

Pump Serial No.

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1 INTRODUCTION

1.1 Manual Purpose

This manual contains useful and important information to allow the pump to be properly installed, operated and maintained. It also contains important instructions for preventing possible accidents and serious damage whilst carrying out those activities.

Carefully read these instructions before commencing any of these activities.

The purpose of this Installation, Operating and Maintenance Manual is to provide the installer, owner or user of the equipment with sufficient information to carry out those tasks for the CD, HL & NC ranges of Dri-Prime® Pumps.

Pump model designations covered by this manual are: -

CD75	HL80	NC80
CD80D	HL100	NC100
CD80M	HL110M	NC150
CD100M	HL125MS	
CD103M	HL150M	
CD140M	HL150MHD	
CD150M	HL200M	
CD160M (Mk 1 & 2)	HL130M	
CD180M	HL160M	
CD200M	HL225M	
CD225	HL250M	
CD250M	HL260M	
CD300M		
CD400M		
CD500M		

The information contained in this manual 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.

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

1.2 Information for the User, Operator or Maintenance Personnel.

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.

Because of the number of different units covered by this manual, the user must ensure that they are reading the correct instructions and viewing the correct diagrams for the unit they are working on.

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.

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 manual will invalidate the warranty.

2 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.

3 HOW TO USE THIS MANUAL

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 and their meaning used throughout this manual.



used to identify mechanical hazards



used to identify electrical hazards



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.

4 SAFETY



WARNING

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

4.1 Lifting

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, Figure 3 and Figure 4 show possible means of lifting. They are intended for guidance only. If in doubt, consult Godwin Pumps Ltd or a local lifting expert.

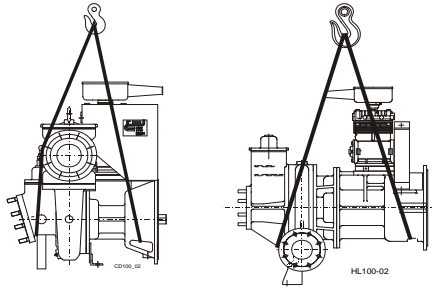


Figure 1 Lifting smaller motor adaptor units

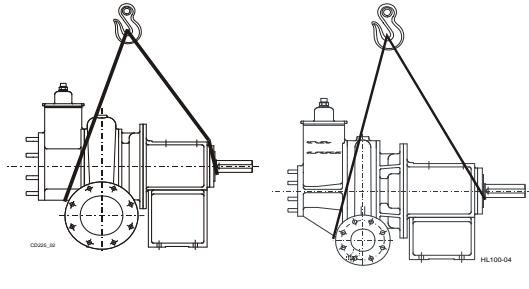


Figure 2 Lifting smaller bearing bracket units

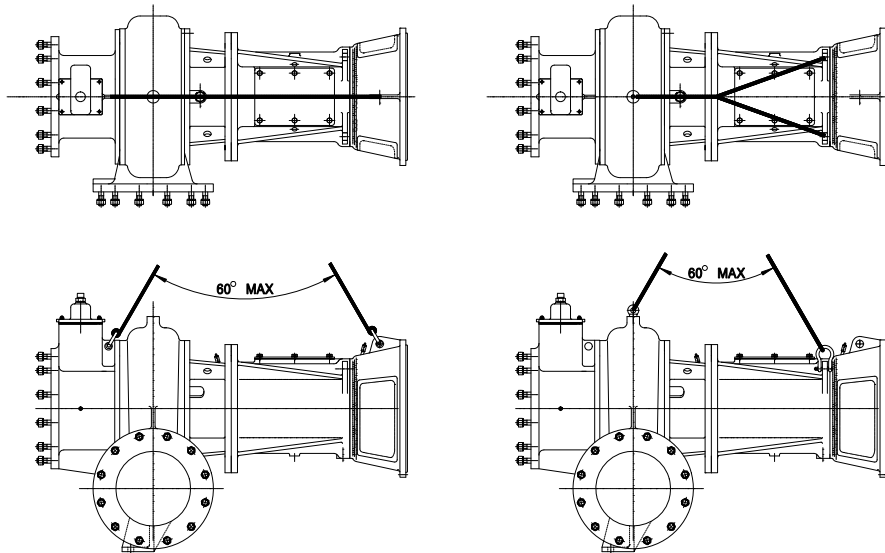


Figure 3 Typical lifting methods for close coupled bare shaft units (CD300M shown)

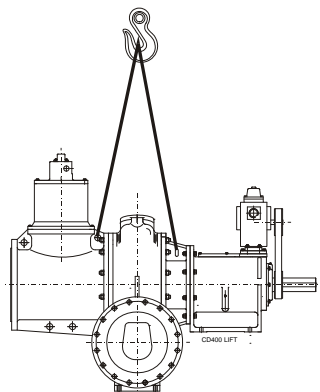


Figure 4 Typical lifting method for CD400 pumps

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

4.2 General

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.

