

Godwin

Dri-Prime[®] Pumps

Operation and Maintenance Manual

End Suction range

CD and HL pumps



Pump Serial No.

S53074

The Declaration of Conformity covers pumps supplied as self contained packaged sets.



Declaration of Conformity



The Manufacturer Godwin Pumps Ltd.
Quenington
Cirencester
Gloucestershire
GL7 5BX
United Kingdom

hereby declares that the machinery described below: -
Dri-prime® pump sets of the CD and HL ranges – details as per the serial
number plate fixed to the pump itself

complies with the provisions of the Machinery Directive (Directive 89/392/EEC as amended) and the
regulations transposing it into national law.

It also complies with the following Harmonised Standards: -
EN 292-1 Safety of machinery: Basic terminology, methodology
EN 292-2 Safety of machinery: Technical Principles and specifications
EN 292-2/A1 Safety of machinery: Technical Principles and specifications – Amendment 1
EN 809 Pumps and pump units for liquids – Common safety requirements
EN-60204-1 Safety of Machinery- Electrical equipment: General Requirements

Signed  D C Braithwaite Technical Director

Date 31/03/05

The Declaration of Incorporation covers pumps supplied as bare shaft units



Declaration of Incorporation



The Manufacturer Godwin Pumps Ltd.
Quenington
Cirencester
Gloucestershire
GL7 5BX
United Kingdom

hereby declares that the machinery described below: -
Dri-prime® bare shaft pump ends of the CD and HL ranges – details as per the
serial number plate fixed to the pump itself

may not be put into service before the machinery in which it will be incorporated is declared to comply
with the provisions of Directive 89/392/EEC as amended, and with the regulations transposing it into
national law.

It complies with the following Harmonised Standards: -
EN 292-1 Safety of machinery: Basic terminology, methodology
EN 292-2 Safety of machinery: Technical Principles and specifications
EN 292-2/A1 Safety of machinery: Technical Principles and specifications – Amendment 1
EN 809 Pumps and pump units for liquids – Common safety requirements
EN-60204-1 Safety of Machinery- Electrical equipment: General Requirements

Signed  D C Braithwaite Technical Director

Date 31/03/05

1	Introduction	4
2	How to use this Handbook	4
3	Safety	5
4	Pump Serial Number	6
4.1	Spares.....	6
5	Installation	7
5.1	Versions	7
5.1.1	Motor Adaptor.....	7
5.1.2	Bearing Bracket.....	7
5.2	Alignment	7
5.2.1	Alignment Procedure.....	8
5.3	General Installation Notes	8
6	Operation	10
6.1	General	10
6.2	Flooded Suction	10
6.3	Draining.....	11
7	Maintenance	12
7.1	Bearings	12
7.1.1	Re-greasing procedure.....	12
7.2	Mechanical Seal.....	13
7.2.1	Seal oil level.....	13
7.2.2	Seal removal	14
7.2.2.1	Front cover & pump body removal	14
7.2.2.2	Removing the impeller.....	15
7.2.2.3	Removing the rear wearplate	16
7.2.2.4	Seal configuration.....	16
7.2.2.5	Removing the seal.....	16
7.2.2.6	Inspection	17
7.2.3	Seal fitting	18
7.2.3.1	Fitting the seal	18
7.2.3.2	Fitting the wearplate	20
7.2.3.3	Fitting the impeller.....	20
7.2.3.4	Front cover & pump body fitting	20
7.2.3.5	Preparing for service	21
7.3	Bearing Bracket & Motor Adaptor Dismantling	21
7.3.1	CD75, CD80D, CD80M, CD100M, CD103M, CD140M, CD150M, CD160M, CD180M, CD200M, CD225M & CD250M.....	21
7.3.2	HL80, HL100M, HL110M, HL125M, HL150M & HL200M	22
7.3.3	Open Coupled CD300M & CD400M	22
7.3.4	HL130M, HL160M, HL225M, HL250M & close coupled CD300M	22
7.4	Bearing Bracket & Motor Adaptor Assembly	23
7.4.1	CD75 & CD80D MA Units.....	23
7.4.2	CD80M, CD100M, CD150M & CD200M MA & BB Units; CD75 BB Units; CD103M MA Units	23
7.4.3	CD140M, CD160M, CD180M & HL110M MA Units & All CD225, CD250M, HL100M, HL125MS, HL150M, HL150MHD & HL200M Units	24
7.4.4	CD300M, CD400M, HL130M, HL160M, HL225M & HL250M	25
7.5	Air Compressor	26
7.5.1	Filter Replacement	26
7.6	Vacuum Pump.....	26
7.6.1	Non Return Valve.....	26
7.7	Drive Belts.....	26
7.7.1	Timing/HTD Belt Replacement (air compressor).....	26
7.7.2	Belt Replacement (vacuum pump).....	26
7.7.3	Link belt tensioning and replacement.....	27
8	Special Tools	29
8.1	Tool Kits	29
8.2	Special Tools.....	29
9	Warranty	29
10	Fault Finding	30
11	Technical Data	31
11.1	Designations, Sizes & Capacities	31
11.2	CD Range data.....	32
11.3	HL Range data	33
11.4	Spanner Torques.....	34
11.5	Thread Locking Compounds	34
11.6	Belt Tensioning.....	35
11.6.1	Force and deflection method	35
11.6.2	Belt frequency method.....	35
11.6.3	Belt tension figures –HTD/Timing belts	35
11.6.4	Belt tension figures Link	35

1 Introduction

The purpose of this Installation, Operating and Maintenance Handbook is to provide the owner or user of the equipment with sufficient information to carry out those tasks on the CD and HL range of Dri-Prime® Pumps.

Pump models covered: -

CD75	CD103M	CD180M	CD400M	HL125MS	HL130M
CD80D	CD140M	CD225	HL80	HL150M	HL160M
CD80M	CD150M	CD250M	HL100	HL150MHD	HL225M
CD100M	CD160M (Mk1 & 2)	CD300M	HL110M	HL200M	HL250M

This handbook covers many pumps. The user must ensure that they are reading the correct instructions and viewing the correct diagrams for the unit they are working on.

Installation and maintenance is designed to be carried out using simple hand and service tools. A range of special tools designed to ease dismantling and reassembly is available from Godwin Pumps Ltd. When the user has insufficient tools, experience or ability, this work should not be attempted. Under no circumstances should makeshift tools or equipment be used, as this may adversely affect safe working practices and pump operation.

Ensure that suitably qualified personnel carry out the installation. The variety of conditions and environments in which this equipment can be used means that the operator and those responsible must satisfy themselves as to the safety and acceptability of each application and operating condition of this equipment. Standard pumps are designed for use with predominately clean or dirty water. For all other applications, including sea water, consult Godwin Pumps Ltd. Under no circumstances will Godwin Pumps Ltd be responsible or liable for indirect or consequential damages arising from the use or application of this equipment.

The pump may be supplied as a bare shaft pump end or completely packaged into a self contained pump set. This handbook covers the pump end only. For packaged pump sets, information on equipment other than the pump end is contained in separate documentation.

Parts that have not been approved by Godwin Pumps Ltd cannot be relied upon for correct material, dimensions or finish. Godwin Pumps Ltd cannot therefore be held responsible for any damage arising from the use of such parts. This and failure to observe any instruction or procedure in this handbook will invalidate the warranty.

The information contained in this handbook was correct at the time of publication. It is subject to amendment at any time. Should any doubt exist about the veracity of the information, contact Godwin Pumps Ltd for clarification before proceeding.

2 How to use this Handbook

Read this section before installing, operating or carrying out any maintenance on the unit.

When the pump is being installed operated or maintained there are a number of practices that may lead to personal injury or product damage. Your attention is drawn to the following symbols used throughout this handbook.



CAUTION

This caution symbol draws attention to special instructions or procedures which, if not correctly followed, may result in damage to, or destruction of equipment.



WARNING

This warning symbol draws attention to special instructions or procedures which, if not strictly observed, may result in personal injury.



WARNING

A WARNING SYMBOL WITH THIS TYPE OF TEXT DRAWS ATTENTION TO SPECIAL INSTRUCTIONS OR PROCEDURES WHICH, IF NOT STRICTLY OBSERVED, MAY RESULT IN SEVERE PERSONAL INJURY, OR LOSS OF LIFE.

NOTE: - A note is used to draw your attention to additional important information.

3 Safety



WARNING

ALL ITEMS IN THIS SECTION, IF NOT STRICTLY OBSERVED, COULD RESULT IN SEVERE PERSONAL INJURY OR LOSS OF LIFE.

Use only lifting equipment of suitable capacity for the size and weight of the equipment being lifted

The equipment must always be lifted using safe working practices and in accordance with any local and national guidelines or statutes. Figure 1, Figure 2 and Figure 3 show possible means of lifting. They are intended for guidance only. If in doubt, consult Godwin Pumps Ltd or a local lifting expert.

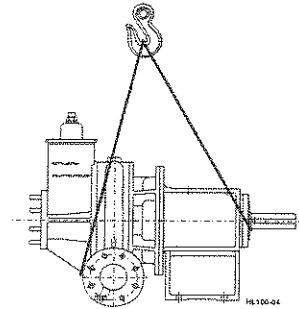
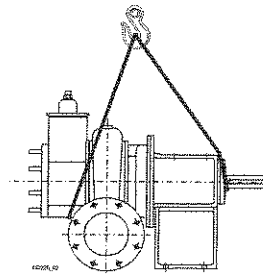
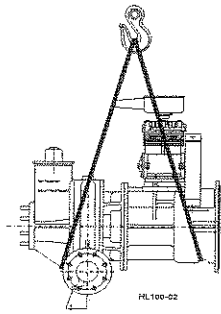
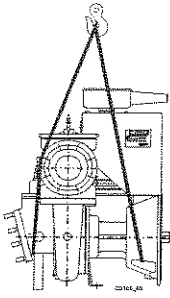


Figure 1 Lifting method for smaller motor adaptor units

Figure 2 Lifting method for smaller bearing bracket units

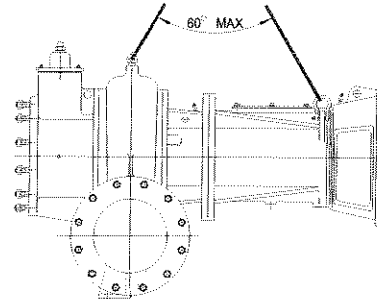
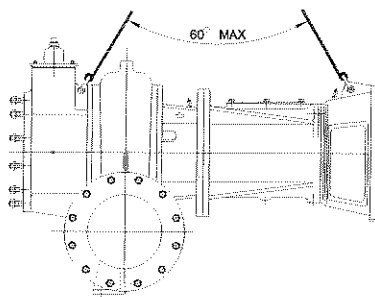
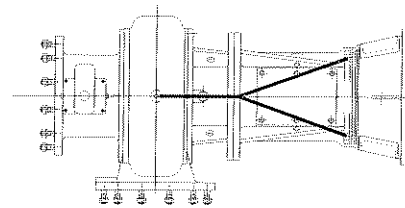
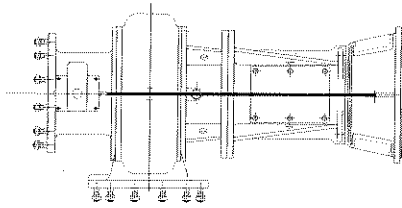


Figure 3 Typical lifting methods for close coupled bare shaft units (CD300 shown)

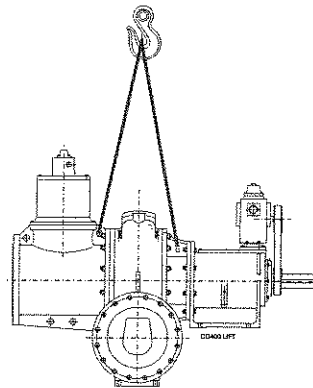


Figure 4 Typical lifting method for CD400 pumps

Whilst lifting the unit keep personnel well away and **never** allow people underneath.

Personnel working on the pump must always wear clean, correctly fitting clothing and safety footwear. Clothing impregnated with oil or fuel can constitute a health hazard through prolonged contact with the skin and may also constitute a fire hazard.

Check the type of liquid that the pump has been used for **before** carrying out any maintenance work. Residues could be hazardous to your health. If in doubt, flush thoroughly with clean water before commencing work.

Rotating equipment presents a hazard in itself. Alert surrounding personnel before starting and post notifications whilst in operation.

Moving parts are guarded to protect you. Guards removed for maintenance must be replaced before starting the pump.

Never insert anything into the pump body whilst the pump is running and the suction or delivery hoses are disconnected.

Use all flange bolt holes and ensure the correct bolt size and quality is utilised when connecting suction and delivery hoses.

Collapsible hoses must never be used on the suction side of the pump.

Keep the hose end suction area free from debris. Although the pump can handle solids up to the size indicated in the Technical Data section of this manual, larger or irregular solids may cause blockage with damage to pump components.

Always allow adequate ventilation for the pump driver. Diesel engines require air for both combustion and cooling. Electric motors require air for cooling purposes. This air must never be allowed to recirculate.

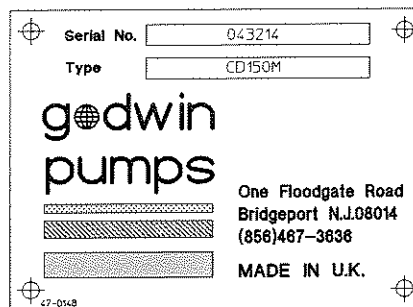
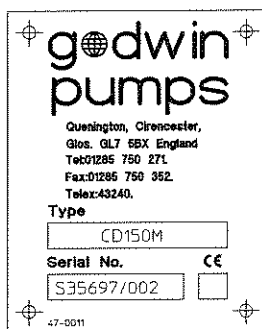
Be aware of burn and fire risks from items such as exhaust pipes and silencers. Never place flammable items around the unit.

Diesel engine exhaust and some of its constituents are known in the State of California to cause cancer, birth defects and other reproductive harm.

Liquid pressure may still be present even after shutdown of the pump. Particular attention should be paid to delivery lines that are long, or rise through any height, as these can contain large volumes of liquid. These lines must be isolated and drained down before commencing work. Sudden release of this liquid can cause serious injury to an operator either directly or indirectly through the rotational motion it can induce.

4 Pump Serial Number

Every pump unit has a nameplate similar to one of those shown below. This nameplate lists the serial number and type of the pump. **These numbers must be quoted in any enquiry for spares or service.**



4.1 Spares

Use only genuine parts from your local Godwin Pumps Ltd supplier or distributor. Failure to do so may invalidate warranty and/or reduce the pump's working life.

5 Installation

All pumps in the range are designed to be run **in one direction only**. This is anti-clockwise when viewed from the suction flange end or clockwise when viewed from the driving shaft end.

Rotation on electric motor driven pumps should be checked carefully – preferably with the coupling disconnected. On installations where coupling disconnection is not possible apply power only for a brief instance, preferably with a soft start, in order to determine rotation. A fast start or prolonged running in the wrong direction could cause parts to come loose.



CAUTION. Failure to provide the correct rotation will give rise to poor performance, vibration and possible severe damage to the pump.

5.1 Versions

Larger pumps (CD300/400 or HL130/160/225/250) can be supplied with or without an SAE adaptor fitted. With the adaptor fitted they are suitable for direct coupling, without they are suitable for open coupling. The bearing bracket must be adequately supported when used as open coupled units. If any doubt exists over the suitability of the support consult Godwin Pumps Ltd.

Smaller pumps in the range are supplied as either motor adaptor or bearing bracket versions: -

5.1.1 Motor Adaptor

Motor adaptor (MA) versions of the pump are designed for close coupling to a suitable driver, usually a diesel engine. They are supplied with transport feet that must be removed before attachment to the driver. Alignment of the pump to driver will be taken care of by the flanged adaptor.

5.1.2 Bearing Bracket

Bearing bracket (BB) versions of the pump are designed for open coupling with the bearing bracket supported from the same base but standing independently of the driver.



Correct alignment is critical for the longevity of the pump bearings, coupling and driver bearings. Follow the coupling manufacturers' instructions exactly.

See Section 5.2 for recommendations on alignment.

CAUTION

Incorrect coupling alignment will lead to premature bearing and /or coupling failure.

5.2 Alignment

The following notes provide general guidance on alignment and its elimination.

It is normal practice to carry out any adjustment to alignment by moving the driver – not the pump. In designing any structure to support the pump set allow an additional 0.25mm (0.010”) extra height difference between pump and driver support for shimming purposes.

There are two forms of misalignment – parallel and angular. Both must be less than the coupling manufacturers' guidelines in order for the coupling and bearings to give long and trouble free operation. It is essential that the baseplate or support structure be fully tightened down before commencing any alignment procedures. This will ensure that no misalignment is introduced by support structure deformation.

Alignment must always be carried out **before** any pipework is attached to the pump. Keep a note of the actual figures. Carry out a check after the pipework has been attached and compare the figures. Any discrepancy must have been introduced by the pipework attachment and must be corrected by refitting the pipework before putting the pump into service.

5.2.1 Alignment Procedure

Roughly align the pump and driver by eye.

a) Parallel alignment

Mount a dial gauge on the driver shaft with the gauge running on the outer-machined diameter of the pump coupling (see Figure 5). If the driver shaft is not accessible then the dial gauge can be mounted on the driver coupling.

Turn the driver shaft, note the total indicator reading, and adjust the driver position accordingly. Recheck.

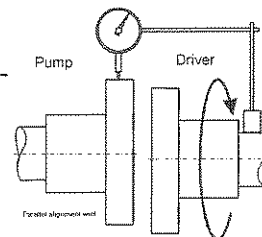


Figure 5 Initial parallel alignment check

b) Angular alignment

Mount the dial gauge on the driver shaft or coupling (as for step a)) and adjust the dial gauge to run on a mating face of the coupling as close to the outer diameter as possible (see Figure 6).

Turn the driver shaft, note the total indicator reading, and adjust the driver in the direction required. Recheck.

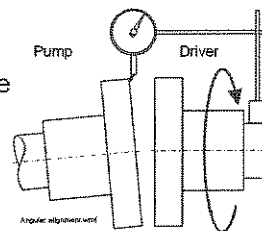


Figure 6 Angular alignment check

c) Confirming parallel alignment

Mount a dial gauge on the pump shaft with the gauge running on the outer-machined diameter of the driver coupling (see Figure 7). If the pump shaft is not accessible then the dial gauge can be mounted on the pump coupling provided the mounting face is concentric with the shaft.

Turn the pump shaft and note the total indicator reading. Adjust the driver in the direction required and recheck.

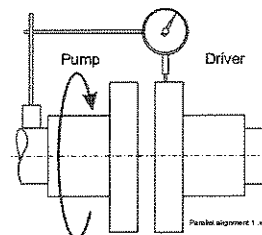


Figure 7 Secondary parallel alignment check

After alignment the pump and driver should be fully tightened down and the alignment rechecked to ensure that nothing has moved in the tightening down procedure.

If a dial gauge is not available, then vernier callipers (or a taper gauge) and a straight edge can be used, providing the coupling is of a type that permits it.

Measure the gap between coupling faces with the vernier callipers (or taper gauge) at four points equidistant around the circumference of the coupling. Adjust until all are equal.

Use a straight edge across both machined outer diameters of the coupling at four points equidistant around the circumference to confirm parallel alignment.

5.3 General Installation Notes

Godwin Pumps Ltd. may refute warranty liability if the installation does not meet the requirements of the pump. Should any doubt exist as to the suitability of an installation, then Godwin Pumps Ltd. should be consulted.

Only suitably qualified personnel (both mechanical and electrical) should carry out the installation. All local and national regulations in force must be observed.

The coupling used to connect the driver and pump must have the correct characteristics for the purpose. If in doubt –consult Godwin Pumps Ltd.

The completed pump set must be mounted on a firm level surface.

On bare shaft pumps guarding of the belts, pulleys and couplings is the responsibility of the installer.

Pump sets are supplied with guarding to meet general applicable standards but site conditions may necessitate further measures such as railings or screens. These are also the responsibility of the installer.

The Godwin Dri-Prime pump range is designed to operate on long lengths of suction pipe but it is always advisable to position the pump as close to the source as possible.

The Godwin Dri-Prime product is designed to handle small amounts of air leakage, but to ensure optimum pump performance, it is advisable to ensure that the suction pipework is airtight and the end is sufficiently submerged to prevent air being drawn into the pipe.

A general-purpose strainer should be fitted to the end of the suction pipework and the total area of the openings should be at least three times the normal area of the suction pipework. Strainer apertures should be no greater than the maximum recommended solids handling size for the pump.

The suction and delivery pipework should be kept as short as possible with a minimum number of large radii bends to minimise pipe friction losses. To maximise flow rates, it is encouraged to fit larger diameter pipework than the pump connection sizes.

Lay out piping runs before connecting to the pump to ensure that tight bends and other flow restrictions are not included. Figure 8 shows some common pipeline installation problems and their recommended solutions.

