure pump driver mountings.	Sheft bearing wear or failure.	Wom un-synchronised thring gears.	Gearcone oli quantity incorrect.	Metal to metal contact of pumping element.	Wom pumping element.	Front cover reflet valve leakage.	Relief valve charter.	Relief valve incorrectly set.	
Selzure														•						•			•	•	•	•						
Product hose through gland													·			•																
Cland see													•		•																	
Pump Pump													•	•						•			•	٠		•						
Noise &					ŀ				•		•		·	•		•				•	•	•	•	•	•	•						
Emerative power absorbed									•			•		•	•					•	•	_	•	•		•						
Motor overheets									•			•		•	•					•	•		•	•	•	•						
Pump overheets								-	•		•			•						•	•		•	•	•	•		•				
Pump etaite when starting	;								·			•		•										•		•						
Prime loat ather starting			•		ŀ		ŀ	•	•					•		•									_							
Imegular Discharge						•								•		•							•									
Under Capacity			•		ŀ	•			ŀ	•				•		•				•							•	•	•			
No Discherge																											•					



### 12.0 Technical Data

#### **12.1 Pump Information Chart**

	Models	1000	1100	2000	2100	3000	3100
Max flow rate GPM	All	37	60	93	155	395	510
Max pressure PSI(bar)	Std 'X'	110 (7.5) 150 (10)	75 (5) 100 (7)	110 (7.5) 150 (10)	75 (5) 100 (7)	75(5) 100 ( <u>7</u> )	- 65 (4.5)
Max speed (r/min)	Std 'X'	1000 1000	1000 1000	750 750	750 750	700 700	- 600
Max pressure at max speed PSI (bar)	Std 'X'	65 (4.5) 89 (6)	44 (3) 65(4.5)	65 (4.5) 89 (6)	44 (3) 65 (4.5)	44 (3) 65 (4.5)	- 58 (4)
Max speed at max pressure (r/min)	Std 'X'	650 650	650 650	500 500	500 500	550 550	- 550



#### **12.2 Designation System**



Example denotes 1100 medium pressure pump with 2 inch (51mm) connections.



#### 12.3 Torque Settings/ Wrench Sizes

#### RECOMMENDED TORQUE SETTINGS IN FOOT POUNDS.

	Models							
	1000	2000	3000					
Front Cover Nut 36	26	26	26					
Rotorcase Nut 30	26	26	92					
Rotor Nut 33	81	81	92					
Bearing Housing Screw 20	52	59	184					
Shaft Nut 9	280	811	1475					

#### WRENCH SIZES (mm)

			Mod	els		
	100	)0	200	)0	300	)0
Front Cover Nut 36	19	S	19	S	19	S
Rotorcase Nut 30	19	S	19	S	24	S
Rotor Nut 33	26	S	43	S	65	S
Rotor Nut Locking Screw	2.5	А	3	А	3	А
Spring Retainer Screw 86	2.5	A	3	А	4	A
Seal Plate Retaining Screw	5	А	5/6	А	6	А
Bearing Housing Screw 20	8	А	19	S	24	S
Bearing Retaining Plate Screw 17	10	S	10	S	10	S
Shaft Nut 9	43	S	65	S	79	S
Shaft Nut Locking Screw 10	4		4		6	

S = Wrench A = Hex. Socket Screw



### 13.0 Exploded Pump Drawing

Complete Mechanical Seal kits are available. Kits include position 75-79 on exploded view. Offered in the following materials.

Carbon v Stainless	Steel (Std) EPDM (Std) Nitrile Fluorinated Rubber (FPM) PTFE Enc	Elastomer options
Carbon v Silicon Ca	rbide FPDM	<b>`</b>
	Nitrile Fluorinated Rubber (FPM)	Elastomer options
	PTFE Enc	)
Silicon Carbide v	Silicon Carbide EPDM Nitrile Fluorinated Rubber (FPM) PTEE Enc	Elastomer options

#### Pos Qty* Description

Sea	l Comp	oonents
75	2	Wave spring
	12	Coil spring
	8	Coil spring
76	2	'O' Ring EPDM (Std)
·	2	Nitrile
	2 2	Fluorinated Rubber (FPM) PTFE
77	2	Rotary seal ring Carbon
77	2	Rotary seal ring Silicon carbide
78	2	Static seat stainless steel
78	2	Static seat silicon carbide
79	2	EPDM O-ring (Std)
	2	Fluorinated Rubber (FPM)
	2	PTFE Enc
85	2	Spring retainer
	2	Coil type spring retainer
86	4	Screw
	2	Screw
106	2	Dowel
	, ,	

* Quantity per pump







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#### 13.2 Pinned Mechanical Seal Externally Mounted

Flushing Assy Complete includes positions 87-99

#### Pos Qty* Description

#### Other seal parts

85	1	Spring retainer
86	4	Screw
87	2	Housing
88	2 2 2 2	O ring EPDM (Std) Nitrile Fluorinated Rubber (FPM) PTFE
89	4	Flushing tube
90	4	Screw
93	4	Heel stud
94	4	Dowel
95	2 2	Lip seal - Nitrile (Std) Lip seal - Fluorinated Rubber (FPM)
96	2	Housing
97	4	Screw
98	4	Dowel
99	2 2 2 2 2	O ring - EPDM (Std) O ring - Nitrile O ring - Fluorinated Rubber (FPM) O ring - PTFE







