

**OPERATION AND**  
**MAINTENANCE MANUAL**  
**HPI PLUNGER PUMP**

**ISSUE 2**

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**SECTION 1**

**GENERAL DESCRIPTION**

## 1. GENERAL DESCRIPTION

### 1.1. HPI Plunger Pump

- 1.1.1. The HPI Plunger Pump is a fixed output single acting plunger pump. The pump consists of an electric motor driving a worm/worm wheel mesh gearbox with a crank/conrod mechanism. This reciprocates a plunger within a pump head assembly. Ball or poppet type suction and delivery valves are fitted to the pump head. The various engineering material options make the pump suitable for a wide range of chemicals. Typical applications are chemical injection, water treatment dosing, sampling or any other application where a positive liquid feed is required. The pump can be supplied stand alone or in a variety of custom built skid packages.
- 1.1.2. The standard pump duty range is 135 l/h at 248 bar to 750 l/h at 44 bar. The pressure range is set by the electric motor power rating. Standard motors are 4 pole IP 55 with a 415 VAC 3 phase 50 Hz supply. This gives a maximum stroke speed of 100 strokes/minute. Other motor options for hazardous environments or special projects are available on request.
- 1.1.3. The gearbox case is manufactured from cast iron. The standard construction of the pump head wetted parts is 316L stainless steel with a nitrile seals. Other materials are available on request. The standard units are suitable upto 100°C depending upon an adequate positive suction head.
- 1.1.4. The inlet and outlet port connections are 1/2" BSP for flows upto 295 l/h and 3/4" BSP for flows upto 750 l/h. Other port connections, i.e. NPT, flanges are available on request.
- 1.1.5. A full range of accessories including loading valves, relief valves and electrical starters are available from Grosvenor Pumps.

**SECTION 2**

**TECHNICAL DATA**

**2. TECHNICAL DATA**

**2.1. Pump Sizes**

7/8" x 2-1/2"	135 l/h @ 125 Bar (1.5 kW)
	135 l/h @ 165 Bar (2.2 kW)
	135 l/h @ 220 Bar (3 kW)
	135 l/h @ 248 Bar (4 kW)
1" x 2-1/2"	180 l/h @ 96 Bar (1.5 kW)
	180 l/h @ 124 Bar (2.2 kW)
	180 l/h @ 165 Bar (3 kW)
	180 l/h @ 206 Bar (4 kW)
1-1/8" x 2-1/2"	227 l/h @ 55 Bar (1.5 kW)
	227 l/h @ 82 Bar (2.2 kW)
	227 l/h @ 109 Bar (3 kW)
	227 l/h @ 150 Bar (4 kW)
1-1/4" x 2-1/2"	295 l/h @ 40 Bar (1.5 kW)
	295 l/h @ 62 Bar (2.2 kW)
	295 l/h @ 82 Bar (3 kW)
	295 l/h @ 113 Bar (4 kW)
1-3/8" x 2-1/2"	340 l/h @ 36 Bar (1.5 kW)
	340 l/h @ 55 Bar (2.2 kW)
	340 l/h @ 73 Bar (3 kW)
	340 l/h @ 100 Bar (4 kW)
1-1/2" x 2-1/2"	409 l/h @ 30 Bar (1.5 kW)
	409 l/h @ 45 Bar (2.2 kW)
	409 l/h @ 60 Bar (3 kW)
	409 l/h @ 82 Bar (4 kW)
1-5/8" x 2-1/2"	477 l/h @ 25 Bar (1.5 kW)
	477 l/h @ 38 Bar (2.2 kW)
	477 l/h @ 51 Bar (3 kW)
	477 l/h @ 71 Bar (4 kW)
1-3/4" x 2-1/2"	568 l/h @ 21 Bar (1.5 kW)
	568 l/h @ 32 Bar (2.2 kW)
	568 l/h @ 43 Bar (3 kW)
	568 l/h @ 60 Bar (4 kW)
1-7/8" x 2-1/2"	660 l/h @ 18 Bar (1.5 kW)
	660 l/h @ 27 Bar (2.2 kW)
	660 l/h @ 37 Bar (3 kW)
	660 l/h @ 51 Bar (4 kW)
2" x 2-1/2"	750 l/h @ 16 Bar (1.5 kW)
	750 l/h @ 24 Bar (2.2 kW)
	750 l/h @ 33 Bar (3 kW)
	750 l/h @ 44 Bar (4 kW)

Material		
Pump head		316L stainless steel
Seals	Standard	Nitrile
	Option	Viton
		PTFE
Inlet Port		
7/8" x 2-1/2" to 1-1/4" x 2-1/2"		1/2" BSP
Discharge Port		
1-3/8" x 2-1/2" to 2" x 2-1/2"		3/4" BSP
Suction Condition		Flooded