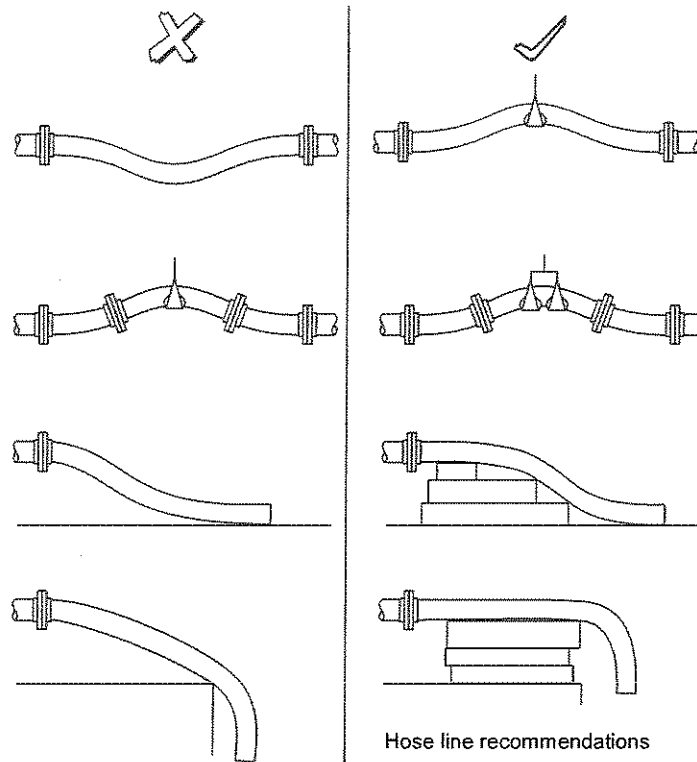


Figure 8 Common pipeline installation problems and their solutions

It is important that the suction and delivery pipework is supported immediately after the pump connections to prevent straining and possible misalignment of the equipment.

6 Operation

6.1 General

Before attempting to start the unit ensure that you are familiar with the controls and any local or national safety regulations.

If the unit is engine driven refer to the engine manufacturer's handbook.

If the unit is driven by an electric motor refer to the relevant control requirements.

Once started, the air compressor or vacuum pump will start to prime the pump and the unit will require no further attention.

6.2 Flooded Suction

Should the unit be required to operate under flooded suction conditions (i.e. liquid to be pumped is above pump suction connection – see Figure 9), then the air compressor or vacuum pump pipeline to the pump must be disconnected and the pump opening blocked. The compressor or vacuum pump drive must also be disconnected to save wear on the compressor or vacuum pump.

CAUTION



Failure to disconnect the pipeline will result in serious compressor or vacuum pump damage and consequential pump failure.

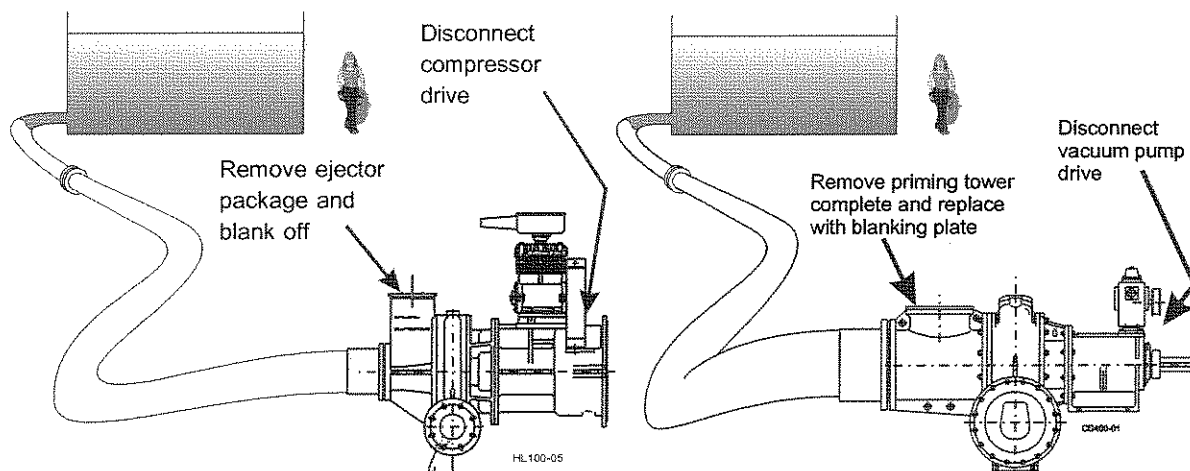


Figure 9 Flooded suction conditions

The duty of the pump should be carefully checked against the drive characteristics. In some instances this arrangement can overload the driver.

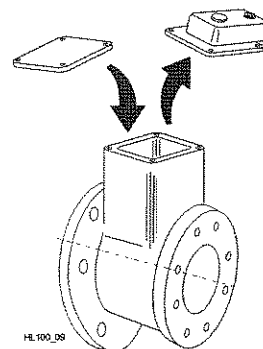


WARNING

This procedure requires access to operating and rotational parts of the pump. Accidental start up could cause injury.

To disconnect: -

- Ensure that the driver is isolated and the unit cannot be started whilst the pump is being worked on.
- Compressor units: -Disconnect the air delivery pipe to the ejector.
Vacuum pump units: - Disconnect the air suction pipe from the priming tower.
- Compressor units: -Remove the ejector housing complete and replace with a plain blanking plate (see Figure 10).
Vacuum pump units: -Remove the priming tower complete and replace with a plain blanking plate.



Blanking plates are available from Godwin Pumps Ltd or may be fabricated on site.


Figure 10 Typical blanking plate fitted in place of ejector housing

- d) Ensure that the blanking plate has a leak free joint to the pump
- e) Remove the isolation means from the driver and restart the pump.

Remove the blanking plate, replace the ejector housing or priming tower, reconnect the air hose and reinstall the compressor/vacuum pump drive when the pump is next required to self-prime.

6.3 Draining

In cold weather when the slightest possibility of frost exists, drain the pump and the non return valve (if fitted). The drain plug is either on the bottom or side of the volute (see Figure 11), or on the underside of the discharge flange (see Figure 12).

CAUTION  Failure to drain the pump and non return valve in these conditions could result in the pumped product residue freezing and cracking the volute or non return valve.

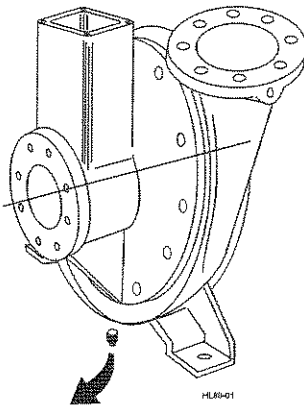


Figure 11 Side/bottom drain plug position

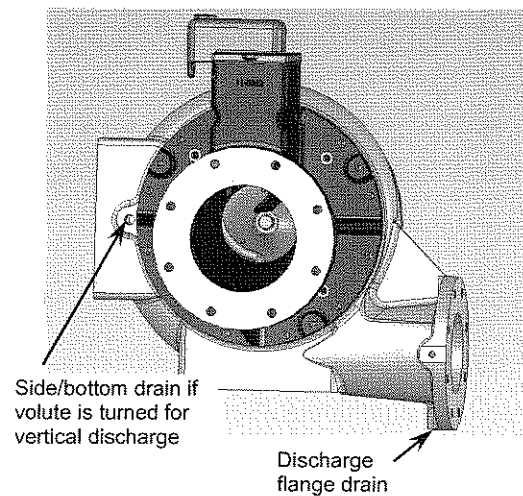


Figure 12 Discharge flange drain plug position

7 Maintenance

7.1 Bearings

All CD and HL range pump shafts are supported from two bearing positions. The types of bearings and configurations vary across the ranges.

7.1.1 Re-greasing procedure

Greasing interval: 250 hrs

Grease specification: - see Technical Data section

Grease nipple positions: - See Figure 13

Clean both the grease nipple and the grease gun nozzle thoroughly before application. Two or three strokes of a hand held grease gun per grease nipple are sufficient. Overfilling the bearings with grease can be as harmful as under lubrication. Compaction of grease results in it being churned by the rolling action of the bearings which leads to overheating, breakdown of the lubricant and ultimately bearing failure.

CAUTION
Failure to re-grease the bearings correctly at suitable intervals could result in premature bearing failure.

Remove any excess grease from the unit, particularly in the area of any drive belt. Grease on the drive belt will shorten its life and lead to premature failure.

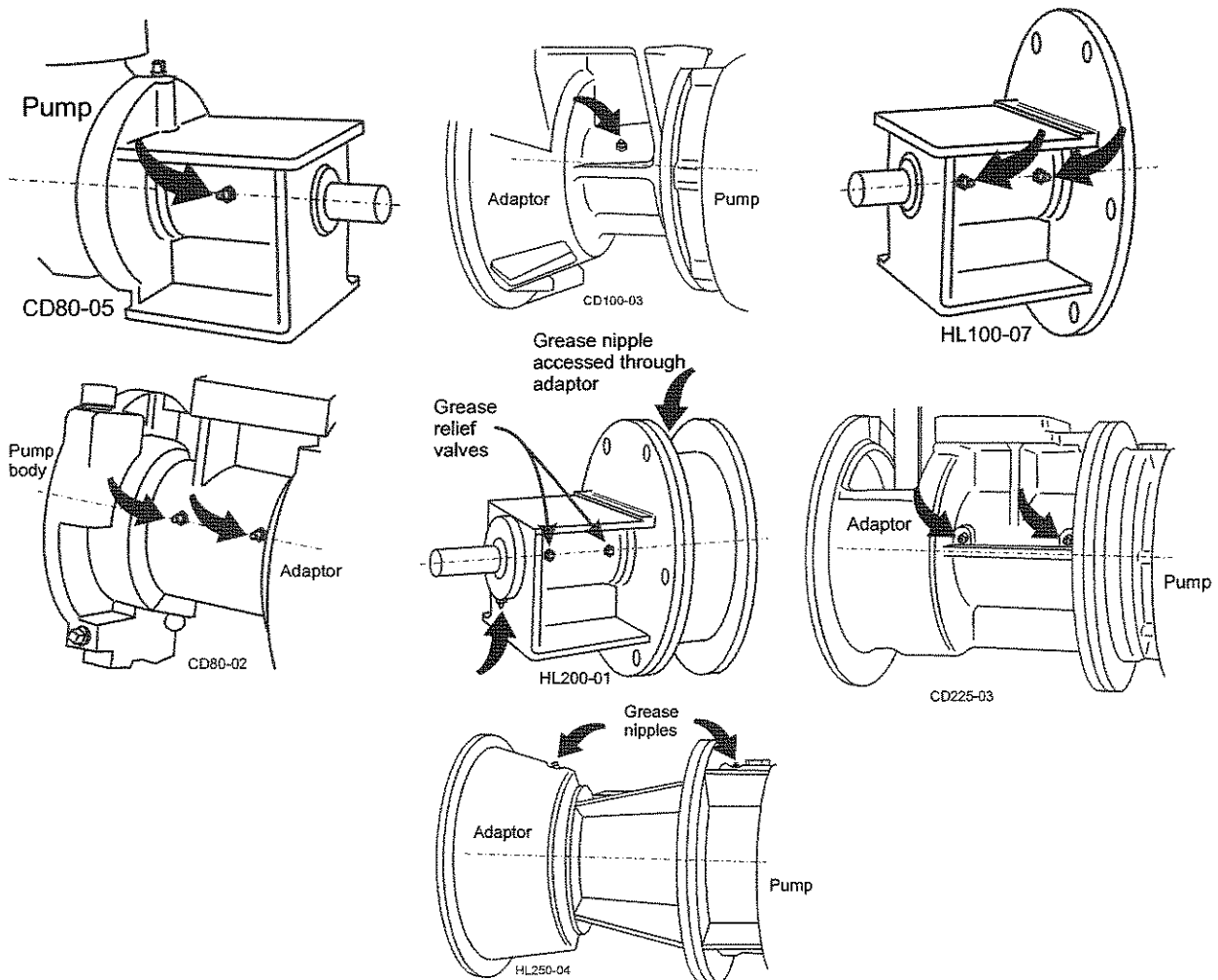


Figure 13 Grease nipple positions

7.2 Mechanical Seal

7.2.1 Seal oil level

All pumps are fitted with oil cooled and lubricated mechanical seals. The types and configurations vary across the ranges. Check the oil level in the seal housing at least once a week – preferably daily.

Seal oil may become emulsified in time. The extent and timing depends on the conditions under which the pump is operated. This is not detrimental to the operation of the seal, but the oil must be changed at the first sign of sludging.

Oil level can vary depending on the conditions under which the pump is operated. A slight loss of oil under high suction lift conditions or slight emulsification under low conditions is normal.

Oil specification: - see Technical Data section

CAUTION Dry running caused by failure to initially fill or subsequently maintain the correct oil level in the seal housing will result in seal failure.

Seals that have failed due to lack of operator provision of oil are not covered by the warranty.

The various configurations for filling and draining are shown in Figure 14, Figure 15 or Figure 16.

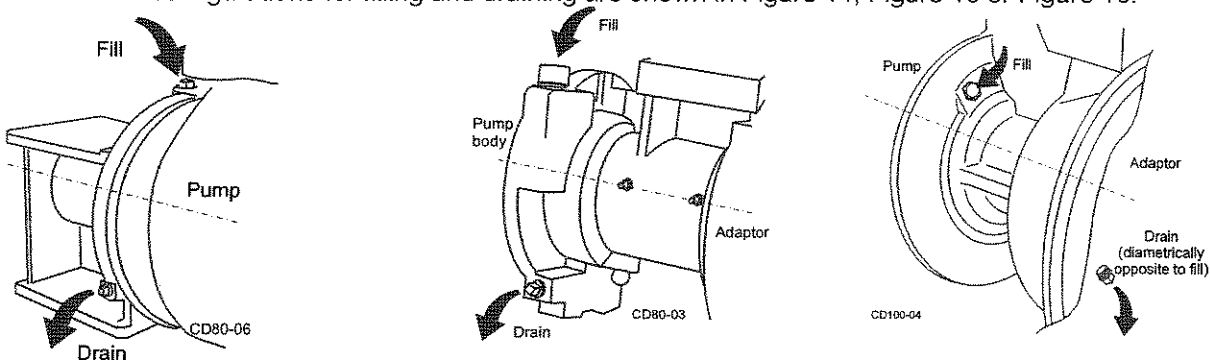


Figure 14 Smaller pump fill and drain plugs

The seal oil level for pumps of the style shown in Figure 14 is 10 –15mm below the bottom of the plug. If no oil is visible then it must be topped up before starting the pump.

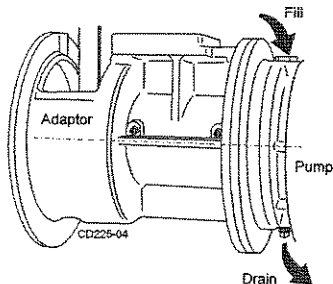


Figure 15 Medium sized pump fill and drain plugs

The seal oil level for pumps of the style shown in Figure 15 is 35-40mm below the filler plug seating face (10 –15mm below the bottom of the filling hole)

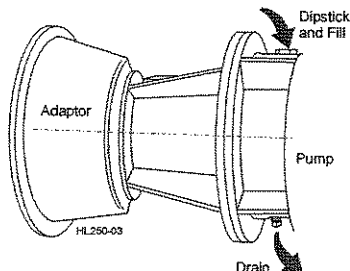


Figure 16 Larger pump fill and drain plugs

Larger pumps (Figure 16) have a filler plug combined with a dipstick. The oil level must be maintained between the maximum and minimum marks.

7.2.2 Seal removal

Preparation



WARNING. This procedure requires access to operating and rotational parts of the pump. Accidental start up could cause injury.

- 1) Isolate the driver and ensure the unit cannot be started whilst the pump is being worked on.
- 2) Drain down the delivery line (see warning note in Section 3). Disconnect both suction and delivery lines. Ensure that the non-return valve is empty.
- 3) Drain water from the pump (see Section 6.3).
- 4) Drain oil from the mechanical seal cavity (see Section 7.2.1).
- 5) For units fitted with a compressor disconnect the air supply hose to the ejector head. For units fitted with a vacuum pump disconnect the suction hose from the priming tower.

Dismantling



WARNING. Dismantling requires adequate support of both the parts being removed and the remaining parts of the pump. Those being removed must be supported by suitable lifting gear whilst fasteners are undone. The lifting gear can then be used to lift the part clear. Remaining parts must also be adequately supported. Failure to hold or support the parts adequately could cause them to fall and cause injury.

7.2.2.1 Front cover & pump body removal

- 1) CD75, CD80D, CD80M, & CD100M.

The pump body and front cover are one piece. They are fitted with studs that pass through the adaptor or bearing bracket, secured by nuts and spring washers. Undo and remove the nuts and spring washers (see Figure 17 or Figure 18). Remove the pump body complete with non-return valve and ejector package (if fitted) to expose the impeller.

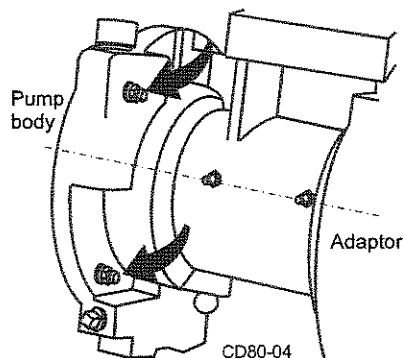
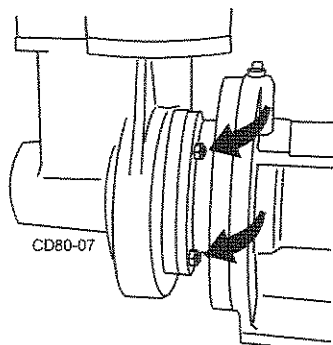


Figure 17 Typical pump body attachment to bearing bracket (CD80D shown)

Figure 18 CD75 & CD80D Pump body attachment to motor adaptor

- 2) ALL OTHER UNITS

Due to the weight and size of some of the parts on larger pumps and lifting gear limitations it is recommended that items such as separation tanks, priming towers and non return valves are removed before proceeding further.

Release and remove the fasteners holding the front cover to the pump body (see Figure 19). These are on the periphery of the front cover. At this stage do not disturb any other fasteners, as these hold the front wearplate to the front cover. Remove the front cover and wearplate complete. Larger pumps are provided with pre-tapped holes around the periphery to enable the use of jacking screws to help in removal.

NOTE: - The CD400M has an adaptor plate fitted between the front cover and pump body. It carries the front wearplate and is located by a spigot on the front cover. It normally detaches with the front cover, but may occasionally require separate removal.

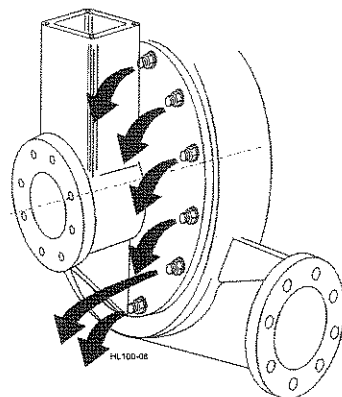


Figure 19 Removal of front cover

Larger pumps (HL80, CD180M, CD300M, CD400M, HL160M, HL225M and HL250M) have bodies with sufficient room to allow the seal to be removed without further dismantling. For other units and the HL130M, release and remove the peripheral fasteners holding the pump body to the adaptor.

Arrange a suitable support to take the weight once the pump body is removed. Release and remove the bolts holding the pump body down.



CAUTION

Failure to support the motor adaptor once the pump body is removed could distort the adaptor and displace the bearings leading to pump failure.

Remove the pump body to expose the impeller.

7.2.2.2 Removing the impeller

Lock the pump shaft to prevent rotation.

1) CD75, CD80D & CD80M

The impeller is screwed (right hand thread) directly onto the shaft. Unscrew in anti clockwise direction.

If the impeller is reluctant to rotate, place a block of wood against one of the vanes and tap lightly with a hammer to overcome the initial resistance.

Shims will have been fitted on the shaft behind the impeller. Remove these carefully and retain for reuse unless damaged.

2) CD100M, CD103M, CD140M, CD150M, CD160M, CD180M, CD200M, CD225, & CD250M, HL80, HL100M, HL110M, HL125MS, HL150M, HL150MHD & HL200M.

The impeller is screwed (right hand thread) directly onto the shaft and retained by a screw in the centre of the boss. Remove the screw. (NOTE: - this screw incorporates a self locking device and must be replaced and not reused). Unscrew the impeller in an anti clockwise direction.

If the impeller is reluctant to rotate, place a block of wood against one of the vanes and tap lightly with a hammer to overcome the initial resistance.

Shims will have been fitted on the shaft behind the impeller. Remove these carefully and retain for reuse unless damaged.

3) CD300M, CD400M, HL130M, HL160M, HL225M, HL250M

Unscrew the cover in the centre of the impeller and expose the impeller locking bolt.

Knock down the tabs on the tab washer. Unscrew the bolt. Remove the bolt, tab washer and clamping washer.

The impeller is splined on to the shaft and can now be pulled off.

Shims will have been fitted on the shaft behind the impeller. Remove these carefully and retain for reuse unless damaged. Some units will have a shaped impeller spacer fitted behind the shims. Remove and retain for reuse.

7.2.2.3 Removing the rear wearplate

Fasteners from the motor adaptor/bearing bracket/seal housing adaptor side retain the rear wear plate. Undo these fasteners and remove the wear plate. Larger pumps are provided with pre-tapped holes to enable the use of jacking screws to help in removal.

1) CD75, CD80D & CD80M, CD100M, CD150M & HL80

The rear wear plate holds the seal seat retained by a circlip (item 6 in Figure 20). Once the wear plate has been removed the remainder of the mechanical seal is left exposed on the shaft.

Remove the circlip from the wear plate and press out the seal seat.

2) ALL OTHER UNITS

Removal of the wear plate exposes the outer seal seat carrier retained by four off cap head socket screws. Removing the screws and carrier exposes the remainder of the mechanical seal on the shaft. The inside face of the seal carrier holds the outer seal seat (item 12 in Figure 21 or Figure 22, item 1 in Figure 23) retained by either a clamping ring held in place by screws.