#### 13.3 Pressure Relief Valve Piston Type

Pos	Qty*	Description
35-	1	Belief valve, assy with cover
215		(mech op) EPDM
	1	Relief valve, assy with cover
		(mech op) EPDM
35	1	Front cover
201-	1	Relief valve, assy
215		(mech op) EPDM
	· 1	Relief valve, assy
		(mech op) Fluorinated Rubber (FPM)
201	1	O-ring - EP
202	1	Valve head, assy EP
203	3	Circlip
204	2	O-ring - EP
205	1	Guide pin
206	1	Spindle
207	1	Piston
208	1	O-ring - EP
209	1	Bush
210	1	Retaining wire
211	2	Blanking plug
212	1	Cannister, assy
214	1	Spring
215	1	Adaptor ring
35-	1	Relief valve, assy with cover
212		(air op) EPDM
	1	Relief valve, assy with cover
		(air op) Fluorinated Rubber (FPM)
35	1	Front cover
37	1	Joint plate
201-	212	Relief valve assy (air op) EPDM
		Relief valve assy (air op) (FPM)
201		O-ring - EP
202	1	Valve head, assy - EP
203	3	
204	2	O-ring - EP
205		Guide pin
200		Spindle
207	1	Pision Oring ER
200	4	O-Illig - EF Buch
210	1	Betaining wire
211	2	Blanking plug
212	1	Cannister assy
2121	'	Calmister assy
Opti	onal parts	s
230	1	Lever lift assy
231	1	Valve switch
	1	Microswitch Assy
Alter	native ma	aterials
2011	11	O-ring - (FPM)

- 202 1 Valve head, assy -(FPM)
- 204 1 O-ring (FPM)
- 208 1 O-ring (FPM)
  - *Quantity per pump

Recommended spare parts: Pos 202, 203, 201, 204, 208, 209, 210 Note : Position 230 for 2000 series require 5 pos 215







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#### 13.4 Pumps 1000, 1000X, 2000, 2000X

Pos	Qty⁺	Description
1	1	Gear housing - cast iron (Std)
2	1	Filler plug
3	1	Oil level glass - screw fit
4	1	Drain plug
5	2	Dowel
6	2	Oil seal - Nitrile
7	2	Oli Seai - (FPN) Bearing - outer
8	2	Bearing - inner
	2	Bearing assy (Pos 7 and 8)
9	2	Nut
10	2	Screw
11	2	Timing gear
12	1	Shim set
13/14	4	Bearing assy (Pos 13 and 14) Bearing set (Pos 7 8 13 14)
15	1	Bearing housing
16	2	Bearing retainer
17	4	Bolt
	6	Bolt
18	1	Shim set
19	2	Dowel - size 1
	2	Dowel - size 2
20	2	Dowel - Size 3
21	2	Oil seal - Nitrile (Std)
	2	Oil seal - (FPM)
	1	Oil seal set - Nitrile (Pos 6, 21)
	1	Oil seal set - (FPM) (Pos 6, 21)
22	1	Drive shaft (1000-2000)
	4	RH I nread - mech seal
	I	BH Thread - mech seal
	1	Drive shaft (1000-2000)
	-	RH Thread - packed seal
	1	Drive shaft (1100-2100)
		RH Thread - packed seal
	1	Drive shaft (1000-2000)
	4	LH Inread - mech seal
	1	LH Thread - mech seal
	1	Drive shaft (1000-2000)
		LH Thread - packed seal
	1	Drive shaft (1100-2100)
		LH Thread - packed seal
23	1	Lay shaft (1000-2000)
	4	hn Inread - mech seal
	1	RH Thread - mech seal
	1	Lay shaft (1000-2000)
		RH Thread - packed seal
	1	Lay shaft (1100-2100)
		RH Thread - packed seal

* Quantity per pump

Recommended spare parts: 6, 7, 8, 12, 13, 14, 18, 21, 27, 33, 34, 38 and shaft seals



#### Pumps 1000, 1000X, 2000, 2000X (cont.)

Pos	Qty*	Description
	1	Lay shaft (1000-2000)
		LH Thread - mech seal
	1	Lay shaft (1100-2100)
		LH Thread - mech seal
	1	Lay shaft (1000-2000)
		LH I hread - packed seal
	1	Lay shaft (1100-2100)
24	1	Kov
25	2	Key
26	2	Thrower ring - EPDM (Std)
20	2	Thrower ring- Nitrile
	2	Thrower ring - (FPM)
	2	Thrower disc - PTFE
27	1	Shim set
28	4	Retaining ring - EPDM (Std)
	4	Retaining ring - (FPM)
29	4	Stud
30	4	Nut
31	1	Rotorcase
32	4	Stud
33	2	Nut - STD rotors - RH Thread
	2	Nut - STD rotors - LH Inread
	2	Nut Hyllo rotors - RH Thread
34	2 1	loint ring - EPDM (Std)
04	1	loint ring - Nitrile
	1	Joint ring - (FPM)
	1	Joint ring - PTFE
35	1	Front cover
-	1	Front cover - heating jacket
36	4	Nut
	4	Nut - quick release
38	2	Strip bearing