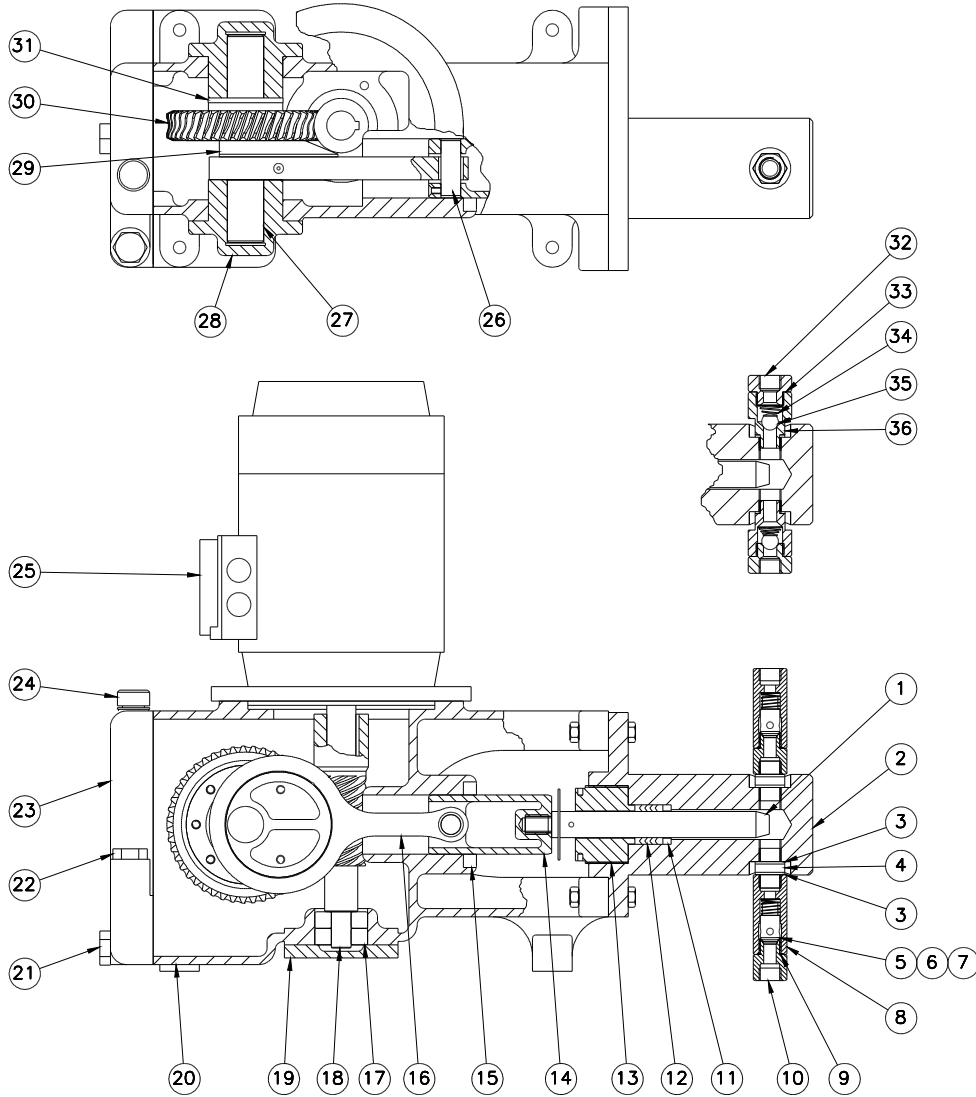
**2.2. Motor - Standard**

Type		IP 55 4 pole
Speed		1500 rev/min
Supply		
Standard		415 VAC/3 ph/50 Hz (star)
		240 VAC/3 ph/50 Hz (delta)
Optional		240 VAC/1 ph/50 Hz
Operation		Continuous

**2.3. Dimensions**

Weight	150 kg nett
Overall Length	675 mm
Overall Height	572 mm max.
Overall Width	248 mm