Remove the screws from the clamping ring. Remove the clamping ring and press out the outer seal seat.

7.2.2.4 Seal configuration

Identify the correct seal configuration from the following table. Follow the relevant instructions for dismantling and reassembly. Note that although the arrangement type may be the same, size and individual detail between pumps will be different.

Type	Pump type	Seal configuration	Remarks
1	CD75 CD80D CD80M CD100M CD103M CD140M CD150M CD200M CD225M	HL80 HL100M HL125MS HL150M HL150MHD	Single mechanical seal outboard isolating the pumped product Dynamic lip seal inboard retaining the oil
2	CD160M Mk1 CD180M CD300M	HL130M HL160M HL250M	2 off mechanical seals fitted back to back (double mechanical seal)
3	CD160M Mk2 CD400M	HL110M HL200M	2 off mechanical seals fitted back to back (double mechanical seal)
4	CD300M	HL130M HL225M	2 off mechanical seals fitted back to back in a cartridge (double one piece mechanical seal)

7.2.2.5 Removing the seal

1) CD75, CD80D & CD80M, CD100M, CD103M, CD150M, CD200M, CD225M, CD250M, HL80, HL100M, HL125MS, HL150M & HL150MHD (Figure 20).

Remove the rotating seal face (1) and O-ring (2) from the shaft.

Unscrew the grub screws (5) holding the stationary seat (3) to the shaft. Remove the stationary seat.

CD140M, CD200M, CD225M, CD250M, HL100M, HL125MS, HL150M & HL150MHD have a spacer fitted on the shaft behind the mechanical seal. This will now be loose. Remove the spacer and retain for reuse.

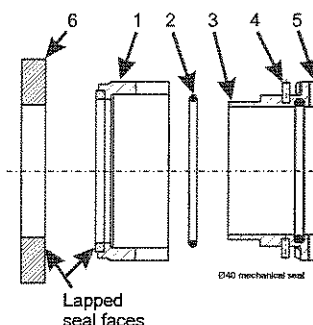


Figure 20 Type 1 single mechanical seal

2) CD160M MkII, CD180M, CD300M, HL130M, HL160M & HL250M two part seal (Figure 21).

Remove the rotating seal face (1) and O-ring (2) from the shaft.

Unscrew the grub screws (5) holding the stationary seat (3) to the shaft. Remove the stationary seat.

Remove the second rotating seal face (13).

The seal seat (11) is held in a carrier retained by 4 off cap head socket screws. Undo the screws, remove the carrier and seat. Press the seat out of the carrier.

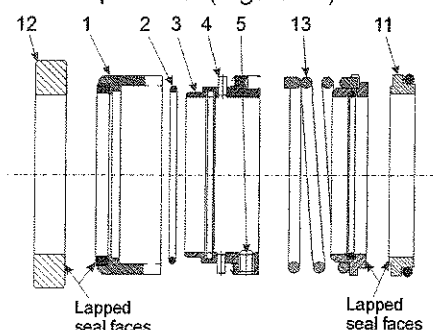


Figure 21 Type 2 two part double mechanical seal

3) CD160M Mki, CD400M, HL110M & HL200M two part seal (Figure 22).

Remove the rotating seal face (1) and O-ring (2) from the shaft.

Unscrew the grub screws (5) holding the stationary seat (3) to the shaft. Remove the stationary seat.

Unscrew the grub screws (6) holding the second stationary seat (8) to the shaft. Remove the stationary seat.

Remove the second rotating seal face (10) and O-ring (9) from the shaft.

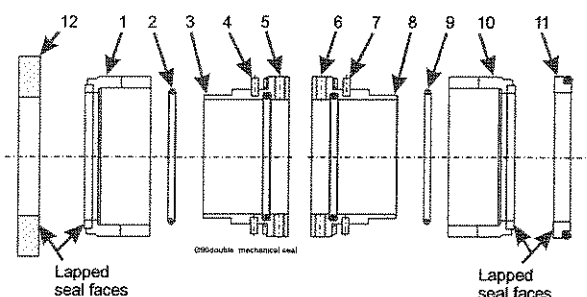


Figure 22 Type 3 double mechanical seal

The seal seat (11) is held in a carrier retained by 4 off cap head socket screws. Undo the screws, remove the carrier and seat. Press the seat out of the carrier.

4) CD300M, HL130M & HL225M one piece double seal Figure 23

Extract the sleeve (2) carrying the double seal faces. The seal seat (11) is held in a carrier retained by 4 off cap head socket screws. Undo the screws, remove the carrier and seat. Press the seat out of the carrier.

The seal seat (3) is held in a carrier retained by 4 off cap head socket screws. Undo the screws, remove the carrier and seat. Press the seat out of the carrier.

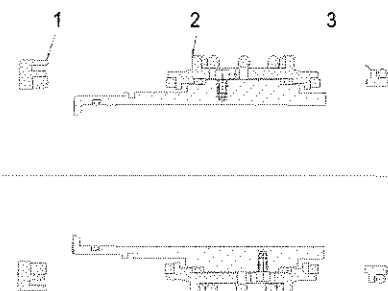


Figure 23 Type 4 one piece double mechanical seal

7.2.2.6 Inspection

Inspect all items for wear. The seal face for type 1, 2 & 3 seals (item 6 in Figure 20; item 12 in Figure 21 or Figure 22) is double sided. It may be reversed when refitted to provide a second wearing face. Replace any damaged parts and renew all O-rings.

7.2.3 Seal fitting



CAUTION

Mechanical Seals are precision engineered devices. Extreme care must be taken to ensure that no damage occurs to the lapped faces. These faces must be kept absolutely clean throughout the entire installation. Do not touch them or allow any contaminant to come into contact with them. Soiled faces will have to be cleaned with appropriate alcohol based degreasing cleaner and soft tissue. Failure to observe these precautions will lead to premature seal failure.

Preparation

Ensure that the parts and edges the seal will pass over or through during the assembly process are free from any burrs or sharp edges and are scrupulously clean. Any of these could damage the seal during assembly and cause premature failure.

Clean the shaft thoroughly and lubricate with clean water or a diluted soft soap solution. Do not use heavy grease, silicone or PTFE based lubricants, as these would prevent the seal bellows from gripping the shaft.

It is recommended that the seal components be laid out in the order of assembly before starting to enable easy identification during the procedure.

The retaining screws for the seal shaft sleeve should be fitted using a thread locking compound. See Technical Data section for details.

Re-assembly

7.2.3.1 Fitting the seal

- 1) CD75, CD80D & CD80M, CD100M, CD103M, CD150M, CD200M, CD225M, CD250M, HL80, HL100M, HL125MS, HL150M & HL150MHD (Figure 20).

CD140M, CD200M, CD225M, CD250M, HL100M, HL125MS, HL150M & HL150MHD only. Fit the seal spacer onto the shaft ensuring it seats against the shaft shoulder.

Carefully remove the rotary head (1) and O-ring (2) from the assembly. Do not place the rotary head (1) face down as this may cause damage to the lapped seal face.

Take the sleeve assembly (3) and ensure that the drive screws (4) are fully retracted to prevent scratching of the shaft during assembly. Carefully slide the sleeve assembly along the shaft until it butts up against the shaft shoulder (CD75 & CD80D) or collar (CD80M, CD100M, CD103M, CD150M) or spacer (CD140M, CD200M, CD225 CD250M, HL100M, HL125MS, HL150M & HL150MHD).

Apply thread locking compound (see Technical Data Section) and lightly tighten the drive screws to centralise the sleeve on the shaft. Ensure that the sleeve is still abutted to the shoulder, collar or spacer, and then tighten the drive screws fully.

Lightly smear the O-ring (2) with a silicon based grease lubricant. Place the O-ring inside the rotary head (1). Avoid getting any grease onto the lapped seal face.

Gently push the rotary head (1) onto the sleeve assembly (3) ensuring that the drive pins (5) are engaged in the slots of the rotary head.

Carefully clean the lapped seal face with a suitable degreasing agent and soft tissue.

Fit the seal seat (6) to the wear plate and retain with either the circlip or retaining clamp. Ensure a new O-ring is fitted.

- 2) CD160M MkII, CD180M, CD300M, HL130M, HL160M & HL250M two part seal (Figure 21).

Take the seal seat (11) from the inboard assembly, lightly smear the O-ring with silicon based grease lubricant and carefully push into the seat carrier.

Fit a new O-ring to the carrier and slide the assembly along the shaft to seat in the adaptor. Secure with cap head screws and washers.

If necessary, carefully clean the seal seat (11) and seal face on the rotary head (13) with a suitable degreasing agent and soft tissue.

Ensure that the grub screws (5) in the mechanical seal (3) are fully retracted so that they do not scratch the shaft during assembly.

Carefully remove the rotary head (1) and O-ring (2) from the assembly. Do not place rotary head face down as this may cause damage to the lapped seal face.

Take the mechanical seal (3), locate the spring in the face seal (13) and carefully slide the two along the shaft until the faces touch.

Set the seal working length (see Technical Data section for dimension), apply thread locking compound (see Technical Data Section) and lightly tighten the drive screws so as to centralise and secure the sleeve on the shaft.

NOTE:- a seal setting tool that bolts to the adaptor face is available for this task.

Ensure that the seal faces are still abutted and the working length is correct, then tighten the drive screws fully.

Take the remaining rotary head (1), lightly smear the O-ring with silicon based grease lubricant and place over the shaft. Ensure it locates on the drive pins of the mechanical seal. Avoid getting any grease onto the lapped seal face.

Fit the seal seat (Item 12) to the carrier and retain with the retaining clamp. Ensure a new O-ring is fitted.

3) CD160M Mk I, CD400M, HL110M & HL200M two part seal (Figure 22).

Take the seal seat (11) from the drive end assembly and carefully push into the seat carrier. Fit a new O-ring to the carrier and slide the assembly along the shaft to seat in the adaptor. Secure with cap head screws and washers.

Carefully clean the lapped seal face with a suitable degreasing agent and soft tissue.

Carefully remove the rotary head (10) and O-ring (9) from the assembly. Do not place the rotary head face down as this may cause damage to the lapped seal face.

Take the sleeve assembly (8) and ensure that the drive screws (6) are fully retracted to prevent scratching of the shaft during assembly.

Lightly smear the O-ring (9) with silicon based grease lubricant. Place the O-ring inside the rotary head (10). Avoid getting any grease onto the lapped seal face.

Gently push the rotary head (10) onto the sleeve assembly (8) ensuring that the drive pins (7) are engaged in the slots of the rotary head.

Carefully slide the sleeve assembly along the shaft until the seal faces butt together

Set the seal working length (see Technical Data Section), apply thread locking compound (see Technical Data Section) and lightly tighten the drive screws to centralise and secure the sleeve on the shaft. A special tool is available from Godwin Pumps Ltd to enable this first seal working length to be set correctly. It is strongly recommended that this tool be used. Ensure that the seal faces are still abutted and the working length is correct, then tighten the drive screws fully.

Carefully remove the rotary head (1) and O-ring (2) from the outboard assembly. Do not place the rotary head face down as this may cause damage to the lapped seal face.

Take the sleeve assembly (3) and ensure that the drive screws (5) are fully retracted to prevent scratching of the shaft. Slide the sleeve assembly along the shaft until it abuts the sleeve assembly (8) previously fitted. Apply thread locking compound (see Technical Data Section) and secure in place by tightening the drive screws fully.

Lightly smear the O-ring (2) with a silicon based grease lubricant. Place the O-ring inside the rotary head (1). Avoid getting any grease onto the lapped seal face.

Gently push the rotary head (1) along the shaft onto the sleeve assembly (3) ensuring that the drive pins (4) are engaged in the slots of the rotary head.

Fit the seal seat (12) to the carrier and retain with the retaining clamp. Ensure a new O-ring is fitted.

4) CD300M, HL130M & HL225M one piece double seal (Figure 23)

Take the seal seat (Item 3) from the assembly and carefully push into the seat carrier. Fit a new O-ring to the carrier and slide the assembly along the shaft to seat in the adaptor. Secure with cap head screws and washers.

Carefully clean the lapped seal face with a suitable degreasing agent and soft tissue.

Ensure the O-ring is in place inside the sleeve (2) carrying the double seal faces and carefully slide the whole onto the shaft.

Fit the seal seat (1) to the carrier and retain with the retaining clamp. Ensure a new O-ring is fitted.

7.2.3.2 Fitting the wearplate

- 1) CD75, CD80D & CD80M, CD100M, CD150M & HL80
Fit the rear wear plate smearing the outside diameters and O-rings with oil to aid assembly. This will also help to prevent the wear plate rusting into the pump body and ease later strip-downs.
- 2) ALL OTHER UNITS
Slide the carrier over the shaft and attach with four off cap head socket screws. Position the rear wear plate and attach with fasteners from the motor adaptor/bearing bracket/seal housing adaptor side.

7.2.3.3 Fitting the impeller

Lock the pump shaft to prevent rotation.

Impeller clearance tolerances are given in the Technical Data section. Once the impeller is fitted the rear clearance must be checked. If the clearance lies outside the tolerance, then remove the impeller, add or remove shims, and replace the impeller. Repeat until a value within the tolerance is obtained.

- 1) CD75, CD80D & CD80M
Refit the shims (or new equivalents) removed during strip down.
Screw the impeller (right hand thread) directly onto the shaft. Check there is still a clearance and torque down fully.
Check the rear impeller clearance.
- 2) CD100M, CD103M, CD140M, CD150M, CD160M, CD180M, CD200M, CD225, & CD250M, HL80, HL100M, HL110M, HL125MS, HL150M, HL150MHD & HL200M.
Refit the shims (or new equivalents) removed during strip down.
Screw the impeller (right hand thread) directly onto the shaft. Do not fit the self locking retaining screw at this stage. Check there is still a clearance and torque down fully.
Check the rear impeller clearance. If within the permitted tolerance secure the impeller with the self locking retaining screw.
- 3) CD300M, CD400M, HL130M, HL160M, HL225M, HL250M
Refit the shims (or new equivalents) removed during strip down. If a 4mm thick impeller spacer was fitted ensure it is refitted first with its internal radiused edge towards the shaft shoulder.
The impeller is splined. Carefully locate the impeller on the shaft and push back along the spline.
Fit the O-ring, clamping washer, tab washer and bolt. Tighten the bolt.
Check the rear impeller clearance. If within the permitted tolerance knock up the tabs on the tab washer.
Fit the cover using a new O-ring.

7.2.3.4 Front cover & pump body fitting

Impeller clearance tolerances are given in the Technical Data section.

Fit the front cover/wear plate ensuring the fasteners are torqued down evenly in equal increments. Check the front clearance. NOTE: - CD75 clearance is set automatically during assembly and no shimming or change in gaskets is required.

If the clearance lies outside the tolerance, then remove the front cover/pump body, add or remove shims/gaskets, and replace the front cover/pump body. Repeat until a value within the tolerance is obtained.

- 1) CD75, CD80D, CD80M, & CD100M.
The pump body and front cover are one piece fitted with studs that pass through the adaptor or bearing bracket, secured by nuts and spring washers (see Figure 17 or Figure 18).
Refit the pump body complete with non-return valve and ejector package (if fitted) and secure with nuts and spring washers.
CD75: - No further work is required.

CD80D: - Check the front impeller clearance. Adjust the gaskets between pump body and bearing bracket/motor adaptor to achieve the correct figure.

CD80M & CD100M: - Check the front impeller clearance. Adjust the shims between pump body and front wear plate to achieve the correct figure.

2) **ALL OTHER UNITS**

Larger pump bodies (HL80, CD300M, CD400M, HL160M, HL225M, HL250M but not HL130M) were probably not removed as they have sufficient room to allow the seal to be removed.

For other units or if the larger pump body has been removed, fit the body, guiding the body studs into the adaptor holes. Secure the peripheral fasteners.

Attach the front cover and wearplate assembly to the pump body (see Figure 19) using the peripheral fasteners.

NOTE: - The CD400M has an adaptor plate fitted between the front cover and pump body. It carries the front wearplate and is located by a spigot on the front cover. It normally remains with the front cover, but may occasionally have become detached and require refitting.

Check the front impeller clearance. Adjust the shims between pump body and front wear plate to achieve the correct figure.

7.2.3.5 Preparing for service

Reconnect compressor or vacuum pump lines.

Fill the oil chamber around the mechanical seal with the correct quantity and grade of oil. See Section 7.2.1 for positions and Technical data section for grade and quantity.

7.3 Bearing Bracket & Motor Adaptor Dismantling

Preparation for dismantling

Use suitable lifting gear to remove the pump assembly from the driver. It may be convenient to remove the air compressor assembly or vacuum pump (if fitted) before doing so. See Section 7.7.1 for details.

Support the pump unit in a suitable manner before commencing further strip down.

Carry out the instructions for seal removal (Section 7.2.2) before commencing any work detailed in this section.

Dismantling

7.3.1 CD75, CD80D, CD80M, CD100M, CD103M, CD140M, CD150M, CD160M, CD180M, CD200M, CD225M & CD250M

- 1) CD160M, CD180M
Undo the fasteners holding the seal-housing adaptor to the bearing housing and remove the adaptor. Undo the fasteners holding the SAE adaptor to the bearing housing and remove the adaptor.
- 2) Unscrew the drive end bearing cover fasteners and remove the drive end bearing cover.
- 3) CD75, CD80D, CD80M & CD160M motor adaptor units. Release the tab washer and remove the bearing locknut.
- 4) Extract the shaft and bearing assembly.
- 5) Remove pump end bearing cover on bearing bracket units where the cover is retained by screws. CD100, CD103M, CD150M & CD250M motor adaptor units have their pump end bearing cover retained by a circlip. Do not remove the clip, cover or pump end outer bearing race unless required for cleaning purposes or because of damage.
- 6) If necessary, remove the bearing inner races from the shaft.
- 7) Inspect all parts for damage or wear and replace as necessary. All lip seals and O-rings **must** be replaced.

7.3.2 HL80, HL100M, HL110M, HL125M, HL150M & HL200M

- 1) HL80
Undo and remove the nuts and spring washers from the studs holding the pump body to the bearing bracket or motor adaptor.
Undo and remove the pump body holding down bolts (if fitted). Remove the pump body.
Pull the collar and tolerance ring off the pump end of the shaft.
HL100M, HL125MS, HL150M, HL150MHD, HL110M & HL200M
Release the nuts on the bolts holding the seal housing adaptor to the bearing bracket and remove the fasteners. Remove the adaptor.
For pumps other than the HL110M or HL200M this will include the shaft lip seal.
For the HL110M or HL200M this will include the rear mechanical seal seat if it has not already been removed.
- 2) Unscrew both bearing cover fasteners and remove the bearing covers.
- 3) HL100M, HL125MS, HL150M, HL150MHD, HL110M & HL200M
Release the pump end tab washer, lock the shaft against rotation and remove the bearing locknut.
- 4) Extract the shaft and bearing assembly from the drive end, leaving the pump end outer bearing race in place.
- 5) HL80
Motor adaptor units have their pump end bearing cover retained by a circlip. Do not remove the clip, cover or pump end outer bearing race unless required for cleaning purposes or because of damage.
- 6) Remove pump end bearing cover.
- 7) If necessary, remove the bearing inner races from the shaft.
- 8) Inspect all parts for damage or wear and replace as necessary. All lip seals and O-rings **must** be replaced.

7.3.3 Open Coupled CD300M & CD400M

- 1) Remove the pump body and the vacuum pump support plate (if fitted this covers the aperture on top of the bearing bracket).
- 2) Unscrew both the drive end and pump end bearing cover fasteners and remove both covers.
- 3) Release the tabs from the pump end lock washer. Lock the shaft against rotation and unscrew and remove the pump end bearing locknut and tab washer.
- 4) Press the shaft and bearing assembly out of the bearing bracket.
- 5) Press the internal bearing covers and roller bearing outer race out of the bearing bracket.
- 6) Release the tabs from the drive end locknut tab washer and unscrew and remove the locknut and tab washer.
- 7) Remove the angular contact bearings and roller bearing inner race from the shaft.
- 8) Inspect all parts for damage or wear and replace as necessary. All lip seals and O-rings **must** be replaced.

7.3.4 HL130M, HL160M, HL225M, HL250M & close coupled CD300M

- 1) Remove the grease nipple and extension pipe where they protrude through the mechanical seal adaptor.
- 2) Release the nuts on the bolts holding the adaptor to the bearing bracket and remove the fasteners. Remove the adaptor.
- 3) If a close coupling adaptor is fitted then remove the grease nipple and extension pipe where they protrude through the adaptor. Remove the adaptor.
- 4) Unscrew the drive end bearing cover fasteners and remove the bearing cover complete with lip seal. Note that the inner bearing cover will now be loose on the shaft.
- 5) Release the tab washer and remove the bearing locknut.
- 6) Extract the shaft and bearing assembly by pressing from the pump end. Take care that the loose inner bearing cover does not catch on or damage any part of the shaft assembly during this process. Remove the inner bearing cover.

- 7) Unscrew the pump end bearing cover fastenings. Note that three of these hold the inner bearing cover in place. Remove the inner bearing cover and pump end bearing cover.
- 8) If necessary, remove the angular contact bearings and the roller bearing inner race from the shaft and press out the roller bearing outer race from the bearing bracket.
- 9) Inspect all parts for damage or wear and replace as necessary. All lip seals and O-rings **must** be replaced.