Pos Qty* Description

#### TRILOBE ROTORS

	1
2	Rotor - stainless steel - 158°F
2	Rotor - stainless steel - 212°F
2	Rotor - stainless steel - 266°F
2	Rotor - stainless steel - 302°F

#### **TWINLOBE ROTORS**

2 2 2	Rotor - stainless steel - 158°F Rotor - stainless steel - 212°F Rotor - stainless steel - 266°F
2 2	Rotor - stainless steel - 266°F Rotor - stainless steel - 302°F
-	





#### Parts Not Shown

2 x Grub Screw - Rotor Nut 2 x Retaining Washer - Strip Bearing



#### 13.5 Pumps 3000 and 3000X

Pos	Qty*	Description
1	1	Gear housing - cast iron (std)
2	1	Filler plug
3	1	Oil level glass - screw fit
4	1	Drain plug
5	2	Dowel
6	2	Oil seal - Nitrile
-	2	Oil seal - Fluorinated Rubber (FPM)
1	2	Bearing - outer
0	2	Bearing - Inner
0	2	Nut
9 10	2	Screw
11	2	Timing dear
12	1	Shim set
13/14	4	Bearing assy (Pos 13 and 14)
10/14	1	Bearing set (Pos 7 8 13 14)
15		Bearing housing
16	2	Bearing retainer
17	8	Screw
18	1	Shim set
19	2	Dowel - size 1
	2	Dowel - size 2
	2	Dowel - size 3
20	4	Bolt
21	2	Oil seal - Nitrile (std)
	2	Oil seal - Fluorinated Rubber (FPM)
	1	Oil seal set - Nitrile (Pos 6, 21)
	1	Oil seal set - (FPM) (Pos 6, 21)
22	1	Drive shaft (3000) RH Thread - mech seal
	1	Drive shaft (3100) RH Thread - mech seal
	1	Drive shaft (3000) RH Thread - packed seal
		Drive shaft (3100) RH Thread - packed seal
	1	Drive shaft (3000) LH Thread - mech seal
	1	Drive shaft (3100) LH Thread - mech seal
	1	Drive shaft (3000) LH Thread - packed seal
23	4	Lov shaft (3000) PH Thread much soal
20	1	Lay shaft (3100) RH Thread - mech seal
	1	Lay shaft (3000) RH Thread - nacked seal
	1	Lay shaft (3100) RH Thread - packed seal
	1	Lay shaft (3000) LH Thread - mech seal
	1	Lay shaft (3100) LH Thread - mech seal
	1	Lav shaft (3000) LH Thread - packed seal
	1	Lay shaft (3100) LH Thread - packed seal
24	1	Key
25	2	Key
26	2	Thrower ring -EPDM (Std)
	2	Thrower ring -Nitrile
	2	Thrower ring -Fluorinated Rubber (FPM)
	2	Thrower disc - PTFE
	1	

*Quantity per pump

Recommended spare parts: Pos 6, 7, 8, 12, 13, 14, 18, 21, 27, 33, 34, 38 and shaft seals

.



#### Pumps 3000 and 3000X (cont.)

	1	ł
Pos	Qty*	Description
27	1	Shim set
28	4	Retaining ring - EPDM (Std)
	4	Retaining ring - Fluorinated Rubber (FPM)
29	4	Stud
30	4	Nut
31	1	Rotorcase
32	8	Stud
33	2	Nut - STD rotors - RH Thread
	2	Nut - STD rotors - LH Thread
	2	Nut - Hyflo rotors - RH Thread
	2	Nut - Hyflo rotors - LH Thread
34	1	Joint ring - EPDM (Std)
	1	Joint ring - Nitrile
	1	Joint ring - Fluorinated Rubber (FPM)
	1	Joint ring - PTFE
35	1	Front cover
	1	Front cover - heating jacket
36	8	Nut
	8	Nut - quick release
38	2	Strip bearing
39	2	Bearing cap
40	2	Joint ring -EPDM (Std)
:	2	Joint ring - Nitrile
	2	Joint ring - Fluorinated Rubber (FPM)
	2	Joint ring - PTFE
41	8	Screw

Qty⁺	Description
TRILOBE ROTOR	S
2	Rotor - stainless steel - 158°F
2	Rotor - stainless steel - 212°F
2	Rotor - stainless steel - 266°F
2	Rotor - stainless steel - 302°F
	DRS
0	Datar atsinlags steel 159%

2	Rotor - stainless steel - 158°C
2	Rotor - stainless steel - 212°C
2	Rotor - stainless steel - 266°C
2	Rotor - stainless steel - 302°C



Pumps 3000 and 3000X .



2 x Grub Screw - Rotor Nut

2 x Retaining Washer - Strip Bearing

### Information

This page may be used for notes concerning the normal handling of the valve.

#### 1. Notes

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