2.4. HPI Plunger Pump - Diagram of Parts



REF.	DESCRIPTION	PART No.	REF.	DESCRIPTION	PART No.
1	PLUNGER	998	20	GEARBOX	403
2	PUMP HEAD	995	21	DRAIN PLUG	71
3	SEAL, BONDED	115	22	FILL PLUG	470
4	UNION	120	23	CRANKCASE COVER	414
5	POPPET	CV47	24	BREATHER	527
6	SPRING	CV 44	25	MOTOR	640
7	O-RING, POPPET	CV 46	26	CROSS HEAD PIN	461
8	VALVE BODY	CV 43	27	MAIN SHAFT	460
9	O-RING, VALVE BODY	CV 45	28	MAIN BEARING	466
10	VALVE SEAT	CV 42	29	ECCENTRIC	459
11	NECK RING	980	30	WORM WHEEL	1026
12	PLUNGER SEAL PACKING	295	31	THRUST WASHER	458
13	GLAND NUT	952	32	VALVE TOP	742
14	CROSS HEAD	405	33	O-RING, VALVE TOP	745
15	OIL RETAINER	379	34	SPRING	684
16	CON ROD	408	35	BALL $\phi 5/8"$	752
17	BEARING, BOTTOM	509	36	VALVE BODY	1029
18	WORM	1025			
19	BEARING COVER	406			



2.5. Installation Detail - HPI Plunger Pump - GP1244 latest issue

<p>DRAWING NUMBER: GP1244/A3/1</p>	<p>PROJECTION</p>	<p>MATERIAL: 316L STAINLESS STEEL PUMP HEAD: NITRILE SEALS: 1'C MIN. 100" MAX. - 316L TEMPERATURE: 150 kG WEIGHT: 676</p>	<p>MOTOR (STD) TYPE: TEFC IP55 4 POLE SUPPLY: 415 VAC/3 PHASE/50Hz OPERATION: CONTINUOUS</p> <p>MOTOR CAN BE ROTATED 90° INCREMENTS TO PROVIDE ALTERNATIVE TERMINAL BOX POSITIONS.</p>	<p>DELIVERY PORT</p> <p>SUCTION PORT</p> <p>Ø16</p>	<p>4 MTC. HOLES</p> <p>Ø16</p>	<p>DATA SHOWN IS FOR STANDARD ASSEMBLY ONLY. CONTACT GROSVENOR PUMPS FOR FULL DETAILS</p>	<p>SHEET 1 OF 1</p> <p>TITLE: HPI PLUNGER PUMP INSTALLATION DETAILS</p>	<p>FILE: \PUMP\HPI\INST\GP1244</p> <p>DIMENSIONS IN MM</p> <p>ORIGINAL SCALE - 1:8</p>	<p>REMOVE ALL BURRS AND SHARP EDGES. DO NOT SCALE IF IN DOUBT ASK.</p> <p>A3</p>	<p>1 23 FEB 99 REDRAWN CHU</p> <p>0 26 JUL 93 ORIGINAL ISSUE JTL</p> <p>ISSUE DATE ALTERATION SIGN</p>	<p>PART NUMBER: GP1244/A3/1</p> <p>DRAWING NUMBER: GP1244/A3/1</p>																																																																																																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">PUMP SIZE</th> <th rowspan="2">PORT SIZE BSP</th> <th rowspan="2">DIMN 'B'</th> <th rowspan="2">FLOW L/H</th> <th colspan="3">PRESSURE BAR</th> </tr> <tr> <th>1.5 kW</th> <th>2.2 kW</th> <th>3 kW</th> <th>4 kW</th> </tr> </thead> <tbody> <tr> <td>7/8" x 2-1/2"</td> <td>1/2"</td> <td>286</td> <td>135</td> <td>125</td> <td>165</td> <td>220</td> <td>248</td> </tr> <tr> <td>1" x 2-1/2"</td> <td>1/2"</td> <td>286</td> <td>180</td> <td>96</td> <td>124</td> <td>165</td> <td>206</td> </tr> <tr> <td>1-1/8" x 2-1/2"</td> <td>1/2"</td> <td>288</td> <td>227</td> <td>55</td> <td>82</td> <td>109</td> <td>150</td> </tr> <tr> <td>1-1/4" x 2-1/2"</td> <td>1/2"</td> <td>292</td> <td>295</td> <td>40</td> <td>62</td> <td>82</td> <td>113</td> </tr> <tr> <td>1-3/8" x 2-1/2"</td> <td>3/4"</td> <td>388</td> <td>340</td> <td>36</td> <td>55</td> <td>73</td> <td>100</td> </tr> <tr> <td>1-1/2" x 2-1/2"</td> <td>3/4"</td> <td>392</td> <td>409</td> <td>30</td> <td>45</td> <td>60</td> <td>82</td> </tr> <tr> <td>1-5/8" x 2-1/2"</td> <td>3/4"</td> <td>396</td> <td>477</td> <td>25</td> <td>38</td> <td>51</td> <td>71</td> </tr> <tr> <td>1-3/4" x 2-1/2"</td> <td>3/4"</td> <td>398</td> <td>568</td> <td>21</td> <td>32</td> <td>43</td> <td>60</td> </tr> <tr> <td>1-7/8" x 2-1/2"</td> <td>3/4"</td> <td>402</td> <td>660</td> <td>18</td> <td>27</td> <td>37</td> <td>51</td> </tr> <tr> <td>2" x 2-1/2"</td> <td>3/4"</td> <td>404</td> <td>750</td> <td>16</td> <td>24</td> <td>33</td> <td>44</td> </tr> <tr> <td>DIMN 'A'</td> <td></td> <td></td> <td></td> <td>549</td> <td>558</td> <td>558</td> <td>572</td> </tr> </tbody> </table>		PUMP SIZE	PORT SIZE BSP	DIMN 'B'	FLOW L/H	PRESSURE BAR			1.5 kW	2.2 kW	3 kW	4 kW	7/8" x 2-1/2"	1/2"	286	135	125	165	220	248	1" x 2-1/2"	1/2"	286	180	96	124	165	206	1-1/8" x 2-1/2"	1/2"	288	227	55	82	109	150	1-1/4" x 2-1/2"	1/2"	292	295	40	62	82	113	1-3/8" x 2-1/2"	3/4"	388	340	36	55	73	100	1-1/2" x 2-1/2"	3/4"	392	409	30	45	60	82	1-5/8" x 2-1/2"	3/4"	396	477	25	38	51	71	1-3/4" x 2-1/2"	3/4"	398	568	21	32	43	60	1-7/8" x 2-1/2"	3/4"	402	660	18	27	37	51	2" x 2-1/2"	3/4"	404	750	16	24	33	44	DIMN 'A'				549	558	558	572										
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2.6. Wiring Diagram GP1204 latest issue