7.4 Bearing Bracket & Motor Adaptor Assembly

Preparation for assembly

Ensure all parts are clean and free from burrs.

The use of a temperature controlled bearing heater is recommended. A consistent 110°C is the optimum temperature for the bearings to achieve before fitting. In the following text wherever “heat the bearing” is stated it means to 110°C. Never overheat a bearing or allow it to remain at that temperature for longer than its fitting time.



CAUTION

Bearing races must be pressed into position and not hammered either directly or by drift. Direct hammering will damage the bearing or rollers. Drift hammering will introduce swarf into the assembly. Either will result in early bearing failure.

Assembly

7.4.1 CD75 & CD80D MA Units

- 1) Heat the roller bearing. Once up to temperature, slide it hard against the shaft shoulder, holding it there for a minimum of 30 seconds. This allows the race to grip the shaft and prevent it from creeping away from the shoulder during cooling. Let the assembly cool completely.
- 2) Fit the inner and outer bearing spacers.
- 3) Heat the ball bearing. Once up to temperature, slide it hard against the inner spacer, holding it there for a minimum of 30 seconds. This allows the race to grip the shaft and prevent it from creeping away from the spacer during cooling. Let the assembly cool completely.
- 4) Fit the tab washer and locknut. Prise up at least two tabs to lock the nut in position.
- 5) Pack the bearings with grease allowing sufficient excess to one-third fill the cavities at each side of the bearings.
- 6) Position the motor adaptor with the shaft axis vertical (pump end down). Press the shaft assembly into the motor adaptor.
- 7) Grease the pump end lip seal and press it into the motor adaptor body (lip facing in).
- 8) Grease the drive end lip seal and press it into the bearing cover (lip facing in).
- 9) Fit the bearing cover and tighten down the fasteners evenly to the recommended torque.
- 10) Fit ancillary components.

7.4.2 CD80M, CD100M, CD150M & CD200M MA & BB Units; CD75 BB Units; CD103M MA Units

- 1) Heat both inner bearing races. Once up to temperature, slide them up hard against the shaft shoulders and hold in position for a minimum of 30 seconds. This allows the races to grip the shaft and prevent them from creeping away from the shoulder during cooling. Let the assembly cool completely.
- 2) Fill the annular space between the bearing inner races with grease and lightly grease the bearing rollers and the raceways of the inner races to ensure seating.

- 3) *Motor Adaptor units:* - If the pump end bearing cover and circlip have been removed, refit these parts ensuring that, after initial fitting, the bearing cover is pressed hard back against the retaining circlip to prevent excess play in the final bearing assembly. Do not fit lip seal to cover.
Bearing bracket units: - Fit the pump end bearing cover. Do not fit lip seal.
- 4) Fit the pump end bearing outer into the housing ensuring it is pressed hard up against the bearing cover.
Bearing bracket units: - Lock into position with grub screw.
- 5) Position the motor adaptor/bearing bracket with the shaft axis vertical (pump end down). Lower the shaft/bearing inner assembly into position.
- 6) Press the drive end bearing outer into the housing until it just meets the inner race.
- 7) Fit the drive end bearing cap (without lip seal) and hand tighten the retaining screws. Rotate the shaft assembly – by hand – about a dozen times to ensure free movement.
- 8) Using a dial indicator located against the end face of the drive end of the shaft, measure the end float of the shaft. Add shims under the drive end bearing cover to achieve the end float given in the Technical Data section. Rotate the shaft assembly by hand several times and check the end float again. Adjust as necessary.
- 9) Remove drive end bearing cover and shims.
- 10) Grease the motor adaptor/bearing bracket assembly using the external grease nipple until a continuous ring of grease is witnessed emerging through both bearings.
- 11) Grease the drive end lip seal and press it into the drive-end bearing cover (seal lip facing in). Add a small amount of grease to the internal cavity of the cover and refit.
- 12) *Motor adaptor units:* - Grease the bearing cover pump end lip seal and press it into the pump end bearing cover (seal lip facing in).
Bearing bracket units: - Remove pump end bearing cover and press both lip seals into place (seal lip facing out at each end). Add a small amount of grease to the internal cavity of the cover and refit.
- 13) Check that the assembly rotates freely.
- 14) *Motor adaptor units:* - Grease the pump end lip seal and fit (lip facing out) to the shaft collar starting at the small end of the collar and finishing about 5mm from the large end. Press the shaft collar into place at the pump end. The lip seal will remain slightly proud. Press the lip seal home flush with the inner face of the casting.

7.4.3 CD140M, CD160M, CD180M & HL110M MA Units & All CD225, CD250M, HL100M, HL125MS, HL150M, HL150MHD & HL200M Units

- 1) Heat the bearings detailed below: -
CD140M, CD225, CD250M, HL100M, HL110M, HL125MS, HL150M motor adaptor
Single roller bearing inner race (pump end) and the complete spherical roller bearing (drive end)
CD160M, CD180M, HL150MHD & HL200M motor adaptor; CD225, CD250M, HL100M, HL125MS, HL150M & HL200M bearing bracket
Single roller bearing inner race (pump end) and two angular contact bearings (drive end)
- 2) Once up to temperature, take the appropriate drive end bearing. Slide it or them up hard against the shaft shoulder. Hold them there for a minimum of 30 seconds. This allows the races to grip the shaft and prevent them from creeping away from the shoulders during cooling. Let the assembly cool completely. If these are the angular contact bearings, ensure they are fitted in 'O' arrangement, i.e. with the two outer races 'trapped' between the balls.
- 3) Fit the drive end tab washer and locknut. Prise up at least two tabs to lock the nut in position.
- 4) Position the bearing spacer on the shaft.
- 5) Take the single roller bearing inner race and slide it up hard against the shaft shoulder. Hold it there for a minimum of 30 seconds to allow the race to grip the shaft and prevent it creeping away from the shoulder during cooling. Let the assembly cool completely.

- 6) Take the single roller bearing outer race and press it into the bearing bracket/motor adaptor at the pump end. Use the pump end bearing cover, without the lip seal fitted, to press it into its final position.
- 7) Pre-pack the spherical roller bearing or the two angular contact bearings with grease.
- 8) Lightly grease the bearing rollers and the raceway of the outer race of the single roller bearing.
- 9) Position the motor adaptor/bearing bracket with the shaft axis horizontal (unit level). Press the shaft/bearing assembly into the bearing bracket/motor adaptor. Position the shaft/bearing assembly using the drive-end bearing cover (without a lip seal).
- 10) Remove both bearing covers. Fit the pump end bearing tab washer and lock nut. Prise up at least two tabs to lock the nut in position.
- 11) Fit a lip seal into each bearing cover. Fit the bearing covers and tighten the retaining screws. Rotate the shaft assembly – by hand – about a dozen times to ensure free movement.
- 12) Temporarily fit grease nipples in the motor adaptor or bearing bracket in the grease relief valve positions. Pump grease in until it is witnessed emerging continuously through both final nipple locations in the bearing covers.
- 13) Remove both bearing covers. Add a small amount of grease to the internal cavity of the covers, grease the lip seals and refit.
- 14) Remove the grease nipples and refit them in the bearing covers. Fit the grease relief valves in their places

7.4.4 CD300M, CD400M, HL130M, HL160M, HL225M & HL250M

- 1) Heat the single roller bearing inner race and the two angular contact bearings. Once up to temperature, take the two angular contact bearings and slide them up hard against the shaft shoulder at the drive end.
The bearing orientation is in 'O' arrangement, i.e. with the two outer races 'trapped' between the balls.
- 2) Take the single roller bearing inner race and slide it up hard against the shaft shoulder.
- 3) Use the lock nuts without tab washers to hold them hard against the shoulders for a minimum of 30 seconds to allow the races to grip the shaft and prevent them creeping away from the shoulders during cooling. Let the assembly cool completely. Remove both locknuts.
- 4) Fit the drive end tab washer and locknut. Tighten the locknut securely with a C spanner. Prise up at least two tabs to lock the nut in position.
- 5) Locate and secure the bearing bracket on an assembly jig or bench.
- 6) Take the single roller bearing outer race and press it into the bearing bracket at the pump end. Use the pump end bearing cover, without the lip seal fitted, to press it into its final position. Remove the cover.
- 7) Secure the shaft aligning jig to the pump end of the bearing bracket. Place the two bearing inner covers in the bracket. Lift the shaft horizontally using suitable overhead lifting equipment and slide the shaft assembly in to the bracket.
- 8) Fit the lip seal to the drive end bearing cover (seal lip facing in). Smear the lip seal lightly with oil and fit the cover over the shaft and secure it to the bearing bracket and the inner cover.
- 9) Remove the shaft-aligning jig. Fit the non-drive end bearing tab washer and locknut. Tighten the lock nut securely with a C spanner. Prise up at least two tabs to lock the nut in position.
- 10) Fit the lip seal to the pump end bearing cover (seal lip facing in). Smear the lip seal lightly with oil and fit the cover over the shaft and secure it to the bearing bracket and the inner cover.
- 11) Fit the bearing cover extension pipes and grease nipples. Charge the bearings with grease until it is witnessed just emerging from the inner covers. During this process it is important to continually rotate the shaft. When completed remove the grease extension pipes temporarily to avoid damage during further assembly. Plug the bearing cover holes to avoid grease contamination.

7.5 Air Compressor

Smaller pumps in the range are fitted with an air compressor. The following instructions apply to those units only.

7.5.1 Filter Replacement

The air filter is of the element type. Remove air filter's cover and replace the element if necessary. Check all pipework for leakage and damage. Repair or replace as necessary.

7.6 Vacuum Pump

The vacuum pump (if fitted) forms only part of a complete system.

7.6.1 Non Return Valve

Non return valves are a major cause of priming failure. Should this occur then check the condition of the flap/seat/ball dependant on the type of valve fitted. Look for cuts scores, marks or blemishes on all rubber like materials. Replace where necessary.

7.7 Drive Belts

7.7.1 Timing/HTD Belt Replacement (air compressor)

- 1) If the compressor has external oil feed and return pipes, drain the compressor of oil and disconnect the pipes.
- 2) Remove the pulley guard.
- 3) Undo the coupling sufficiently to allow a new belt to be passed over the shaft end.
- 4) Release the fasteners to allow the air compressor to be tipped forward. Remove the belt.
- 5) Fit a new belt and tighten air compressor fasteners.
- 6) Check the belt tension to ensure that it complies with the belt manufacturer recommendations (see Technical Data section). Add or remove shims to achieve this.
- 7) Reassemble the coupling.
- 8) Refit the pulley guard.
- 9) Replace the compressor oil feed and return pipes.

Refill the compressor with oil (see Technical Data section).

7.7.2 Belt Replacement (vacuum pump)

- 1) Remove the pulley guard.
- 2) Release the vacuum pump adjustment screws and slacken the holding down bolts. This will allow the vacuum pump to be moved and release the belt tension.
- 3) Undo the coupling sufficiently to allow a new belt to be passed over the shaft end.
- 4) Remove the old belt and fit the new.
- 5) Tighten the vacuum pump holding down bolts sufficiently so that the pump can still slide but not tip. Use the adjusting screw to push the vacuum pump into place. Tighten the holding down bolts fully. Ensure the belt is correctly aligned.
- 6) Check the belt tension to ensure that it complies with the belt manufacturer recommendations. (see Technical Data section). Adjust as necessary.
- 7) Reassemble the coupling.
- 8) Refit the pulley guard.

7.7.3 Link belt tensioning and replacement

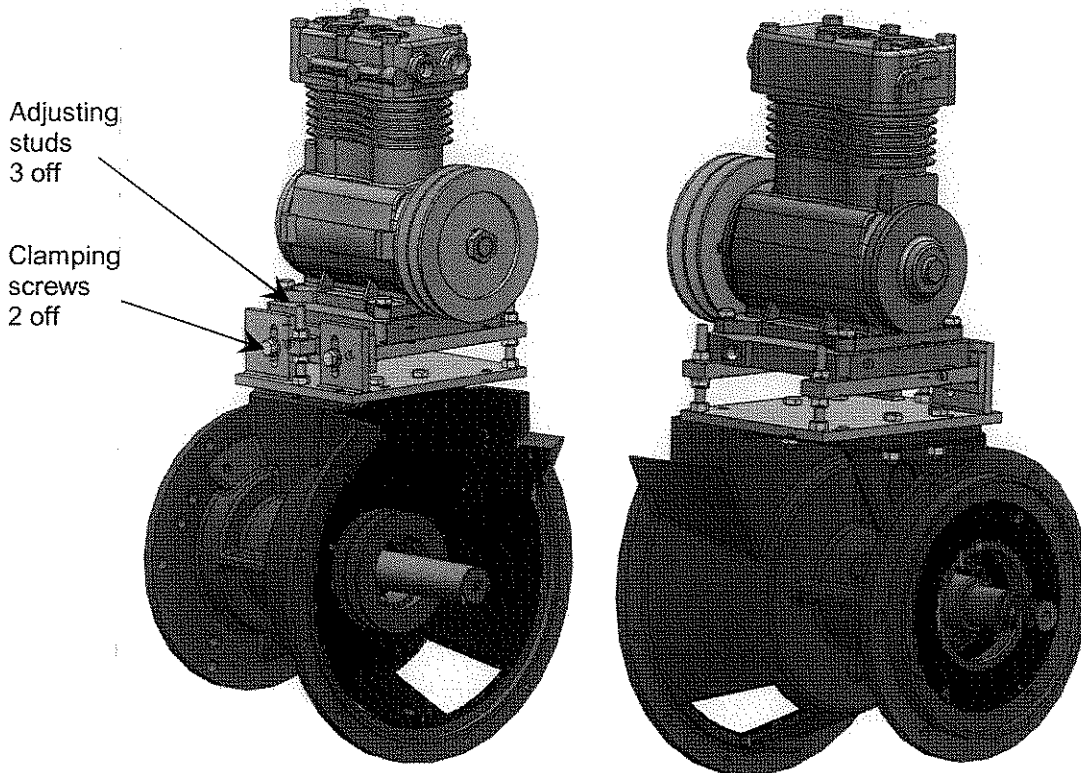


Figure 24 Link belt driven compressor (shown on a CD150 bearing bracket - guards and belt removed)

A) Checking / Tensioning

Link belt tension must be checked and, if necessary, adjusted weekly or after every 100 hrs operation. See Section 11 for force/deflection details.

CAUTION
Link belt tension must be maintained within the specified limits. Belts that are too slack or too tight will wear out quickly, damage the pulleys and will result in loss of pump performance.

To check/adjust tension:-

- 1) Remove at least one half of the guard.
- 2) Check the belt condition. Look for signs of dust and/or pulley wear (belt over tensioned) or smearing of the belt sides (belt under tensioned and slipping).
- 3) Using a spring balance and rule (or a belt tension indicator) check the force and deflection of both belts.
- 4) If adjustment is required, slacken the two clamping screws (see Figure 24) enough to allow the compressor carrying frame to slide on the supporting angle frame.
- 5) Slacken the 3 off adjusting stud nuts on top of the carrying frame (see Figure 24).
- 6) Evenly adjust the nuts under the carrying frame to raise or lower the compressor.

CAUTION
Ensure the compressor drive shaft remains parallel to the pump shaft. Check visually that the drive belts are perpendicular to the shaft axes. Use a straight edge across the pulley faces for confirmation. Failure to ensure that the drive is perpendicular will result in premature belt wear and early failure.

- 7) Check the tension and deflection are within the specified range and that it is the same within 2 or 3% on both belts.
- 8) Correct tension: - Tighten the 3 off adjusting stud nuts (standard torque for nuts on studs – see Section 11) above the carrying frame. Go to instruction 20).
- 9) Tension not achievable because the limit of adjustment has been reached:- A link must be removed from each belt. Lower the carrying frame to the bottom of its adjustment and remove the belts from the pulleys.

 **CAUTION**

The drive must be slack enough to allow the belt to be removed without forcing it over the pulley rim which will damage the belt and lead to premature failure.

- 10) Each belt link is tabbed to the next two. To disconnect turn the belt inside out so the tabs point outwards.
- 11) Bend the belt backwards as far as possible so that the tabs protrude. Hold the belt in this position with one hand and twist one tab so that it is parallel with the slot of the underlying link.
- 12) Pull the underlying link over the twisted tab.
- 13) The belt is now held together by only one tab. Rotate the two parts 90° and remove this remaining tab from the underlying link.
- 14) Remove one link from the belt by repeating instructions 11) to 13).
- 15) To rejoin the belt, ensure it is still threaded around the pump shaft and push one end tab through two links at once on the other end.
- 16) Flex the belt until the second tab can be inserted by twisting into place.
- 17) Ensure both tabs have returned to their normal orientation. Reverse the belt so that the tabs are inside.
- 18) Refit the belt over both pulleys. Go to instruction 6).

- 19) Tighten the 2 off clamping screws (standard torque for nuts and bolts – see Section 11).
- 20) Recheck the force/deflection to ensure no movement has taken place whilst tightening up.
- 21) Replace the guard.
- 22) Run the pump for thirty minutes; recheck the tension adjusting if necessary.
- 23) The pump is now ready for service.

B) Fitting a New Belt

- 1) Remove the guard.
- 2) Slacken the two clamping screws (see Figure 24) enough to allow the compressor carrying frame to slide on the supporting angle frame.
- 3) Slacken the 3 off adjusting stud nuts on top of the carrying frame (see Figure 24).
- 4) If the belts are still intact lower the carrying frame by evenly adjusting the nuts underneath until the belts can be removed.
- 5) Dismantle the belts as described in instructions 11) to 13) of the Tensioning section above.
- 6) Thoroughly clean the area, removing all traces of debris and foreign objects.
- 7) Adjust the carrying frame so that the clamping screws are approximately 10mm above the bottom of the adjusting slots.
- 8) Take a new length of belting and place the end in the top groove of the compressor pulley. Thread the remainder of the belt around the corresponding groove of the bottom pulley and back up to overlap the first end.
- 9) Mark the point at which the belt needs to be dismantled with a pencil or felt tipped pen. Dismantle the belt as described in instructions 11) to 13) of the Tensioning section above. Count the number of links and make a second belt of the same length.
- 10) Make the belts up as described in instructions 15) to 17) of the Tensioning section above.
- 11) Lower the carrying frame to the bottom by undoing the adjusting stud nuts underneath the frame.
- 12) Fit the belts over the pulleys. Evenly adjust the nuts under the carrying frame to raise the compressor until the belts are close to the required tension (See Section 11).
- 13) Check the tension and deflection are within the specified range and that it is the same within 2 or 3% on both belts.
- 14) Tighten the 3 off adjusting stud nuts (standard torque for nuts on studs – see Section 11) above the carrying frame.
- 15) Tighten the 2 off clamping screws (standard torque for nuts and bolts – see Section 11).
- 16) Recheck the force/deflection to ensure no movement has taken place whilst tightening up.
- 17) Replace the guard.
- 18) Run the pump for thirty minutes; recheck the tension adjusting if necessary.
- 19) The pump is now ready for service.

8 Special Tools

8.1 Tool Kits

Pump	MA version	BB version
CD75	ACC-PT-01	√
CD80D	ACC-PT-03	
CD80M	ACC-PT-06*	ACC-PT-02*
CD100M	ACC-PT-06*	ACC-PT-02*
CD103M	ACC-PT-31*	
CD140M		
CD150M	ACC-PT-07 ACC-PT-27*	ACC-PT-08 ACC-PT-28*
CD160M	ACC-PT-33 (Mk1) ACC-PT-36 (Mk2)	
CD200M	ACC-PT-09 ACC-PT-29*	ACC-PT-20 ACC-PT-22*
CD225	ACC-PT-29*	ACC-PT-22*
CD250M	ACC-PT-09	ACC-PT-20
CD300M		ACC-PT-30

Pump	MA version	BB version
HL80	ACC-PT-11 ACC-PT-25*	ACC-PT-12 ACC-PT-26*
HL100M HL125MS HL150M HL150MHD	ACC-PT-19	ACC-PT-21
HL110M	ACC-PT-35	
HL200M	ACC-PT-34	

The kits generally comprise of: -

- ♦ a special spanner and locating tool to aid in impeller removal/fitting.
- * These tool sets have an impeller spanner designed for use with a 1" square drive torque multiplier
- ♦ a locking bar to prevent shaft rotation
- ♦ a sleeve to aid in fitting the mechanical seal
- ♦ a sleeve to aid in pressing the bearing home on the shaft
- ♦ a tool to aid in assembly/removal of the rear wear plate
- ♦ a tool to aid correct location of the lip seals in the bearing covers
- ♦ a tool to position the bearing spacer (where applicable) in the bracket
- ♦ a seal assembly and setting tool.

8.2 Special Tools

Pump	Remarks	Tool Purpose	Tool Part Number
HL110M/HL200M		First seal setting	54-1317-2011
CD300M HL130M/HL160M/HL250M	multi-piece seal	First seal setting	54-1394-9811 (Not required for one piece seal builds)
CD300M/CD400M HL130M/HL160M/HL250M		Shaft aligning jig	54-1468-9811

9 Warranty

Unless special arrangements have been agreed and signed by both parties Godwin Pumps Ltd. will apply the following policy over defects found after delivery.

We will make good, by repair or the supply of a replacement, defects which, under proper use, appear in the goods within a period of twelve calendar months after the goods have been delivered ⁽¹⁾ and arise solely from faulty design (other than a design made, furnished or specified by you for which we have disclaimed responsibility in writing), materials or workmanship: provided always that defective parts have been returned to us if we shall have so required. We shall refund the cost of carriage on such returned parts and the repaired or new parts will be delivered by us free of charge.

Our liability under this clause shall be in lieu of any warranty or condition implied by law as to the quality or fitness for any particular purpose of the goods, and save as provided in this clause we shall not be under any liability, whether in contract, tort or otherwise, in respect of defects in goods delivered or for any injury ⁽²⁾, damage or loss resulting from such defects as from any work done in connection therewith.

(1) For export orders, within a period of twelve calendar months after the goods have been delivered or, if delivery is delayed by reason of customer instructions or lack of instructions, within a period of 18 months after the goods have been notified as ready for despatch (whichever period expires the earlier).

(2) For UK orders, other than personal injury caused by our negligence as defined in Section 1 of the Unfair Contract Terms Act, 1977.

10 Fault Finding

If possible fit a suction and pressure gauge to assist fault finding and check pump rating

POSSIBLE CAUSE		FAULT					
		Pump does not prime	Insufficient liquid delivered	Liquid flow ceases	Excessive power consumption	Vibration or overheating	Seal housing oil emulsified
Suction lift too great		√	√	√			
Insufficient water at suction inlet		√		√			
Suction inlet or strainer blocked		√	√	√			
Separation tank filter blocked		√	√	√			
Suction line not air tight		√	√				
Suction hose collapsed		√	√	√			
Non return valve not seating		√					
Mechanical seal drawing air into pump		√	√	√			
Compressor units only	Ejector jet or nozzle blocked or badly worn	√		√			
	Ejector non-return valve ball stuck	√					
	Compressor pipe leaking air	√					
	Compressor not delivering sufficient air	√					
Compressor/vacuum pump drive belt faulty		√					
Discharge head too high			√				
Obstruction in body or impeller			√	√	√	√	
Impeller excessively worn or damaged			√			√	
Delivery hose punctured or blocked			√	√			
Incorrect speed (if diesel driven)			√		√	√	
Incorrect rotation (if electric motor driven)			√				
Excessive air leak in suction hose				√			
Viscosity and/or SG of liquid too high					√		
Cavitation due to excessive suction lift						√	
Mechanical seal damaged or worn							√

11 Technical Data

11.1 Designations, Sizes & Capacities

CD Range	Suction / Delivery bore (ins)	Max flow (m ³ /hr)	Max. head (m)	Max solids handling (mm)	Max working temp (°C)	Max working pressure (bar)	Weight ⁽¹⁾ (kg)		Speed Range		
							Engine driven	Motor driven	Min	Norm	Max
CD75	3/2	49	22	40	80	2.14	79	83	1500	2500	3000
CD80D	3/3	94	21	40	80	4.03	126		1400	2000	3000
CD80M	3/3	83	21	40	80	2.8	186	146	1200	1800	2200
CD100M	4/4	160	35	45	100	3.5	202	169	1200	1700	2200
CD103M	4/4	200	44	75	80	4.4	220	200	1200	1800	2200
CD140M	4/4	250	85	75	80	9	510		1200	1800	2000
CD150M	6/6	450	49	65	80	4	285	254	1200	1500	2200
CD160M	6/6	460	80	75	80	9	610	580	1200	1800	2000
CD180M	8/6			75	80	9	600	570	1200	1800	2000
CD200M	8/8	790	50	75	80	5	310		1400	2000	2200
CD225M	8/8	790	55	80	80	5.5	385	411	1400	2000	2200
CD250M	10/10	850	55	80	80	5.5	400	411	1400	2000	2200
CD300M	12/12	1300	55	95	80	6.1	890 ⁽²⁾		1200	1500	1800
CD400M	18/16	2140	40	125	80	6.1	2383 ⁽³⁾ 1835 ⁽⁴⁾ 465 ⁽⁵⁾		900	1100	1200

HL Range	Suction / Delivery bore (ins)	Max flow (m ³ /hr)	Max. head (m)	Max solids handling (mm)	Max working temp (°C)	Max working pressure (bar)	Weight ⁽¹⁾ (kg)		Speed Range		
							Engine driven	Motor driven	Min	Norm	Max
HL80	4/3	107	90	25	80	10	258	262	1400	1800	2400
HL100M	4/4	180	125	35	80	14.3	423	402	1400	1800	2200
HL110M	4/3	110	188	20	80	19			1400	2000	2200
HL125MS	6/4	300	125	35	80	14.3	446	456	1400	2000	2400
HL130M	6/4	305	190	23	80	19	1095 ⁽⁶⁾		1200	1800	2100
HL150M	6/6	320	125	35	80	14.8	629	598	1400	2000	2400
HL150MHD	6/6	320	150	35	80	14.8	592		1400	2000	2400
HL160M	8/6	465	182	35	80	19	1155		1200	1800	2000
HL200M	6/8 or 6/6	540	97	38	80	11.4	689		1200	1600	2200
HL225M	10/8	830	110	65	90	11	905 ⁽⁶⁾		1200	1800	2000
HL250M	12/10	1080	116	65	80	13	986		1200	1800	2000

NOTES: -

- (1) Weights are based on cast iron bareshaft pumps fitted with compressors. Different materials or additional equipment can significantly affect the weight.
- (2) Bareshaft open coupled unit with individual bearing bracket.
- (3) Vacuum primed unit with gearbox.
- (4) Ejector (less compressor) primed unit less gear box.
- (5) Gearbox.
- (6) Close coupled units with individual bearing bracket.

11.2 CD Range data

Pump Type	CD75	CD80D	CD80M	CD100M	CD103M	CD150M	CD140M	CD160M Mk I	CD160M Mk II	CD180M	CD200M	CD225	CD250M	CD300M	CD400M
MA Flange (SAE)	5		4			3		2 or 3		4		3		1 ⁽¹⁾	N/A
Shaft end float mm(ins)	0.075 to 0.10mm (0.003" to 0.004")						0.127 to 0.33mm (0.005" to 0.013")	Nominal bearing clearance only 0.05mm (0.002") max			0.127 to 0.33mm (0.005" to 0.013")	Nominal bearing clearance only 0.05mm (0.002") max			
Impeller clearances front & rear (rear only on CD75) mm(ins)	0.50 to 0.63 (0.020" to 0.025")		Cast Iron Imp/Wear Plate = 0.50 to 0.76mm (0.020" to 0.030") Stainless Steel Imp/Wear Plate = 0.63 to 0.76mm (0.025" to 0.030")												
Impeller torque lbs.ft(N-m)	33.0 (46.0)	30.0 (41.0)	31.0 (42.0)	53.0 (72.0)	180.0 (244.0)	320.0 (434.0)	563.0 (763.0)	320.0 (434.0)			N/A				
Impeller bolt torque lbs.ft(N-m)	N/A	N/A	40.0 (54.2)			100 (135.6)					Initial 570.0 (776.0) then relax to 177.0 (240)				
Ø Shaft at seal position mm	40					50	60	75	40	50	75	90			
Seal working length mm	32.0±0.3					34.0±0.3	39.0±0.3	Inboard 372.0±0.3 Outboard 45.0±0.5	32.0±0.3	34.0±0.3	Inboard 372.0±0.3 Outboard 45.0±0.5	50.0±0.5			
Bearing Bracket grease type	Shell Nertia HV Mobil SHV 46 Total Multis Complex EP2 Belesta XPG														
Seal hsg oil	Type	Any SAE 20/20 or BIOPUS 46 Biodegradable													
	Capacity litres	0.5			1.75	3.8	1	6	6.8						
	Volume Max to min marks litres	N/A			0.35	0.5	N/A	0.6	0.6						
Compressor oil type (if not fed from engine)	Total Cortusa 100														

NOTES:-

⁽¹⁾ These figures/notes are for the close coupled version of the CD300M with a one piece seal. Other figures are for the open coupled version with a multi piece seal.

11.3 HL Range data

Pump Type	HL80	HL100M	HL110M	HL125MS	HL150M	HL150MHD	HL200M	HL130M	HL160M	HL225M	HL250M	
MA Flange (SAE)	4	3	2 or 3	3		2		0 or 1				
Shaft end float mm(ins)	0.075 to 0.10mm (0.003" to 0.004")	0.127 to 0.33mm (0.005" to 0.013")	Nominal bearing clearance only. 0.05mm (0.002) max	0.127 to 0.33mm (0.005" to 0.013")	Nominal bearing clearance only. 0.05mm (0.002) max							
Impeller clearances Front & rear mm(ins)	Cast Iron Imp/Wear Plate = 0.50 to 0.63 (0.020 to 0.025) Stainless Steel Imp/Wear Plate = 0.63 to 0.76 (0.025 to 0.030)											
Impeller torque lbs.ft(N-m)	147.0 (199.0)	378.0 (513.0)	563.0 (763.0)	378.0 (513.0)	517.0 (701.0)	563.0 (763.0)	N/A					
Impeller bolt torque lbs.ft(N-m)	40.0 (54.2)	100 (135.6)					Initial 570.0 (776.0) then relax to 177.0 (240)					
Ø Shaft at seal position mm	40	50	60	50		60	75					
Seal working length mm	32.0±0.3	34.0±0.3	39.0±0.3	34.0±0.3		39.0±0.3	N/A ⁽¹⁾		N/A ⁽¹⁾			
Bearing Bracket grease type	Shell Nertia HV Mobil SHV 46 Total Multis Complex EP2 Belesta XPG											
Seal hsg oil	Type	Any SAE 20/20 or BIOPUS 46 Biodegradable										
	Capacity litres			5.25			5.25	5.5 litres initial fill. Top up to full mark on dipstick after 1 hr running				
	Volume Max to min marks litres	N/A		0.5	N/A			0.6				
Compressor oil type (if not fed from engine)	Total Cortusa 100											

NOTES:-

⁽¹⁾ These figures/notes are for the one piece seal versions of the HL130M & HL225M. Other figures are for the multi-piece versions

11.4 Spanner Torques

The following tables give the recommended tightening torques for general purpose metric and UNC fasteners. They are to be used only when the joint is metal to metal (i.e. no joints or gaskets) and no special figures (e.g. for impeller retaining bolts) have been quoted.

Table 1 Metric Fasteners

Thread Size	Torque (N-m)	
	Nuts & Bolts	Nuts on Studs
M6 x 1.0	11.7	4.6
M8 x 1.25	28	11
M10 x 1.5	56	22
M12 x 1.75	98	38
M16 x 2.0	244	95
M20 x 2.5	476	185
M24 x 3.0	822	320
M30 x 3.5	1633	633

Table 2 UNC Fasteners

Thread Size	Torque (N-m)	
	Nuts & Bolts	Nuts on Studs
¼" - 20	13.5	5.4
5/16" - 18	27.1	10.5
3/8" - 16	48.8	20
7/16" - 14	74.6	30
½" - 13	122	48
5/8" - 11	237.3	95
¾" - 10	420.4	167
7/8" - 9	664.4	266
1" - 8	1003	401

Table 1 figures are for Metric fasteners to BS3692 Grade 8.8 for bolts, Grade 4.6 for studs and Grade 10 for nuts.

Table 2 figures are for UNC fasteners to BS1768 Grade S and Grade 3 for nuts.

If the fasteners are of dissimilar condition then the figures Table 1 or Table 2 must be multiplied by those in Table 3.

Table 3 Correction factors

		PLATING CONDITION OF BOLT	
		SELF	ZINC
PLATING CONDITION OF NUT	SELF	1.0	0.9
	ZINC	0.9	0.8

11.5 Thread Locking Compounds

Item	Recommended compound	Characteristics
Mechanical seal shaft sleeve locking screws	Loctite 243	Suitable for stainless steel fasteners Temperature range up to 150°C Medium strength Assembly time 15-30 minutes

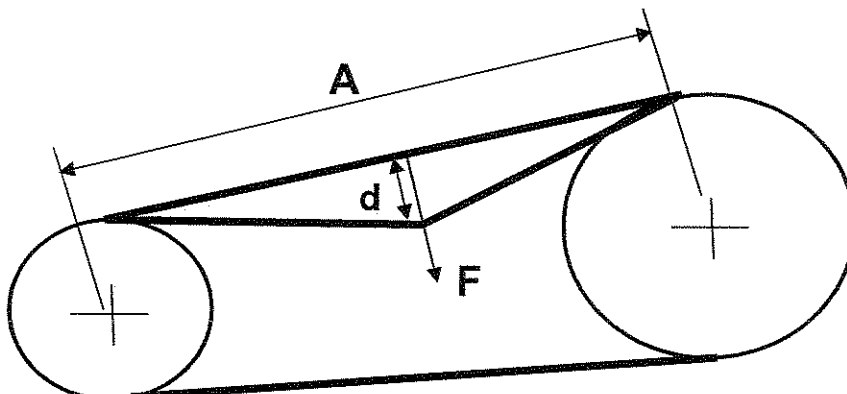
11.6 Belt Tensioning

11.6.1 Force and deflection method

Belt tension is achieved by drive centre distance extension. It is achieved by applying a setting force F at the mid span of the belt to achieve a deflection d . (see diagram and table below). Ensure the force is applied at a right angle to the belt and evenly across the belt width.

11.6.2 Belt frequency method

Use a belt frequency meter to measure the frequency of the belt. For a new belt use the 'as built' column values. For a belt with more than two or three hours service use the 'run in' column values. The figures are based on an ambient temperature of 20°C.



11.6.3 Belt tension figures –HTD/Timing belts

Pump type	Speed Ratio	Pulley Centres A (mm)	Belt type type	Force F (kg)	Deflection d (mm)	Frequency (Hz)	
						As Built	Run in
CD75	1.4	199.6	Timing	1.6	4		
CD80M	2.1	303.9	Timing	2.5	6		
CD75M CD80D	1.2	200.0	HTD	2.5	4	85	70 - 80
CD100M HL80M	1.6	287.4	Timing	2.5	6	75	60 - 70
CD103M CD150M CD200M HL80M	1.3	291.8	Timing	2.5	6	85	70 - 80
CD80D	1.4	207.0	HTD	2.2	4	140	120 - 135
CD150M CD200M	1.4	288.0	HTD	2.4	6	95	80 - 90
HL110M CD140M CD160M CD200M CD225M HL150M HL125M	1.3	300.0	HTD	1.1	6	45	30 - 40
CD100M	1.6	348.0	HTD	1.4	7	65	50 - 60

11.6.4 Belt tension figures Link

Pump type	Force F (kg)	Deflection d (mm)
CD100M, CD103M, CD150M, CD160M, CD200M, CD225 HL80, HL110M, HL125MS, HL150M, HL150MHD, HL200M	2.6 – 3.6	6

NOTES

Godwin Pumps Ltd

Quenington
Cirencester
Gloucestershire
GL7 5BX,
England

Tel: *44 (0)1285 750271
Fax: *44 (0)1285 750352

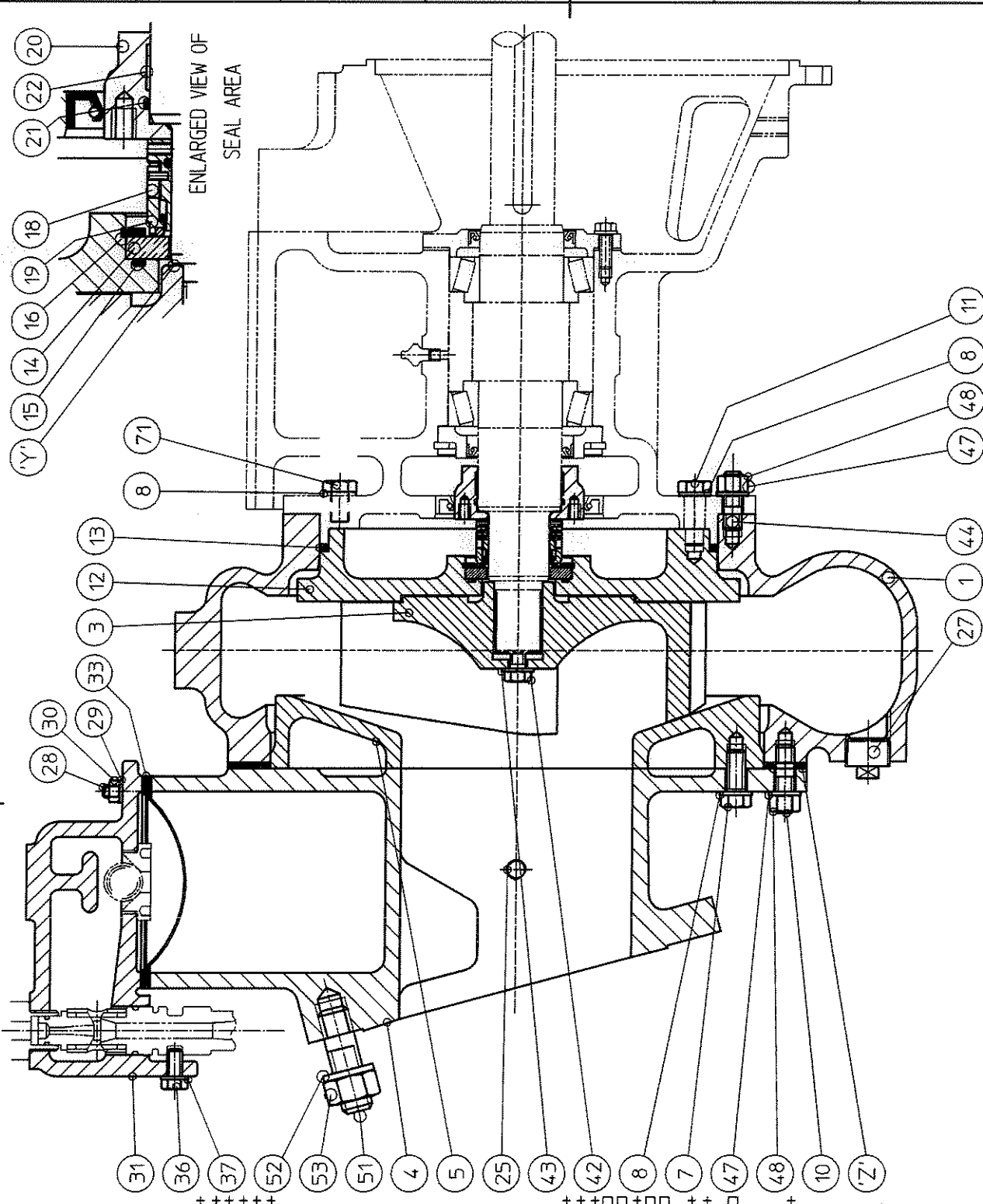
E-mail: sales@godwinpumps.co.uk
Website: www.godwinpumps.co.uk

Godwin Pumps of America Inc.

One Floodgate Road
Bridgeport
New Jersey 08014
U.S.A.

Tel: 856 467 3636
Fax: 856 467 4841

E-mail: sales@godwinpumps.com
Website: www.godwinpumps.com



Pos/Qty	Part No.	Description
86	1 36-0646-6533	SHIM IMPELLER
85	1 36-0646-6523	SHIM IMPELLER
84	1 36-0646-6513	SHIM IMPELLER
83	2 36-034-5443	GASKET
82	1 36-034-5433	GASKET
81	1 36-034-5423	GASKET
80	1 36-034-5413	GASKET
71	2 35-0220-8412	SCREW HEX HEAD
63	1 47-0148-7913	PLATE NAME
53	8 33-0601-8182	NUT HEX FULL
52	8 33-0601-8762	WASHER SPRING
51	8 33-0644-8132	STUD
48	12 35-0401-8182	NUT HEX FULL
47	12 35-0401-8762	WASHER SPRING
44	6 35-0440-8152	STUD
43	1 35-0301-8172	WASHER PLAIN
42	1 35-0330-8418	SCREW HEX HEAD STIFF
37	1 35-0301-8762	WASHER SPRING
36	1 35-0320-8412	SCREW HEX HEAD
33	1 23-0586-9923	FILTER SEPARATION TANK
31	1 21-0230-0115	COVER SEPARATION TANK
30	4 35-0201-8182	NUT HEX FULL
29	4 35-0201-8762	WASHER SPRING
28	4 35-0240-8152	STUD
27	1 43-1188-9912	PLUG
25	2 43-1506-8112	PLUG
22	1 41-0241-6112	RING TOLERANCE
21	1 36-036-4112	O RING
20	1 28-0285-8011	COLLAR
19	1 38-1416-9912	FACE SEAL
18	1 35-1425-9912	SEAL MECHANICAL
16	1 41-0566-9911	ORCLIP
15	1 38-0700-4112	O RING
14	1 38-0620-9913	SEAL SEAL
13	1 38-1004-4112	O RING
12	1 12-0284-0115	WEARPLATE REAR
11	4 35-0435-8412	SCREW HEX HEAD
10	6 35-0425-8152	STUD
8	10 43-0765-9912	SEAL BONDED RUBBER
7	4 35-0430-8412	SCREW HEX HEAD
5	1 12-0283-0115	WEARPLATE FRONT
4	1 11-0259-0125	COVER FRONT
3	1 12-0282-3095	IMPELLER
1	1 11-0386-0115	BODY PUMP

□ - recommended spares after running period of 2500 hours.
 + - recommended spares after running period of 5000 hours.