DRAWING NUMBER GP1204/A3/1	 PROJECTION	<p>CONNECTION DIAGRAM FOR 3 PHASE SINGLE SPEED INDUCTION MOTOR</p> <p>6 LEADS FOR STAR (Y) OR DELTA (Δ)</p> <p>No. 3Y DIRECT-ON STAR (Y)          LINK W2 TO U2 TO V2          SUPPLY TO U1,V1,W1</p> <p>H          HEATER</p> <p>CONNECT TO SINGLE PHASE VOLTAGE SUPPLY</p>	SHEET 1 OF 1	TITLE WIRING CONNECTIONS ALL PUMPS & MIXER MOTORS
		 <b>GROSVENOR</b> PUMPS LTD 8 SHAFTESBURY INDUSTRIAL CENTRE, THE RUNNINGS, CHELTENHAM, GLOS GL51 8NH, ENGLAND.	 PART NUMBER GP1204/A3/1	
		FILE:\COMPINTS\MOTOR\GP1204 DIMENSIONS IN MM ORIGINAL SCALE N/A	CHU JTL SIGN	
		A3	REMOVE ALL BURRS AND SHARP EDGES. DO NOT SCALE IF IN DOUBT ASK.	
		THIS DRAWING IS CONFIDENTIAL AND IS THE PROPERTY OF GROSVENOR PUMPS LTD. AND IS NOT TO BE REPRODUCED EITHER WHOLLY OR PARTLY WITHOUT PERMISSION. COPYRIGHTS ARE RESERVED.		

**SECTION 3**

**SAFETY**

### 3. SAFETY

#### 3.1. Standard Precautions

- 3.1.1. To comply with normal safety standards, the following measures are to be taken:
- 3.1.2. A minimum issue of standard protective clothing to be available to all personnel involved in the handling of chemicals and operation of the dosing plant, consisting of:
- 3.1.3. Goggles - with wide-angle vision, contact the skin in complete seal around both eyes and adequately vented without allowing access to spillage.
- 3.1.4. Safety helmet - of metal or reinforced plastic to the relevant British Standard or equivalent.
- 3.1.5. Gloves - wrist length, of soft PVC or rubber permitting full flexure.
- 3.1.6. Overalls - to be worn in conjunction with the items above or a one-piece chemical suit.
- 3.1.7. Standard site safety provisions, safety precautions and first aid instructions, in condensed form shall be declared at site and in site vehicles. All employees shall be in possession of literature giving full details of safety precautions and first aid action.
- 3.1.8. Ensure that the nature and properties of the chemical being handled are known in advance.
- 3.1.9. Ensure that the correct precautions for the chemical being handled are observed. IF IN DOUBT ASK.
- 3.1.10. Treat all materials as harmful.
- 3.1.11. Do not touch chemicals or residues with bare hands.
- 3.1.12. Maintain personal cleanliness.
- 3.1.13. Wash contaminated clothing before re-use.
- 3.1.14. Wash thoroughly after handling chemicals. Do not eat drink or smoke unless decontaminated.
- 3.1.15. Erect WARNING barriers where necessary.
- 3.1.16. Follow specific process instruction carefully.
- 3.1.17. Mix chemicals in the order specified.
- 3.1.18. **CAUTION: CHEMICALS CAN BE HARMFUL. PLEASE OBSERVE MANUFACTURER'S HANDLING AND STORAGE GUIDELINES.**
- 3.1.19. Health Hazards - Harmful in contact with the skin and irritating to the eyes.
- 3.1.20. Handling - Avoid contact with the skin and eyes. Wear suitable protective clothing gloves and eye protection. Wash out empty container thoroughly with water and add solution to system being treated.
- 3.1.21. Storage - Keep container in a cool, well ventilated place. Keep away from source of ignition. NO SMOKING.
- 3.1.22. Spillage and Disposal - Shut off all sources of ignition. Absorb spillage in earth and sand, collect up and remove all contaminated clothing. Eye exposure; in case of contact with eyes, rinse immediately with copious quantities of water. Ingestion; remove patient to fresh air, rest and warm. Administer oxygen or artificial respiration as necessary.