Notes:

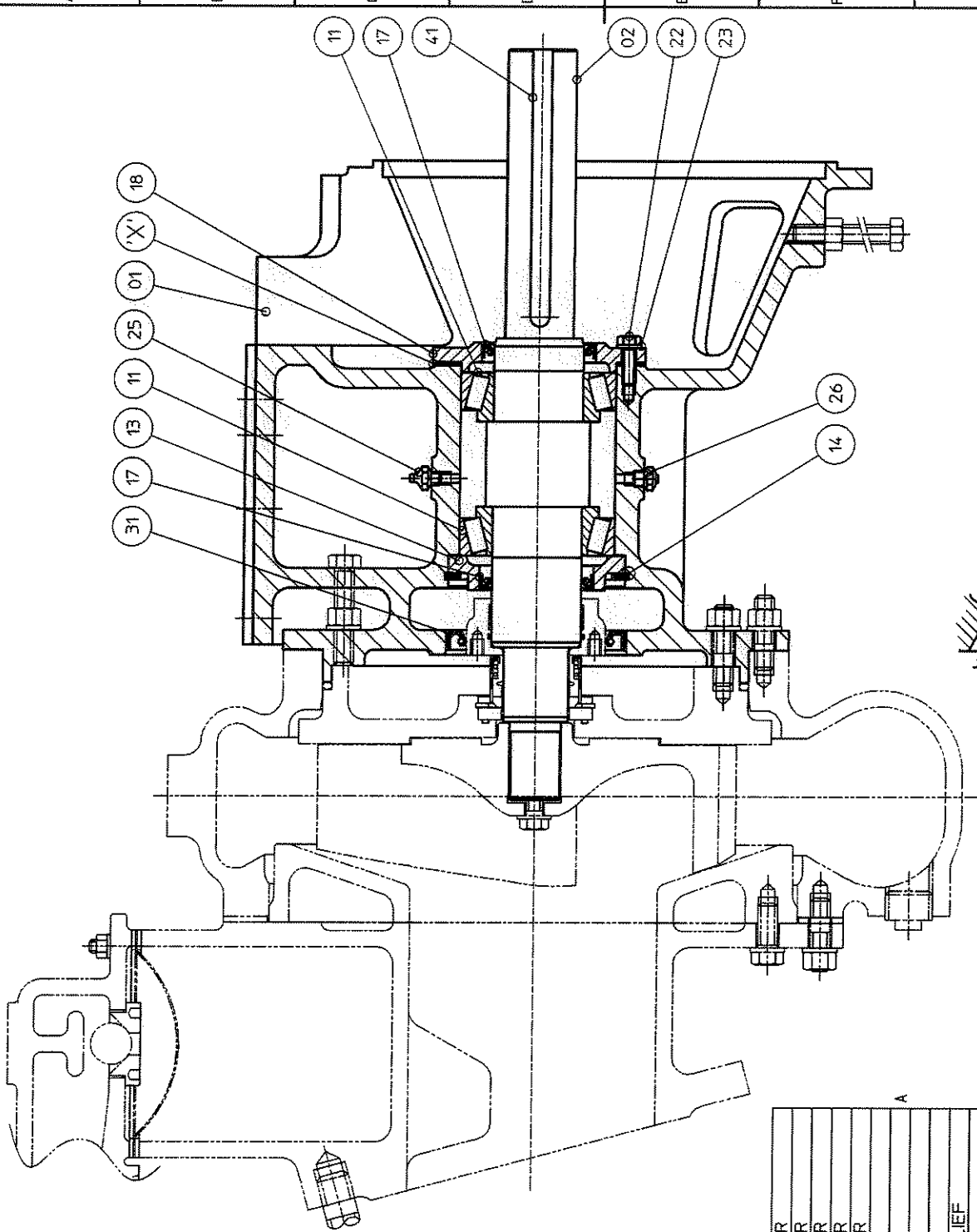
- Item 'Y': Shim, items 84, 85 and 86 are to be added between the impeller and shaft in order to obtain a clearance between the impeller and rear wearplate of 0.50mm (0.020" to 0.025").
- Item 'Z': Gaskets, items 80, 81, 82 and 83 are to be added between the front cover/front wearplate assembly and pump body in order to obtain a clearance between the front wearplate and impeller of 0.50mm (0.020" to 0.025"). All plugs to be inserted with pipe tape to facilitate removal.
- Item 80 gasket material for stainless steel builds is not available.

		Detail 1 15/10/02 Date 15/10/02		Drawn: S.O. Date: 15/10/02		DRG No. CD150-CI-ACW-34 TITLE HYDRAULIC END		SH 1 of 1	
Approved: This Build is for STANDARD HYDROCC BUILDERS. Godwin Pumps Limited Wellington, New Zealand Telephone: 01 758 4000 Fax: +64 01 758 5021 www.godwinpumps.co.nz		TOLERANCES: as per unless otherwise stated We cannot guarantee dimensions of outside suppliers equipment		Ch'kd: J.C. Date: 30/11/05		Date: 30/11/05		Scale 1:1	

ASSEMBLY INSTRUCTIONS

1. ENSURE ALL PARTS ARE CLEAN AND FREE FROM BURRS.
2. HEAT BOTH BEARING INNER RACES AND FIT TO SHAFT. HOLD HARD AGAINST SHAFT SHOULDERS FOR 30 SECS MINIMUM.
3. FILL SPACE BETWEEN RACES WITH GREASE.
4. LIGHTLY GREASE BEARING ROLLERS AND INNER RACES.
5. FIT PUMP END BEARING COVER AND CIRCLIP. PRESS COVER HARD BACK AGAINST CIRCLIP.
6. FIT PUMP END BEARING OUTER RACE INTO HOUSING. PRESS HOME HARD AGAINST THE COVER.
7. POSITION ADAPTOR WITH SHAFT AXIS VERTICAL (PUMP END DOWN).
8. LOWER SHAFT/BEARING ASSY INTO PLACE.
9. PRESS DRIVE END BEARING OUTER RACE INTO HOUSING.
10. FIT DRIVE END BEARING CAP. HAND TIGHTEN RETAINING SCREWS. SHIM (ITEMS 70/12/3/4) UNDER THE DRIVE END BEARING CAP AT 'X' UNTIL 0.05/0.075 (0.002" - 0.003") SHAFT END FLOAT IS OBTAINED.
11. REMOVE DRIVE END BEARING COVER AND SHIMS.
12. GREASE THE ASSEMBLY THROUGH NIPPLE UNTIL A CONTINUOUS RING OF GREASE IS WITNESSED FROM BOTH BEARINGS.
13. GREASE THE DRIVE END LIP SEAL AND PRESS INTO THE BEARING COVER. PARTIALLY FILL COVER CAVITY WITH GREASE AND REFIT.
14. GREASE THE PUMP END LIP SEAL AND PRESS INTO THE BEARING COVER (SEAL LIP FACING OUT).
15. FIT PLUGS ETC.
16. FIT KEY AND RETAIN WITH TAPE IF REQUIRED.
17. PROTECT EXTERNAL SURFACES WITH RUST INHIBITOR (SHELL ENSIS FLUID K OR CASTROL TARP) IF UNIT IS TO BE STORED OR SHIPPED.

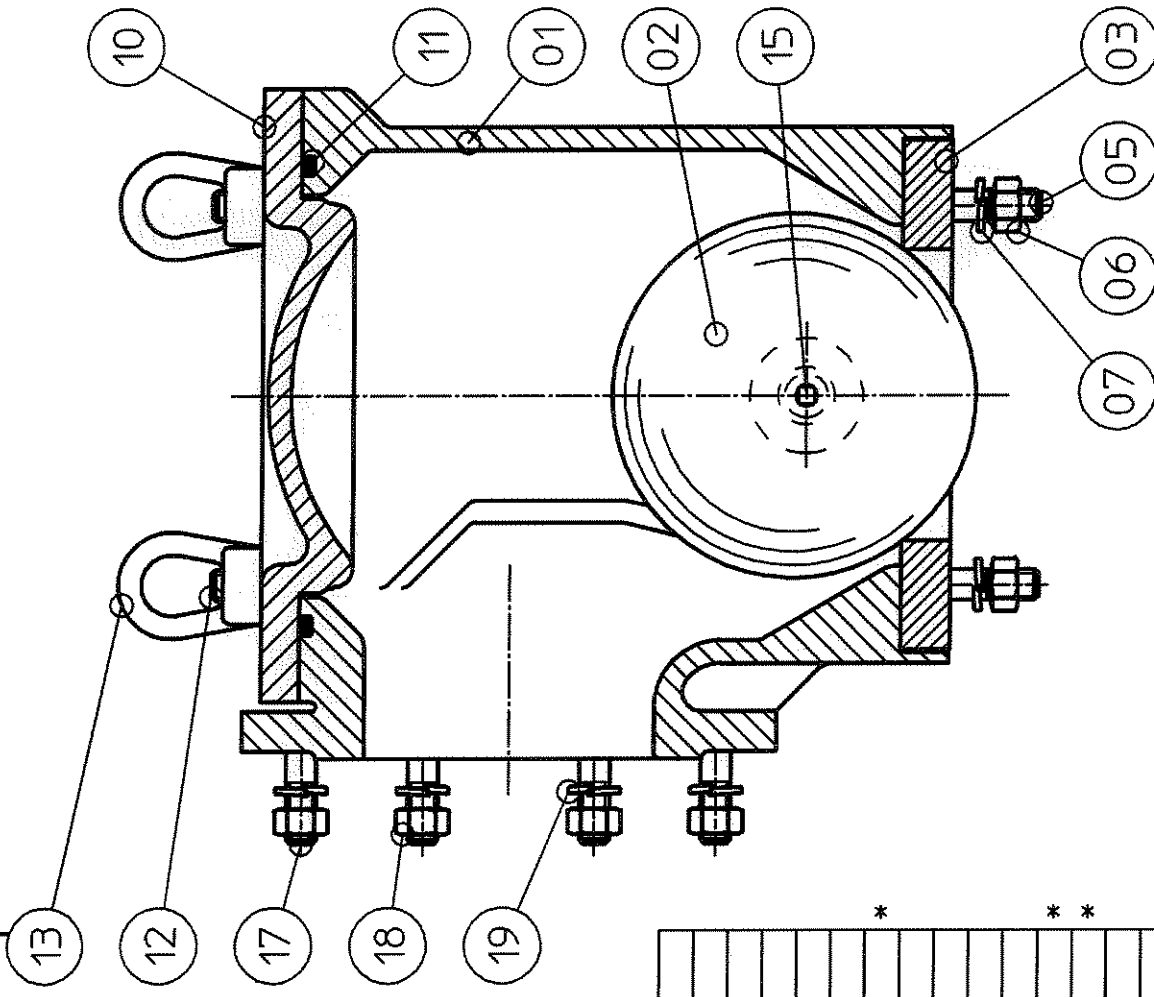
M8 SCREW TORQUE 2Nm (15.5 lb.ft)



'A' DENOTES 2000 HR RUNNING RECOMMENDED SPARES

Pos	Qty	PartNo	Description
74	1	136-0650-9953	SHIM BEARING COVER
73	2	136-0650-9943	SHIM BEARING COVER
72	1	136-0650-9933	SHIM BEARING COVER
71	1	136-0650-9923	SHIM BEARING COVER
70	1	136-0650-9913	SHIM BEARING COVER
41	1	145-0273-8812/170	KEYSTEEL
31	1	138-1033-4112	SEAL LIP
29	1	143-0102-0812	PLUG
28	1	143-1048-9912	PLUG
26	1	151-0010-9912	VALVE GREASE RELIEF
25	1	151-0003-9912	NIPPLE GREASE
23	3	335-0201-8762	WASHER SPRING
22	3	335-0225-8412	SCREW HEX HEAD
18	1	113-0173-0115	COVER BEARING
17	2	136-0809-4112	SEAL LIP
14	1	141-0232-9912	CIRCLIP
13	1	113-0172-8811	COVER BEARING
11	2	239-0069-9912	BEARING TAPER ROLLER
2	1	116-0400-8041	SHAFT
1	1	113-0174-0215	BRACKET BEARING
Pos	Qty	PartNo	Description

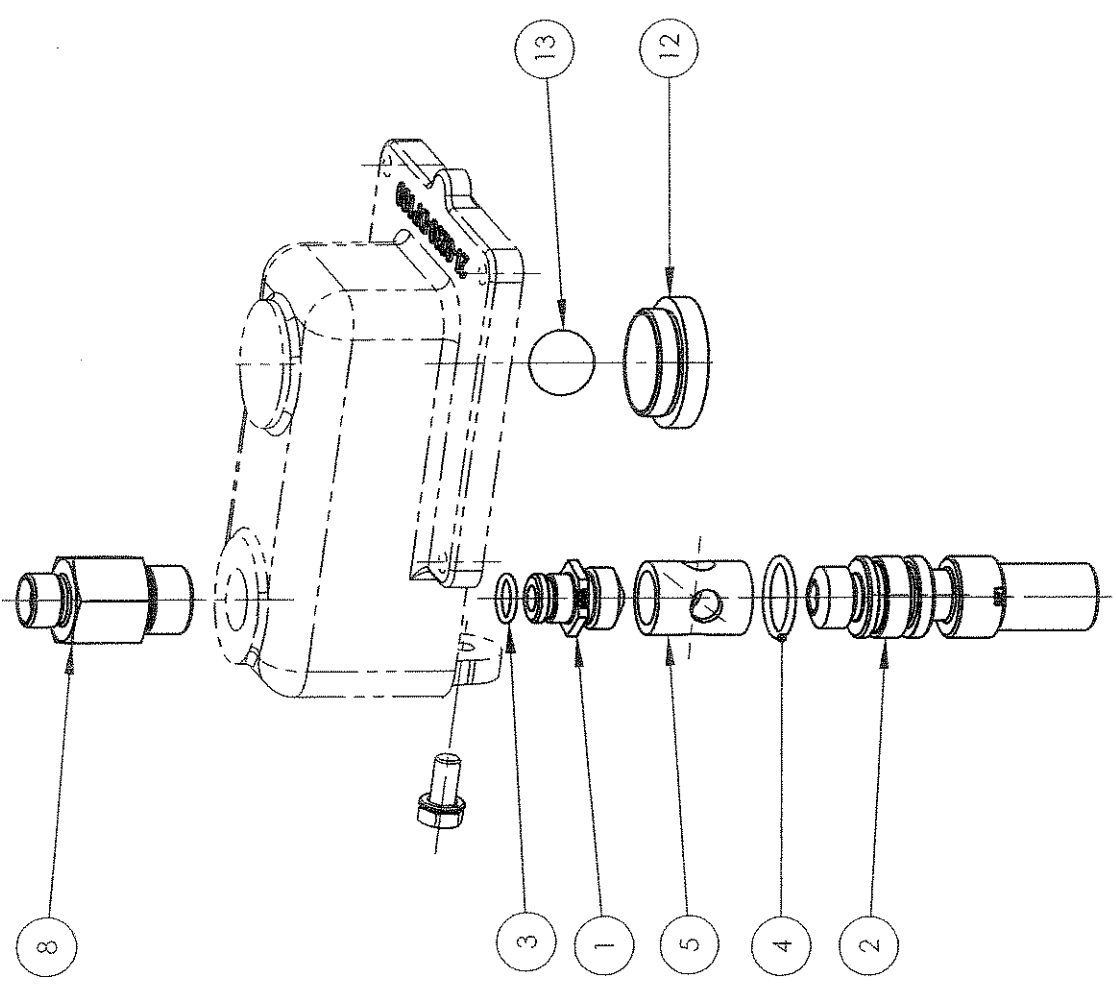
Detail Date 22/09/05
 Item No. 22/09/05
 Drawn S.D. Date 22/09/05
 Checked S.D. Date 22/09/05
 Title MA0348 MOTOR ADAPTOR
 Description CD150M BS. NICKEL CHROME SHAFT.
 Scale 1:2
 Third Angle Projection
 We cannot guarantee dimensions of outside suppliers equipment
 TOLERANCES - see unless otherwise stated
 © 2005
 godwin pumps
 Godwin Pumps Limited
 Southleigh, Gwent, Gloucestershire GL7 5JL, England.
 Tel: +44 (0)1295 750271
 www.godwinpumps.co.uk



'*' - denotes recommended spares after a running period of 5000 hours.

Pos	Qty	PartNo	Description
19	8	33-0601-8762	WASHER SPRING
18	8	33-0601-8182	NUT HEX FULL
17	8	33-0648-8132	STUD
15	1	54-0923-9912	PLUG
13	4	28-0130-9912	NUT BOW
12	4	33-9540-8132	STUD
11	1	38-0961-4112	O RING
10	1	23-0592-0125	COVER INSPECTION
7	4	35-0501-8762	WASHER SPRING
6	4	33-0501-8182	NUT HEX FULL
5	4	33-9560-8132	STUD
3	1	23-0591-4113	SEAT NRV
2	1	39-0652-4113	BALL NRV
1	1	23-0590-0125	BODY NRV
			Description

23	04/07/08	Detail	DRG. No.	V150-02	Sht 1 of 1
<p>godwin pumps Limited Ouerington, Cranesater, Gloucestershire GL7 5BX England. Tel: +44 (0)1285 750271 www.godwinpumps.co.uk</p>			TITLE NON-RETURN VALVE C.I. 7.5" BALL. OUTLET 6" ASA150.		
F N DOUBT - ASK DO NOT SCALE Graphics: BS9889:2002 Dimensions: mm Third Angle Projection			Drawn S.O. Date 01/04/00 Ch'k'd J.C. Date 11/11/04 Scale 1:3		
TOLERANCES ± 3mm (unless otherwise stated) We cannot guarantee dimensions of outside suppliers equipment © 2007			A3		



Pos	Item	Description	Qty	2000 hr spares	5000 hr spares
1	23-0568-2016	JET EJECTOR	1		X
2	23-0571-2016	NOZZLE EJECTOR	1		X
3	38-1013-4112	O RING	1		X
4	38-1014-4112	O RING	1		X
5	23-0570-2011	COLLAR EJECTOR	1		X
8	23-0567-2011	SLEEVE JET	1		
12	23-0412-2011	SEAT NRV	1	X	
13	39-0641-4113	BALL NRV	1	X	



Godwin Pumps Ltd.
 Quenington, Cirencester
 Gloucestershire
 GL7 5BX, UK.
 Tel: +44 (0)1285 750271
 Fax: +44 (0)1285 750352
 © 2008

UNLESS OTHERWISE SPECIFIED:
 Dimension in millimetres
 Surface finish in microns

TOLERANCES
 MACHINING
 Dimension
 0 to 50 0.05
 50 to 100 0.1
 100 to 250 0.15
 250 to 500 0.2
 500 to 1000 0.3
 1000 to 2500 0.5
 2500 to 5000 1.0
 5000 to 10000 1.5
 10000 to 25000 2.0
 25000 to 50000 3.0
 50000 to 100000 4.0
 100000 to 250000 5.0
 250000 to 500000 6.0
 500000 to 1000000 7.0
 1000000 to 2500000 8.0
 2500000 to 5000000 9.0
 5000000 to 10000000 10.0

FABRICATION
 Dimension
 0 to 50 0.05
 50 to 100 0.1
 100 to 250 0.15
 250 to 500 0.2
 500 to 1000 0.3
 1000 to 2500 0.5
 2500 to 5000 1.0
 5000 to 10000 1.5
 10000 to 25000 2.0
 25000 to 50000 3.0
 50000 to 100000 4.0
 100000 to 250000 5.0
 250000 to 500000 6.0
 500000 to 1000000 7.0
 1000000 to 2500000 8.0
 2500000 to 5000000 9.0
 5000000 to 10000000 10.0

FLATNESSES
 Dimension
 0 to 50 0.05
 50 to 100 0.1
 100 to 250 0.15
 250 to 500 0.2
 500 to 1000 0.3
 1000 to 2500 0.5
 2500 to 5000 1.0
 5000 to 10000 1.5
 10000 to 25000 2.0
 25000 to 50000 3.0
 50000 to 100000 4.0
 100000 to 250000 5.0
 250000 to 500000 6.0
 500000 to 1000000 7.0
 1000000 to 2500000 8.0
 2500000 to 5000000 9.0
 5000000 to 10000000 10.0

THIRD ANGLE PROJECTION
 THIS TO BS 8888:2004

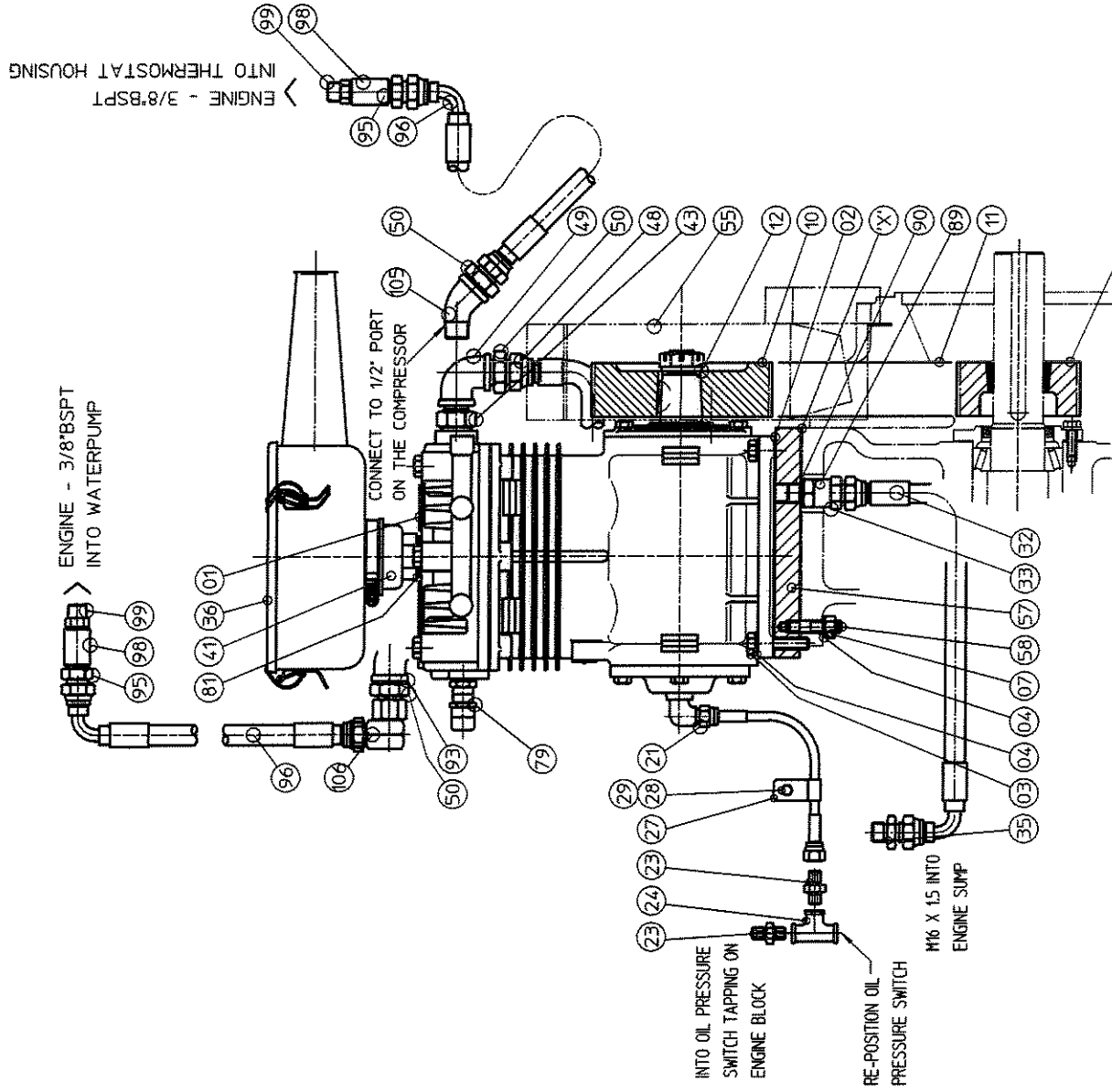
IF IN DOUBT - ASK
DO NOT SCALE DRAWING

TITLE: EJECTOR PACKAGE
25 CFM BRASS NICKEL PLATED (7.1 DIA)
PART NO. EP25-27

4 Redrawn from 3D model - no change to part.
 ISSUE DESCRIPTION

AT NO. BY DATE
 4 07/10/2008

RELEASED BY: 09/10/2008
 APPROVD: 09/10/2008
 DRAWN BY: AJ
 DATE: 09/10/2008
 DWG NO.: EP25-27
 WEIGHT: 1.5
 SCALE: 1:1
 SHEET 1 of 1
 ISSUE 6
 A3



Pos/Qty	Part No	Description
106	1 43-1632-8112	ADAPTOR STUD
105	1 43-0463-0822	ELBOW
99	2 43-0003-0812	NIPPLE
98	2 43-0042-8112	SOCKET EQUAL
96	1 42-0234-9933	HOSE
95	2 43-1461-8112	ADAPTOR STUD
93	1 43-0213-0812	ELBOW
90	1 43-0733-9912	SEAL BONDED RUBBER
89	1 43-1473-8112	ADAPTOR
84	1 27-3613-6523	SHIM COMPRESSOR
83	1 27-3613-6513	SHIM COMPRESSOR
81	1 43-0686-9912	SEAL BONDED RUBBER
79	1 44-0036-9912	VALVE PRESSURE RELIEF
58	4 35-0345-8192	STUD
57	1 27-2775-8525	BASE COMPRESSOR
55	1 27-5469-9811	GUARD PULLEY
50	3 43-0816-8112	ADAPTOR STUD
49	1 43-0198-0812	ELBOW
48	1 43-0718-9913	PIPE COMPRESSOR
43	1 43-0017-0812	NIPPLE
41	1 43-1204-7015	ADAPTOR
36	1 54-0925-9915	CLEANER AIR
35	1 43-1588-8112	ADAPTOR
33	1 43-0850-8112	ADAPTOR STUD
32	1 42-0133-9913	PIPE OIL
29	1 35-0001-8182	NUT HEX FULL
28	1 35-0016-8412	SCREW HEX HEAD
27	1 41-0578-9912	CLIP PIPE
24	1 43-0219-0822	TEE
23	2 43-1459-8112	ADAPTOR STUD
21	1 42-0091-9933	PIPE OIL
12	1 33-0701-8762	WASHER SPRING
11	1 26-0840-9912	BELT TIMING
10	1 26-0724-0243	PULLEY TIMING
9	1 26-0851-9912	PULLEY TIMING
7	4 35-0301-8182	NUT HEX FULL
4	8 35-0301-8762	WASHER SPRING
3	4 35-0330-8412	SCREW HEX HEAD
2	1 38-1071-5413	GASKET
1	1 49-0523-9912	COMPRESSOR AIR
		Description

Items marked '**' denotes recommended spares after a running period of 5000 hours.
 Air cleaner element renewal dependant on application.

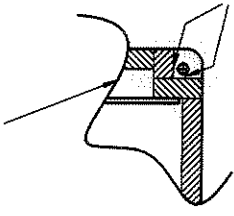
6	07/06/08	DATE	ITEMS 51, 92, 94, AND 97 REMOVED. ITEM 56 AND 96 QTY CHANGED. ITEM 306 ADDED.
		Godwin Pumps Limited Quenington, Gloucester, Gloucestershire GL1 9XJ, England. Tel: +44 (0)1205 750271 www.godwinpumps.co.uk	
TOLERANCES + .004 unless otherwise stated We cannot guarantee dimensions of outside suppliers equipment		IF IN DOUBT - ASK DO NOT SCALE Graphical: E50882002 Dimensional: mm Third Angle Projection	
Drawn: S.O. Date: 14/05/03		Title: COMPRESSOR BUILD	
Ch'kd: S.O. Date: 08/04/09		DRG No: AC150-48	
Scale: 1:3		SH 1 of 1	

Notes:
 Item 'X': Shims added to attain correct timing belt tension.
 Shim item numbers 83 and 84.
 Cylinder head bolt (56) torque: 40.7Nm (58lbf ft).

Pos	Qty	PartNo	Description
35	1	38-1660-5411	GASKET
31	1	43-0466-0822	ELBOW
30	1	47-0271-9911	PLATE INSTRUCTION
29	1	47-0262-9911	LABEL
28	1	41-0254-9912	CLIP HOSE
27	2	42-0211-9912	HOSE RUBBER
26	1	43-1855-9912	ADAPTOR TAILPIECE
25	1	43-1835-9912	ADAPTOR TAILPIECE
24	1	44-0444-9912	VALVE BALL
23	1	43-1522-6112	ADAPTOR STUD
22	1	42-0234-9913	HOSE
21	2	43-0816-6112	ADAPTOR STUD
20	2	41-0254-9912	CLIP HOSE
19	1	43-1853-9912	ADAPTOR TAILPIECE
18	1	39-0830-9912	BALL FLOAT
17	1	33-0201-6182	NUT HEX FULL
16	1	33-0216-3612	SCREW HEX HEAD
15	1	35-0101-6182	NUT HEX FULL
14	1	40-0553-9912	BUFFER
13	1	27-5869-9811	FLOAT ARM
11	3	35-0101-6172	WASHER PLAIN
10	1	41-0633-9912	PIN CLEVIS
9	4	35-0101-6162	WASHER SPRING
8	4	35-0116-3612	SCREW HEX HEAD
7	1	27-5868-9811	BRACKET FLOAT ARM
6	4	35-0101-8762	WASHER SPRING
5	4	34-0529-8182	NUT WING
4	4	35-0125-8132	STUD
3	1	54-1205-9912/1000	STRIP SEALING FOAM
2	1	27-5867-9821	LID FLOAT TANK
1	1	21-0410-0125	TANK FLOAT
			Description

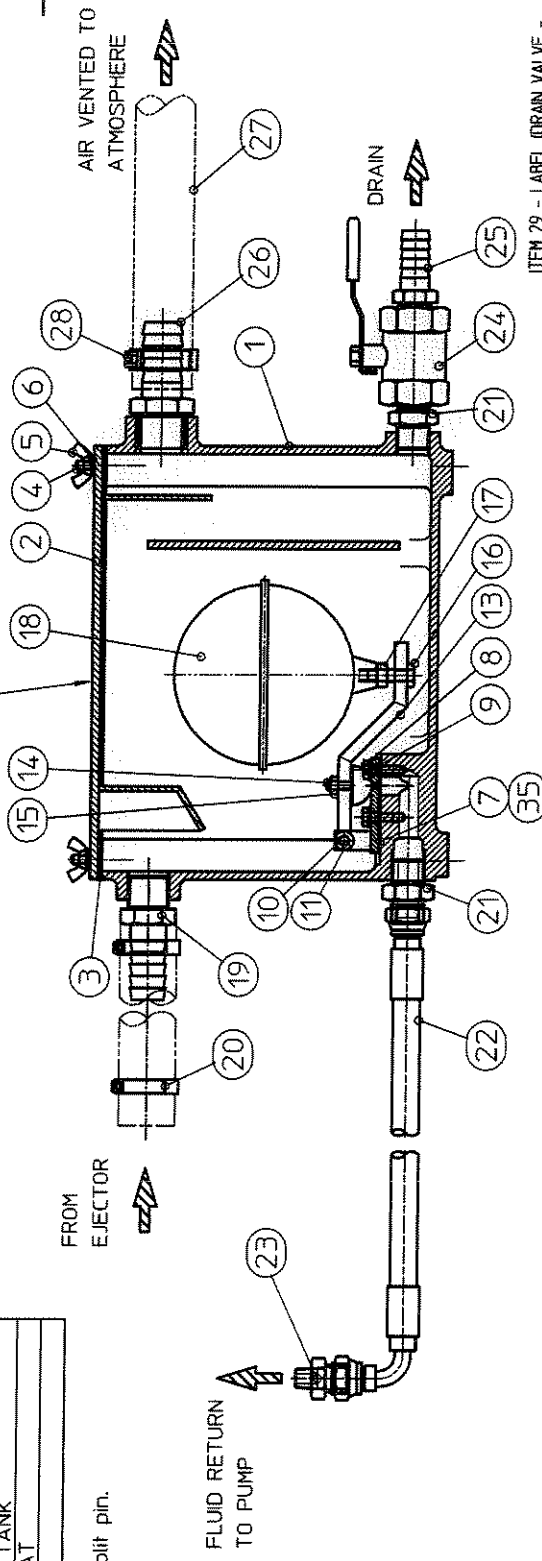
Item 10 clevis pin is supplied complete with split pin.

Fastener must be kept outside sealing strip. This diagram shows the suggested way it is cut and fitted at all four corners of the underside of the lid in order to do this.



Foam strip to be clear of fastener hole

ITEM 30 - PLATE INSTRUCTION TO BE POSITIONED CENTRALLY ON TANK LID



NOTE -
ITEM 31 IS FOR USE ONLY ON CD100, CD150 AND HL80 BUILDS.
IT IS TO BE USED IN BETWEEN ITEM 19 AND ITEM 1.

7	23/06/08	ITEM 35 GASKET - 38-1660-5411 ADDED.	DRG No.	ACC-DP-13	SIN 1
			Drawn	AJ	of 1
			Date	20/01/05	
			GRK'd	AJ	
			Date	23/06/08	
			Scale	4:5	
IF IN DOUBT - ASK GOODWIN PUMPS			TITILE		
Accessories DRIPRIME			CARRY OVER COLLECTION & RETURN (1" HOSE INLET)		
TOLERANCES - 3mm unless otherwise stated			Third Angle Projection		
We cannot guarantee dimensions of outside suppliers equipment					
© 2007					
goodwin pumps			www.goodwinpumps.co.uk		
Goodwin Pumps Limited					
Queeright Crescent,					
Buxton, Derbyshire G17 9BL					
England					
Tel +44 (0)1295 750771					

DESCRIPTION

The GODWIN AUTO/STOP/START panel is a state of the art, automatic engine start / stop controller with glow plug/minimum run timer. The panel operates from a 12 or 24 volt battery and can withstand voltage drops during cranking. It includes crank and rest cycles, sensing circuit for crank disconnect, overcrank, and re-crank protection on false starts. Four red LED's indicate first out shutdown from low oil pressure, high temperature, overcrank, engine stall, and no speed signal. A fifth green LED lights when the engine has started. This same LED flashes during the rest period while the unit is cycle cranking the engine. A sixth LED lights when the glow plug output is operating.

SPECIFICATIONS

- Power Input:** 6 to 28 VDC.
- Power Consumption Standby (AUTO):** <1 mA.
- Operating Temperature:** -40 to 185 °F (-40 to +85 °C).
- Inputs:** Ground or positive inputs for high temperature, low oil pressure, High/Low Level, Auxiliary / Remote Stop sensors. (Note: The momentary start input must be at least 100 ms in duration to be recognised as a valid start.)
- Lamp Test:** When unit is powered up in Manual or Auto, the LED's light for 1 second as a test.
- Outputs:** 5A smart FET for cranking and multifunction output. 10A smart FET for Fuel Valve (Energized to Run) output. 125 ma transistor for common failure, engine run, and auxiliary output.
- Crank Attempts:** Selectable for 3.
- Crank / Rest Cycle Timing:** Field adjustable 10 seconds.
- Multifunction Output:** Glowplug.
- Shutdown Lockout Time Delay:** 6 seconds. Locks out low oil pressure, high temperature, and loss of speed shutdowns on start-up.
- Crank Disconnect Speed Setting:** 250 RPM.
- Speed Sensing Input:** Magnetic pickup.

Sequence of Operation with Panel in "AUTO"

The ASM170 module is very flexible. The basic sequence of operation follows:

When a start signal is received, the following occurs:

- The frequency is checked relative to the crank disconnect set point. If the frequency is sensed to be above the set point, the fuel valve will turn on and the engine run light will light. The following delays will also begin timing:
- Shutdown Lockout Delay
- If the frequency is sensed to be below the set point the fuel valve will turn on. The glow plug output will turn on for 6 seconds.
- During Cycle cranking, the Fuel Valve output is on continuously.
- If the Multifunction output is set to Glowplug, the unit will first turn on the output for the selected amount of time, turn it off then energize the start output. If the unit does not start, the start output will be de-energized through the rest delay and the run light will flash. When the rest delay expires, the glow plug output would then be energized through the delay, turn off, and the start output will be energized again. This sequence will continue until the engine is sensed to start or OVERCRANK occurs.
- If the engine starts but then stalls, the ENGINE STALL LED will flash for 10 seconds. After the 10-second delay expires, the cycle cranking sequence will continue. These "Engine Stalls" or "False Starts" are counted as crank attempts.
- OVERCRANK – If the engine fails to start within the selected number of crank attempts, the fuel output will be de-energized, the common fail output will be energized and the OVERCRANK LED will light. Before the module will attempt to start the engine again, this shutdown condition must be reset by moving the selector switch to the OFF position and back to AUTO.
- If the unit successfully starts the engine by cycle cranking, the starter output will immediately be de-energized; the ENGINE RUNNING light will turn on. The following delays will begin timing:
- Shutdown Lockout Delay

- Once the Shutdown lockout delay has timed out, the unit will arm the following shutdowns:
- LOW OIL PRESSURE
- HIGH ENGINE TEMPERATURE
- NO SPEED SIGNAL
- When the stop signal is sensed the unit will shutdown the engine provided the minimum run timer has expired (factory set at 8 – 10 mins). When it is ready for shutdown the fuel valve will be de-energized and the controller will await another start signal.

SHUTDOWNS: If the controller senses any shutdown conditions while it is running, the fuel output will be de-energized, the common fail output will be energized and the appropriate shutdown LED will light. Before the module will attempt to start the engine again, the unit must be reset by moving the selector switch to the OFF position and back to the AUTO position.

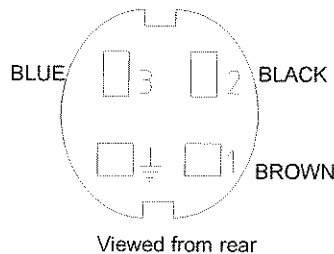
Sequence of Operation with Panel in "MANUAL"

When the MANUAL-OFF-AUTO switch is placed in the "MANUAL" position, an automatic start signal is simulated. Therefore, the controller will operate the same as it does in "AUTO." However, it will continue to run as long as there are no signals from monitored conditions or until the MANUAL-OFF-AUTO switch is moved to the "AUTO" or "OFF" positions.

FLOAT SWITCH ARRANGEMENT

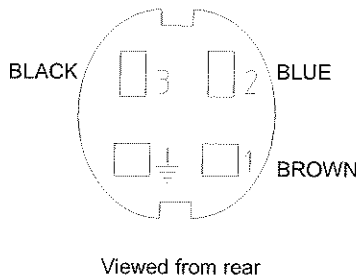
Standard arrangement – Tank empty plug details :

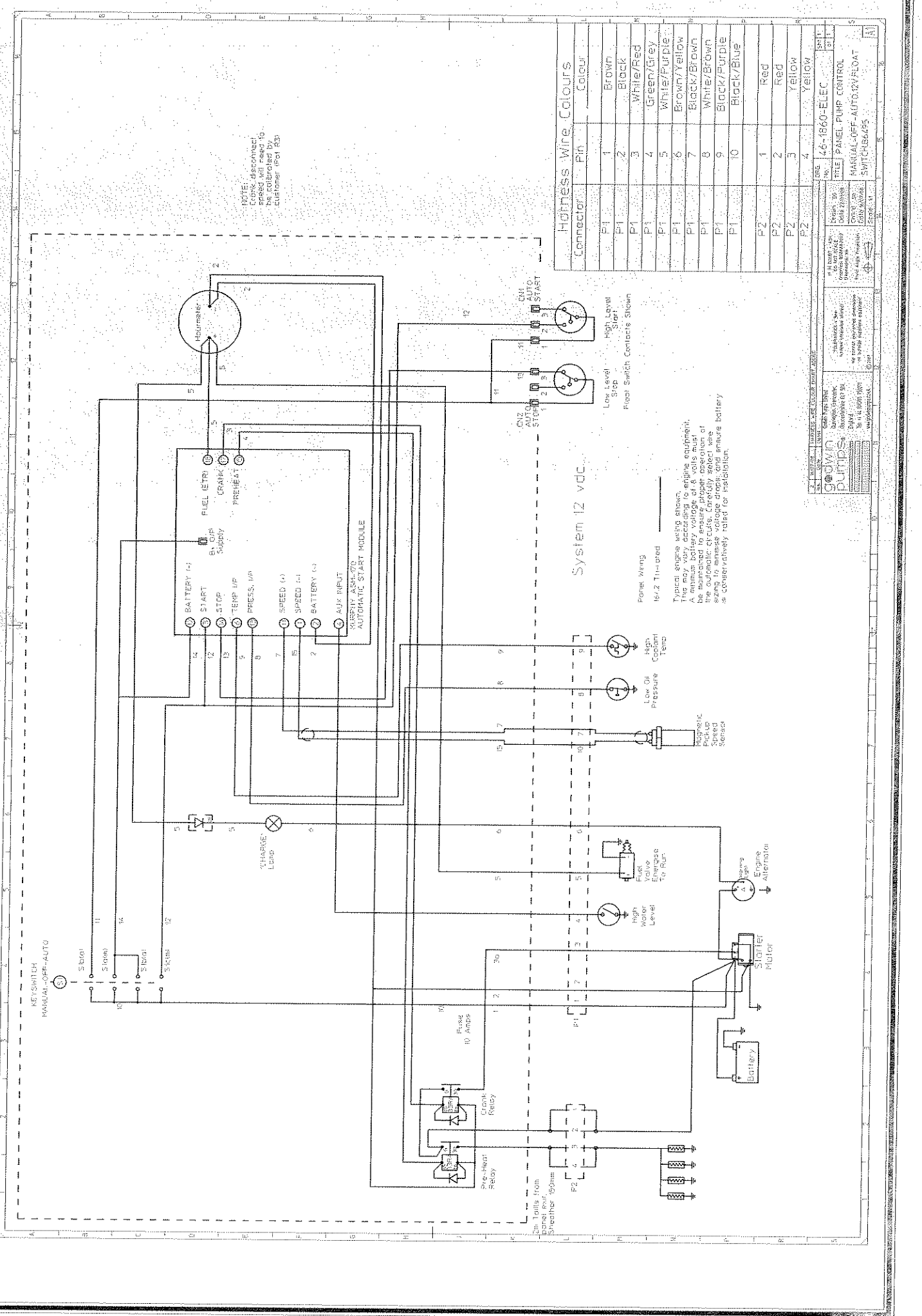
Float switch part number : 46-1632-9915 X 2 off



Optional arrangement – Tank fill plug details :

Float switch part number : 46-1632-9925 X 2 off





NOTE:
Crank disconnect
speed will need to
be calibrated by
customer (not R3)

Connector	Pin	Colour
P1	1	BROWN
P1	2	Black
P1	3	White/Red
P1	4	Green/Grey
P1	5	White/Purple
P1	6	BROWN/Yellow
P1	7	Black/Brown
P1	8	White/Brown
P1	9	Black/Purple
P1	10	Black/Blue
P2	1	Red
P2	2	Red
P2	3	Yellow
P2	4	Yellow

System 12 VDC

Panel Wiring
16.2 Tin-ated

Typical engine wiring shown.
This may vary according to engine equipment.
A minimum battery voltage of 4 volts must
be maintained to ensure proper operation of
the automatic start module. The battery must
be sized to minimize voltage drops. The battery
is conservatively rated for installation.

gardwin PUMPS
 18 BERRY LANE
 BRIMLEY BRIDGE
 GARDWICK
 LEICESTERSHIRE
 LE12 6JW
 TEL: 01530 810100
 FAX: 01530 810101
 E-MAIL: SALES@gardwinpumps.co.uk
 WEBSITE: www.gardwinpumps.co.uk

Part No. 46-1560-ELEC
 Title: PANEL PUMP CONTROL
 Manual-Off-Auto-2V Float
 Rev: 1
 Date: 1999
 Scale: 1:1

Godwin Dri-Prime[®] Pumps

Operation and Maintenance Manual

HUSHPAC Supplement

godwin
pumps[®]

godwin
pumps.