**SECTION 4**

**INSTALLATION, COMMISSIONING & OPERATION**

## **4. INSTALLATION, COMMISSIONING & OPERATION**

### **4.1. Mounting**

- 4.1.1. For maximum operating life, the pump should be located in a clean cool dry environment. If the site is classified as a hazardous area ensure the pump meets the site requirements. Position the pump on a rigid base preferably as low as possible relative to the supply for the optimum suction condition. Fix the pump gearbox firmly to the base using four suitable floor bolts.
- 4.1.2. If the pump is to be installed in an aggressive, hot, dirty environment, it is advisable to provide some cover. However it is essential to leave adequate ventilation for motor cooling. Do not obstruct the motor fan cover.

### **4.2. Pipe Connections**

- 4.2.1. The suction pipe sizes should be larger than the port connection. The number of pipe bends should be kept to a minimum to reduce flow losses, pulsation and water hammer effects. Increase the pipe size if long pipe runs are unavoidable. If water hammer is present, fit a pulsation damper unit in the delivery pipe line as close to the pump as possible. For technical advice, please refer to Grosvenor Pumps.
- 4.2.2. In favourable conditions, the pump will self-prime. However, if difficulties are experienced with priming, loosen/remove the delivery valve sub-assembly, fill the pumping chamber with the pumped liquid and refit the valve. Appropriate care should be taken if the liquid is harmful.
- 4.2.3. Allow sufficient time while filling large diameter and/or long pipe lengths to build up hydraulic pressure. If the pressure does not increase, check:-
  - All joints are tight and fully sealed and any dump/flushing valves are shut.
  - The relief valve is adjusted to the correct pressure.
  - The suction and delivery lines are connected to the correct pump ports.
  - The liquid is free of large debris and contaminants. Large solids will reduce valve efficiency. Fit a suction strainer/filter.
  - Entrapped air pockets. Bleed the system.
- 4.2.4. If there is a high suction head present, a loading valve may be required to prevent syphoning.

### **4.3. Gearbox Oil**

- 4.3.1. Note the pump gearbox is supplied without lubrication oil. Unscrew the breather unit and fill the gearbox with a sufficient quantity of suitable oil (refer to Section 5 - Maintenance for approved lubricants). The level should be no higher than the oil level plug.

### **4.4. Electrical**

- 4.4.1. Before beginning any electrical work, isolate the supply at the mains.
- 4.4.2. Open the motor terminal box. Connect a suitably rated power supply to the motor. Use suitable power multi-core power cable with a cable gland nut. Fasten the power leads firmly to the terminal points. Always connect the supply earth lead.

- 4.4.3. Three phase motors can be controlled by a direct on-line starter or a frequency inverter. The standard motors can be wired in star or delta with a corresponding voltage variation e.g. either 415 VAC or 240 VAC. Therefore check the power supply.
- 4.4.4. The motor rotation should be clockwise when viewed from the fan side. For three phase supply, if the rotation is anti-clockwise, change any two of the three supply phases over.
- 4.4.5. As the pump will operate upto the motor stalling point, it is recommended that an electrical overload trip device is fitted and/or a hydraulic relief valve fitted in the delivery line. To allow for start-up current surge, current trips should be 6 to 7 times the full load motor current. If the supply is from a frequency inverter, the motor should be specified with a thermistor which is compatible with the frequency inverter. Unless a blower is fitted to the motor, turndown must be limited to 3:1 with an inverter.