Declaration of Conformity



The Manufacturer Godwin Pumps Ltd.
 Quenington
 Cirencester
 Gloucestershire
 GL7 5BX
 United Kingdom

hereby declares that the machinery described below: -

Dri-prime® HUSHPAC pump sets of the CD and HL ranges – details as per the serial number plate fixed to the pump itself

comply with the provisions of the Machinery Directive (Directive 89/392/EEC as amended) and the regulations transposing it into national law.

It also complies with the following Harmonised Standards: -

EN 292-1	Safety of machinery: Basic terminology, methodology
EN 292-2	Safety of machinery: Technical Principles and specifications
EN 292-2/A1	Safety of machinery: Technical Principles and specifications – Amendment 1
EN 809	Pumps and pump units for liquids – Common safety requirements
EN-60204-1	Safety of Machinery- Electrical equipment: General Requirements

Signed

D C Braithwaite

Technical Director

Date

10/01/05

INDEX

1	Introduction.....	4
2	How to use this Supplement.....	4
3	Safety.....	4
4	HUSHPAC Features.....	5
4.1	Compressor exhaust air water removal.....	6
	4.1.1 Operating detail.....	7
4.2	Engine sump pump.....	8
4.3	Engine fuel tank.....	8

1 Introduction

The purpose of this HUSHPAC supplement to the Installation, Operating and Maintenance Handbook is to provide information about the additional equipment that may be supplied in the range of Dri-Prime® HUSHPAC Pumps.

It is intended for use in conjunction with both the basic pump and engine manuals.

Ensure that suitably qualified personnel carry out the installation. The variety of conditions and environments in which this equipment can be used means that the operator and those responsible must satisfy themselves as to the safety and acceptability of each application and operating condition of this equipment. Under no circumstances will Godwin Pumps Ltd be responsible or liable for indirect or consequential damages arising from the use or application of this equipment.

The pump unit is completely self contained within the HUSHPAC housing requiring only the addition of fuel, the checking of engine fluid levels and the connection of hoses to be ready for pumping.

The information contained in this handbook was correct at the time of publication. It is subject to amendment at any time. Should any doubt exist about the veracity of the information, contact Godwin Pumps Ltd for clarification before proceeding.

2 How to use this Supplement

Read this section before installing, operating or carrying out any maintenance on the unit.

When the pump is being installed operated or maintained there are a number of practices that may lead to personal injury or product damage. Your attention is drawn to the following symbols used throughout this handbook.



CAUTION

This caution symbol draws attention to special instructions or procedures which, if not correctly followed, may result in damage to, or destruction of equipment.



WARNING

This warning symbol draws attention to special instructions or procedures which, if not strictly observed, may result in personal injury.



WARNING

A WARNING SYMBOL WITH THIS TYPE OF TEXT DRAWS ATTENTION TO SPECIAL INSTRUCTIONS OR PROCEDURES WHICH, IF NOT STRICTLY OBSERVED, MAY RESULT IN SEVERE PERSONAL INJURY, OR LOSS OF LIFE.

NOTE: -

A note is used to draw your attention to additional important information.

3 Safety



WARNING

ALL ITEMS IN THIS SECTION, IF NOT STRICTLY OBSERVED, COULD RESULT IN SEVERE PERSONAL INJURY OR LOSS OF LIFE.

Use only lifting equipment of suitable capacity for the size and weight of the equipment being lifted.

The equipment must always be lifted using safe working practices and in accordance with any local and national guidelines or statutes. If in doubt, consult Godwin Pumps Ltd or a local lifting expert.

Whilst lifting the unit keep personnel well away and **never** allow people underneath.

Never lift the unit with the hoses still connected.

4 HUSHPAC Features

HUSHPACs are designed as totally self contained pumping units in sound reducing enclosures requiring only the attachment of suction and delivery hoses in order to commence work.

The enclosure contains a diesel driven pump set with control panel, overnight running fuel tank, bunded base, engine exhaust silencer(s) and starter batteries. Devices to help reduce the risk of accidental spillage or pollution are also fitted. These include water removal from the compressor exhaust air and an engine sump pump.

The bunded base collects and holds any engine fluid spill or leakage from the fuel tank. It is sized to contain the full contents of the fuel tank and all engine fluids. A drain plug is provided.



Figure 1 Front 3/4 view of typical HUSHPAC (HL80 shown)

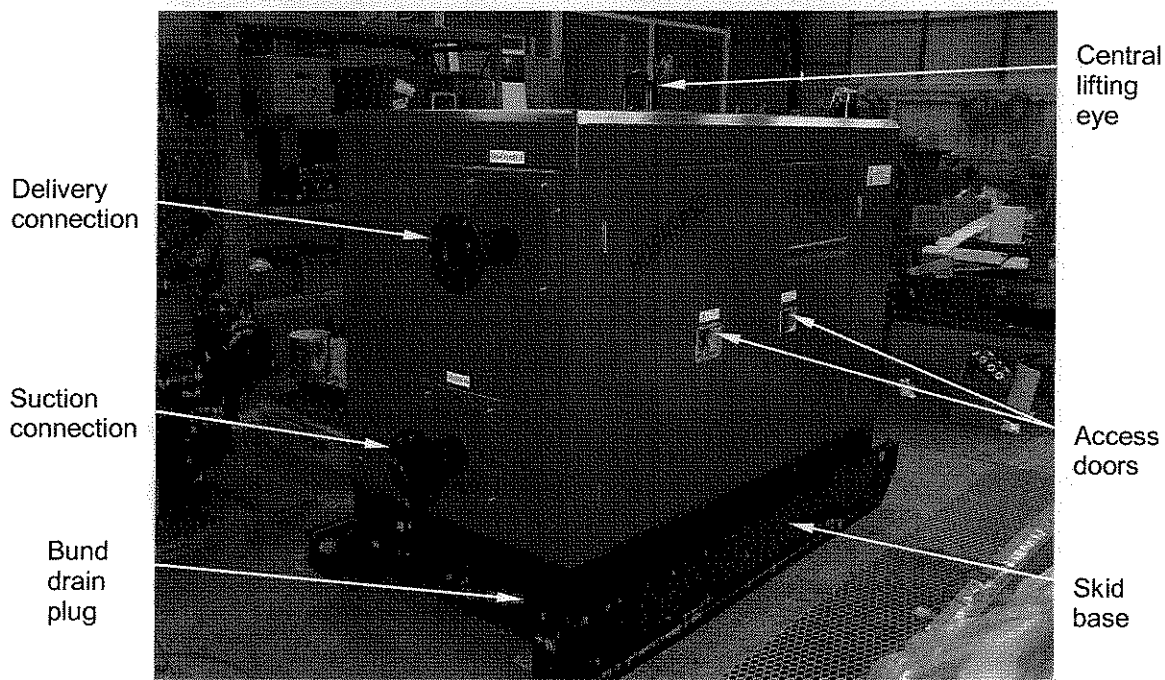


Figure 2 Rear 3/4 view of typical HUSHPAC (HL80 shown)

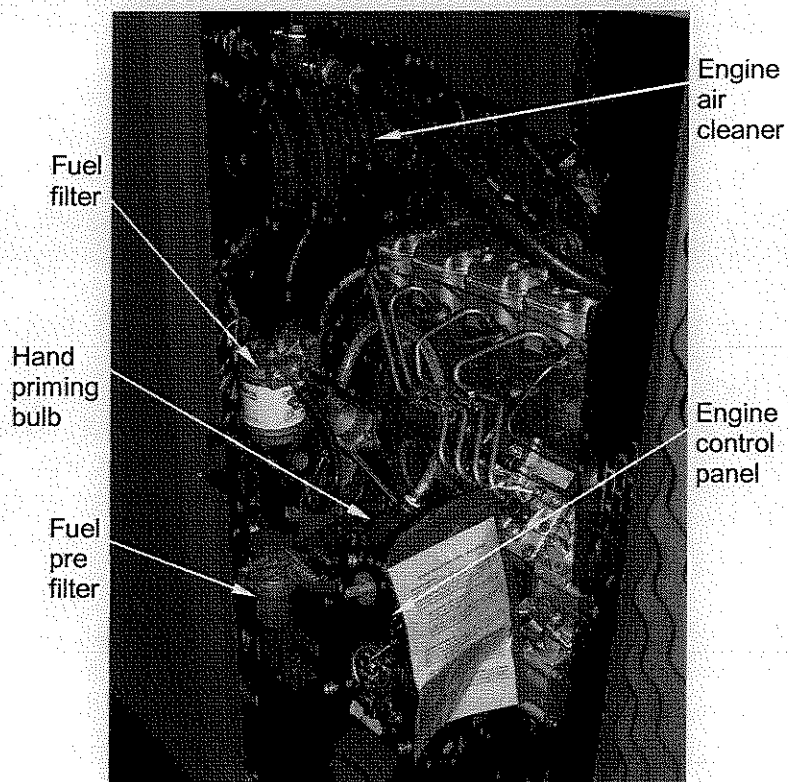


Figure 3 View of engine features (Perkins 102.5 engine shown)

4.1 Compressor exhaust air water removal

This device is an integral part of the HUSHPAC system. It removes water from the compressed air exhaust system and returns it to the pumped flow. See Figure 4 Schematic - Compressor exhaust system for system details.

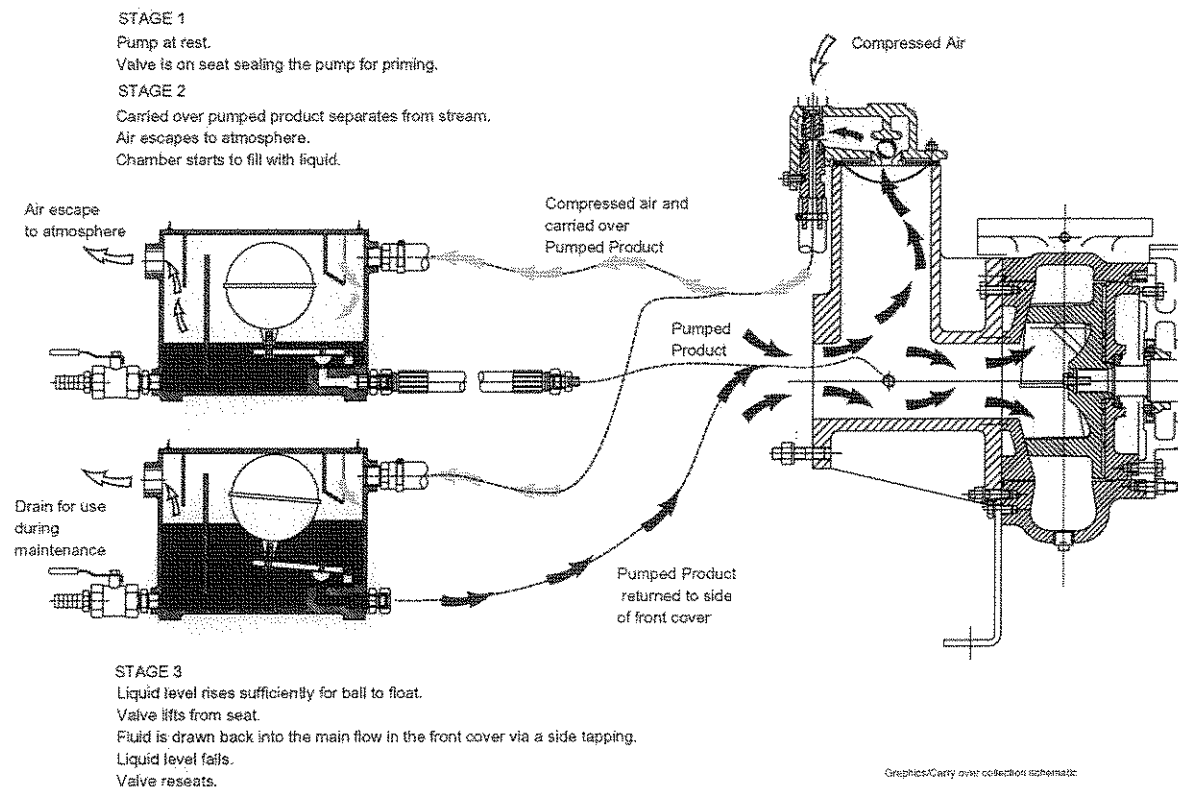


Figure 4 Schematic - Compressor exhaust system

4.1.1 Operating detail

The compressed air ejector system fitted to the pump lowers the pressure in the tower thereby drawing the fluid into the pump. During operation the fluid level in the tower fluctuates and some, either in fluid or vapour form, is drawn into the compressed air exhaust system.

The system for collecting this carried over fluid and returning it to the main incoming flow is shown schematically in Figure 4 and pictorially in Figure 5. A labyrinth tank that slows the air flow down allows the fluid to condense or drop out of the air stream into a collecting area. The air is then allowed to escape to atmosphere within the enclosure. A pipe from the collecting area has a float valve sealing its entry. This pipe is connected to the low pressure area in the front cover of the pump. When sufficient fluid has been collected the float lifts and is drawn out into the main pump flow by the pressure difference. The float valve then falls and seals the pipe entry.

A drain valve is fitted to the collecting tank. It should only be opened and the tank contents drained during maintenance or in frosty conditions when the pump is not in use.



CAUTION

If the valve is not opened and the tank drained in frosty weather the contents may freeze and crack the tank.

The valve must always be shut when the pump is running, otherwise the fluid will not be collected. The resultant flow will slowly fill the bunded base – leading to increased lifting weight and eventually overflowing over the sides.

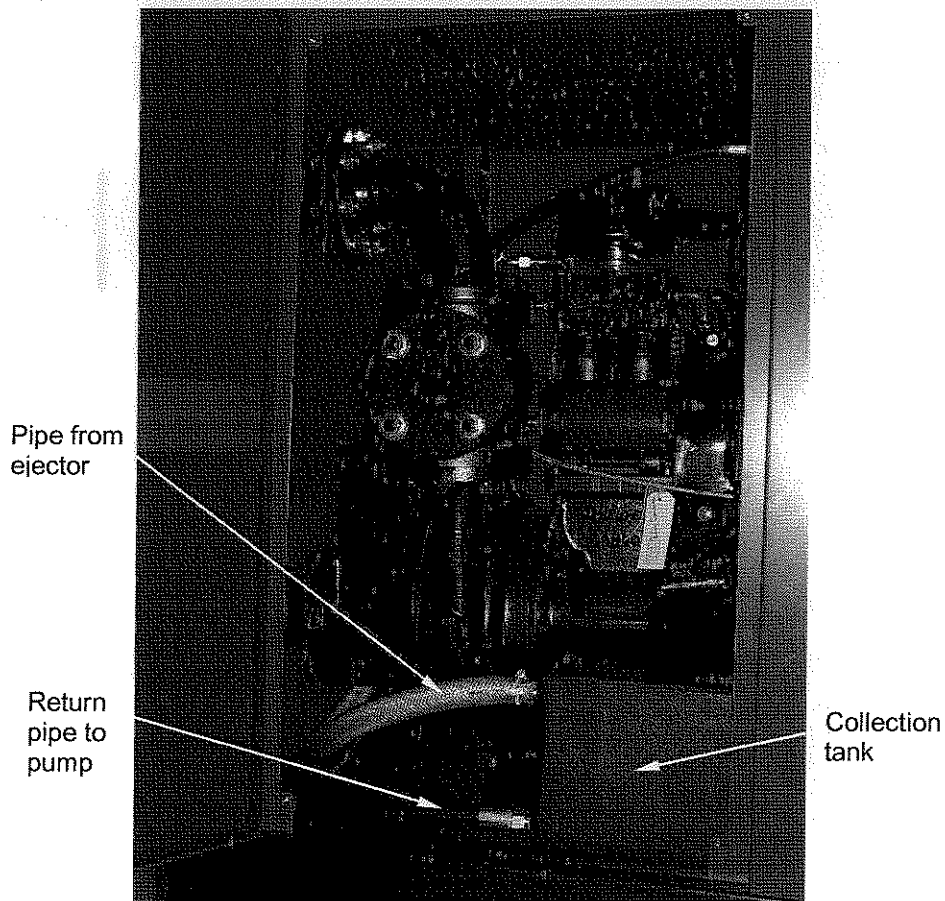


Figure 5 Exhaust air water removal trap

Check daily for sediment build up and clean as necessary.

When pumping heavily contaminated products, disconnect the ejector hose from the collection tank. Extend the hose and pipe back to suction source.

Engine sump pump

A sump pump is fitted to the unit to drain the engine oil sump. It is supplied fitted to the structure but not connected to the oil system.

To use the pump, disconnect the oil return pipe from the base of the compressor and attach to the connection on the bottom of the sump pump. Operate the handle to drain the sump of oil.

Once drained, disconnect the pipe from the sump pump and reconnect it to the base of the compressor.



CAUTION

The pipe must be reconnected to the base of the compressor after draining the engine sump or the compressor will not be lubricated and suffer catastrophic failure within a few seconds of starting.

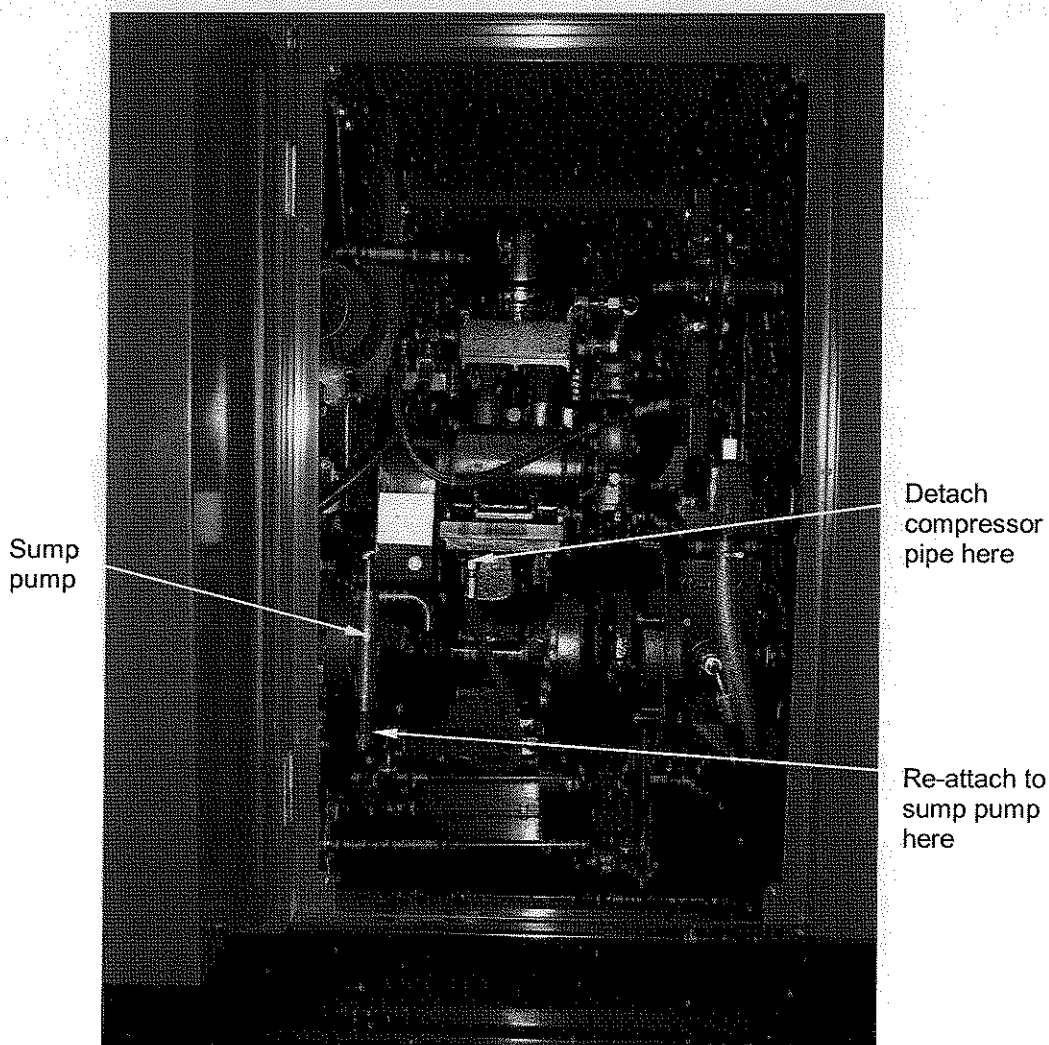


Figure 6 Sump pump detail

4.2 Engine fuel tank

A drain valve is fitted to the fuel tank. This discharges into the bunded base.



CAUTION

The valve must be checked to ensure it is closed fully before filling otherwise fuel will pass into the bunded base and overflow from the unit.