#### **4.5. Commissioning**

- 4.5.1. After pipe and electrical installation has been completed run the pump between 30 and 60 minutes at minimum hydraulic load and flow. Examine the entire hydraulic system including the pump for any leakages. Check the pump for unusual noises and vibration. For the first 14 days operation, expect the pump gearbox to run at a temperature of 65-70°C. This will in no way affect the overall pump performance.
- 4.5.2. If difficulties are experienced with priming, remove the delivery valve, fill the pumping chamber with the pumped liquid and refit the valve. Appropriate care should be taken if the liquid is harmful.
- 4.5.3. Allow sufficient time to fill large diameter and/or long pipe lengths to build up hydraulic pressure. If the pressure does not increase, check:-
  - (i). All joints are tight and fully sealed and any dump/flushing valves are shut.
  - (ii). The relief valve is adjusted to the correct pressure.
  - (iii). The suction and delivery lines are connected to the correct pump ports.
  - (iv). The liquid is free of large debris and contaminants. Large solids will reduce valve efficiency. Fit a suction strainer/filter.
  - (v). Entrapped air pockets. Bleed the system.
- 4.5.4. If there is a high suction head present, a loading valve may be required to prevent syphoning.

#### **4.6. General Operation**

- 4.6.1. After successfully commissioning as detailed in Section 4.5., the pump can commence full operational duty. Before switching on the pump check all isolating valves are open. Likewise switch off the pump before closing an isolating valve.
- 4.6.2. To avoid damaging the plunger packing do not allow the pump to run dry.
- 4.6.3. Check the system for water and chemical leaks.
- 4.6.4. Check the pump for excessive noise, vibration and overheating.

- 4.6.5. Ensure that all associated instruments are functioning correctly and that their indications are accurate and meaningful.
- 4.6.6. Operate the pump within the duty specified in the original order. Please note that the performance data specified in section 2.1. is the maximum capable for each pump.
- 4.6.7. Check the pump will operate satisfactorily if it is to be used for another duty, i.e. different liquid, pressure, environment, power supply.
- 4.6.8. Always handle the pump by gripping the gearbox case and the pump head and not by the valves or any pipework attached to the pump head.

#### **4.7. Speed Variator and Flow Control**

- 4.7.1. The speed variator allows the flow to be varied by controlling the motor speed into the pump gearbox. The speed can be varied over a range of 0% to 100% by turning the handwheel. The number of rotations is shown on a gravity dial indicator set within the handwheel.
- 4.7.2. The orientation of the speed variator and the motor can be rotated in 90° increments to suit the individual application.



**SECTION 5**

**MAINTENANCE**

## **5. MAINTENANCE**

### **5.1. Safety**

- 5.1.1. **CAUTION: BEFORE STARTING ANY MAINTENANCE PROCEDURE, ENSURE THAT ALL SAFETY INSTRUCTIONS DETAILED IN THE CURRENT WORKS MANUAL AND STANDARD PROCEDURES HAVE BEEN COMPLIED WITH.**

### **5.2. General Maintenance**

- 5.2.1. General maintenance is an oil change every 6 months. If the pump is in continuous operation at maximum duty, a detailed inspection of parts will be required at 12 month intervals. The pump unit is best dismantled in a fully tooled workshop. Full spares and any special tools are available from Grosvenor Pumps. Full refurbishment can be carried out by Grosvenor Pumps engineers. Contact Sales Dept for a quotation.

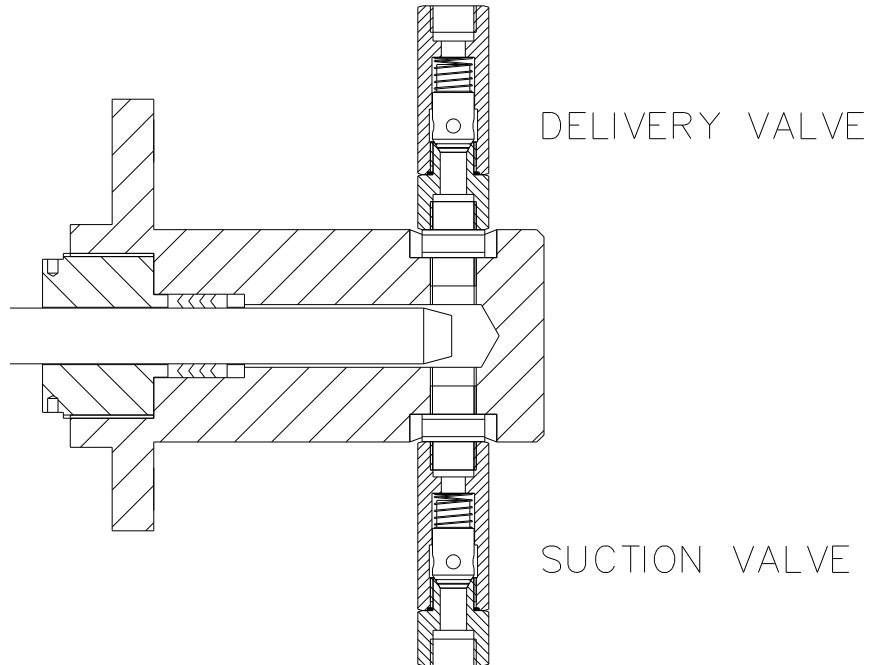
### **5.3. Motor**

- 5.3.1. Isolate electric supply, disconnect wires from terminal box. After removing the flange bolts, the motor lifts off the mounting flange. The motor shaft is located in the worm with a close tolerance fit and may require some considerable force to separate it from the gearbox. The motor is non-serviceable.
- 5.3.2. To refit the motor, insert the shaft into the worm, ensuring the key (1085) is not displaced. Press the motor fully down onto the mounting flange. Retighten the motor flange bolts.
- 5.3.3. Reconnect the wiring to ensure rotation is clockwise when viewing motor on the fan end.

### **5.4. Speed Variator (if fitted)**

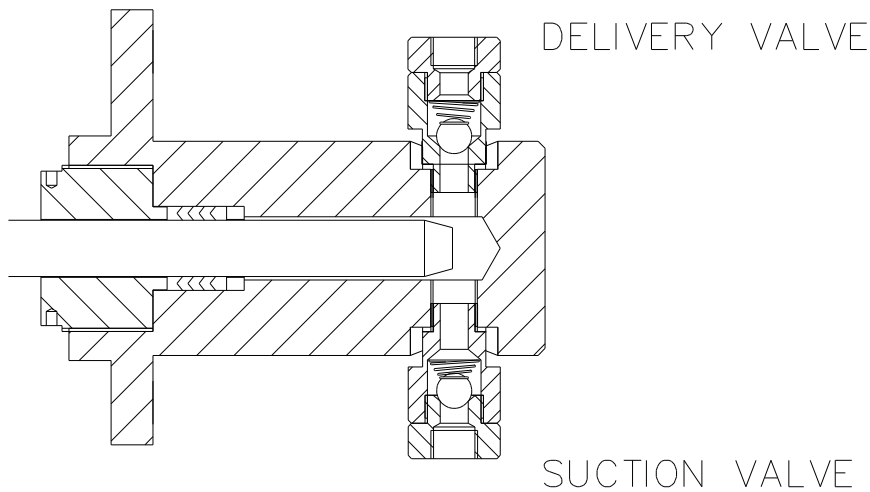
- 5.4.1. The speed variator can be removed from the pump gearbox by unscrewing the four screws. Normally the worm will lift off with the speed variator output shaft. It is a sliding fit but the worm can seize itself onto the variator output shaft. Use lever bars and releasing fluid to ease off the worm. Applying heat from a blow torch to the worm is permissible but care must be taken not to damage the speed variator aluminium body. Do not damage the worm teeth. The speed variator is non-serviceable.
- 5.4.2. To replace the speed variator, position the speed variator over the pump gearbox. Line up the speed variator output shaft key with the worm keyway and lower the speed variator onto the pump gearbox. Ensure the key is not displaced and the speed variator sits fully down on the gearbox flange before tightening the four screws.
- 5.4.3. The speed variator is non-serviceable. A replacement speed variator is available from Grosvenor Pumps.

**5.5. Poppet Suction and Delivery Valves Assemblies**



- 5.5.1. Note the orientation of the parts which make up the suction and delivery valve assemblies. Unscrew the valve assembly from the pump head. Separate the valve body (CV 43) from the valve end (CV 42). Examine all parts for wear and/or damage. Always renew the valve body O-rings (CV 45) and valve poppet O-rings (CV 46).
- 5.5.2. Check the poppets and valve ends are replaced in the respective valve bodies in their correct suction or delivery orientation. Tighten the valve assemblies to 15 Nm.

**5.6. Ball Suction and Delivery Valves Assemblies**



- 5.6.1. Note the orientation of the parts which make up the suction and delivery valve assemblies. Unscrew the valve assembly from the pump head. Separate the valve body (1029) from the valve top (742). Examine all parts for wear and/or damage. Always renew the valve body O-rings (745).
- 5.6.2. Check the balls and springs are replaced in the respective valve bodies in their correct suction or delivery orientation. Tighten the valve assemblies to 15 Nm.

### 5.7. Pump Head Assembly

- 5.7.1. To remove the pump head assembly, first disconnect the suction and discharge piping at the pump valve connection.
- 5.7.2. Slacken the gland nut (952).
- 5.7.3. Remove the four screws securing the pump head (995) to the gearbox (403). All parts are now accessible for examination and replacement if necessary.
- 5.7.4. Unscrew the plunger (995) from the crosshead (405). Examine for surface wear. Light marking can be polished out with a fine metal polish. Deep scoring or corrosion damage will require a replacement plunger. Refit the plunger with a thread sealant e.g. Loctite 270 or an equivalent.
- 5.7.5. Unscrew the gland nut. Extract the chevron packing set (295) and the neck ring (980) if fitted. Examine for wear damage and replace as required.
- 5.7.6. Reassemble in the reverse order referring to RG511 ensuring the correct orientation of the chevron packing set and the neck ring. Screw the gland nut loosely back onto the pumphead. Wet the plunger and gently ease the pumphead over the plunger. Secure the pumphead to the gearbox with the four screws retighten to 20 Nm.
- 5.7.7. Reconnect the suction and delivery pipework.
- 5.7.8. Check the chevron packing sealing integrity. Hand tighten the gland nut. Then give turn it 15°. Start the pump with minimum hydraulic load. Check for leakage at the gland nut. If the leakage is persistent, adjust 15° every 15 minutes until the leakage is reduced. When the pump is fully recommissioned it may be necessary to periodically retighten the gland nut. For long plunger packing life it is acceptable to have slight gland leakage. The packing relies on the liquid it is sealing for lubrication. Never overtighten the gland nut otherwise the packing will run dry and wear out. Should any gland leakage be greater than 1 drop per second, tighten the gland nut by 15°. Run the pump and observe any leakage. Repeat as required until the leakage is at an acceptable level. If the Gland still leaks badly after a full turn, the packing will need replacing.

### 5.8. Gearbox Assembly

- 5.8.1. It is impractical to service the gearbox assembly with the pump is still mounted on the skid base frame. Work is carried out after removing the complete motor as in 5.3. and pump head assembly 5.7..
- 5.8.2. Drain the gearbox oil by removing the drain plug (71). Remove the crankcase cover (414). If fitted, remove the top bearing (454). On the bottom face of the pump gearbox, unscrew the three capscrews holding the bottom bearing cover (406). Press out the two worm bearings (445) in the bottom bearing housing.

Remove the two lock grubscrew in the eccentric (459). Remove the two main bearings (466) and push out the main shaft (460). Pull out the connecting rod (408) and crosshead (405). Remove the crosshead pin lock screw and push out the crosshead pin (461).

5.8.3. Examine all parts for severe wear or damage. Replace any parts as required.

5.8.4. Reassembly of gearbox is reverse of 5.8.2.. Replace all gaskets and seals.

### **5.9. Final Assembly**

5.9.1. Fit the motor.

5.9.2. Fit nameplate and crosshead guard

5.9.3. Connect wiring to give correct rotation.

5.9.4. Run-in for the gearbox for 2 hours. Drain the gearbox and refill with fresh oil.

5.9.5. Replace pumphead and valve assemblies. The complete pump is ready for commissioning. Check the pump for unusual noises and vibration. For the first 14 days operation, expect the pump gearbox to run at a temperature of 65-70°C. This will in no way affect the overall pump performance.

### **5.10. Spare Parts**

5.10.1. Spare parts can be identified to drawing by part number. Always quote pump serial number which can be found on pump crankcase cover. Parts should be ordered from:-

**Grosvenor Pumps Limited,  
Trevoole, Praze,  
Camborne, Cornwall. TR14 0PJ  
Tel.01209 831500 Fax. 01209 831939**

### **5.11. Lubrication**

5.11.1. The pump is empty when supplied, but should be filled before commissioning. Recommended grades are shown on pump nameplate for major oil companies. Equivalent grades for other oil companies are listed here. The oil level is determined by level plug and should be checked weekly. Change approximately every 6 months. All gearbox parts are lubricated by splash. Motor bearings are fully charged with grease for life by manufacturer.

**Oil capacity - 5 litres Approx.**

### **5.12. Approved Lubricants**

5.12.1. Oil grades based on ambient temperatures, suitable for normal applications. The recommendations are based on current information available and responsibility cannot be accepted for quality or suitability of oil supplied nor to any mechanical defect due to unsatisfactory lubrication.

5.12.2. Oils marked \* contain mild E.P. additives and should not be used for units operating above 80°C normal running temperatures.

**SUPPLIER**

BP Oil Ltd.

Burmah - Castrol (UK) Ltd.

Esso Petroleum Ltd.

Mobil Oil Co. Ltd.

Shell

Texaco Ltd.

**OILS**

Energol HLP 320

Energol CS 320 \*

Hypogear 90 EP #

Alpha ZN 320

Castrol ST 90 #

Hypoy EP 90 #

Teresso 320

GX 85W/90

DTE AA

HD 140 #

GX 140 #

Vitrea 320 \*

Macoma R 320 \*

Tellus V320

HD 90/140#

Regal R &amp; O 320