Signs on the unit (e.g. directional arrows, maintenance and serial number plates & fluid connections, etc.) must be kept clean and clear.

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 re-circulate.

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.

5 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.

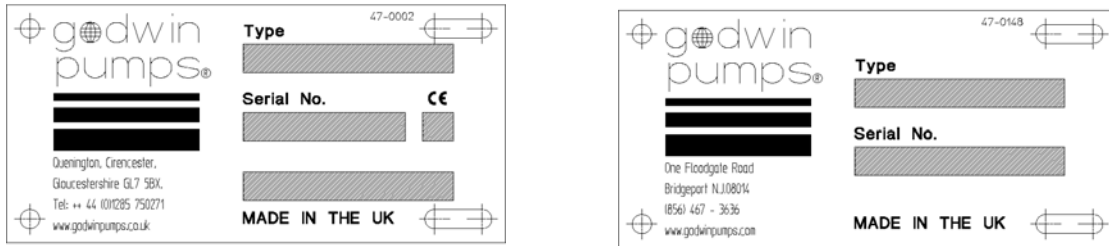


Figure 5 Typical pump serial number plates

5.1 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.

6 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.

6.1 Versions

Larger pumps (CD300/400/500 or HL130/160/225/250/260) 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: -

6.1.1 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.

6.1.2 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 6.2 for recommendations on alignment.

6.2 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.



CAUTION.

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

6.2.1 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 6). 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.

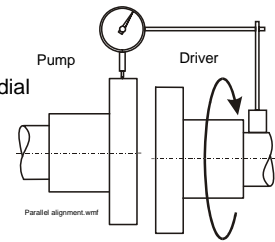


Figure 6 Initial parallel alignment check

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 7).

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

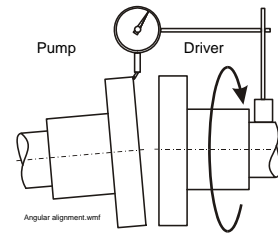


Figure 7 Angular alignment check

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 8). 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.

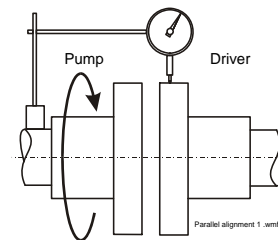


Figure 8 Secondary parallel alignment check

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.

6.3 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.

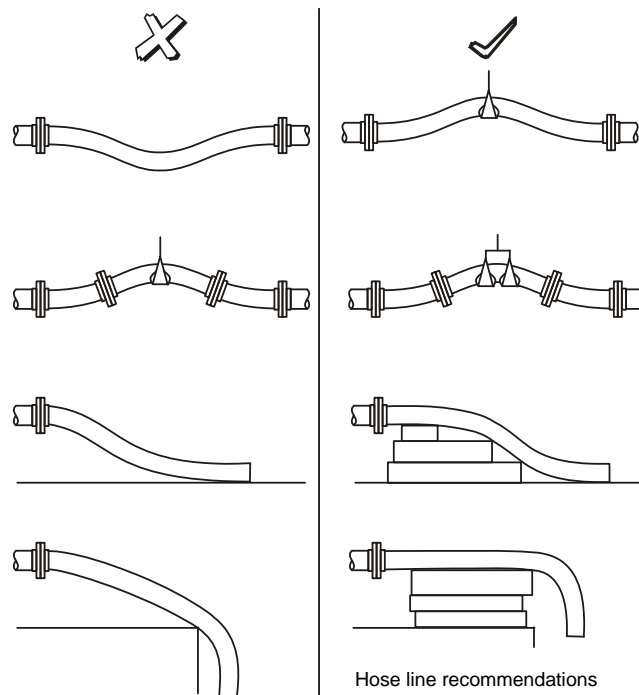
The Godwin Dri-Prime product is designed to handle small amounts of air leakage, but to ensure optimum pump performance, it is advisable to ensure that the suction pipe work is airtight and the end is sufficiently submerged to prevent air being drawn into the pipe.

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

The suction and delivery pipe work 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 pipe work 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 9 shows some common pipeline installation problems and their recommended solutions.

Figure 9 Common pipeline installation problems and their solutions



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

7 OPERATION

7.1 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 manual.

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

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

7.2 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 10), 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.

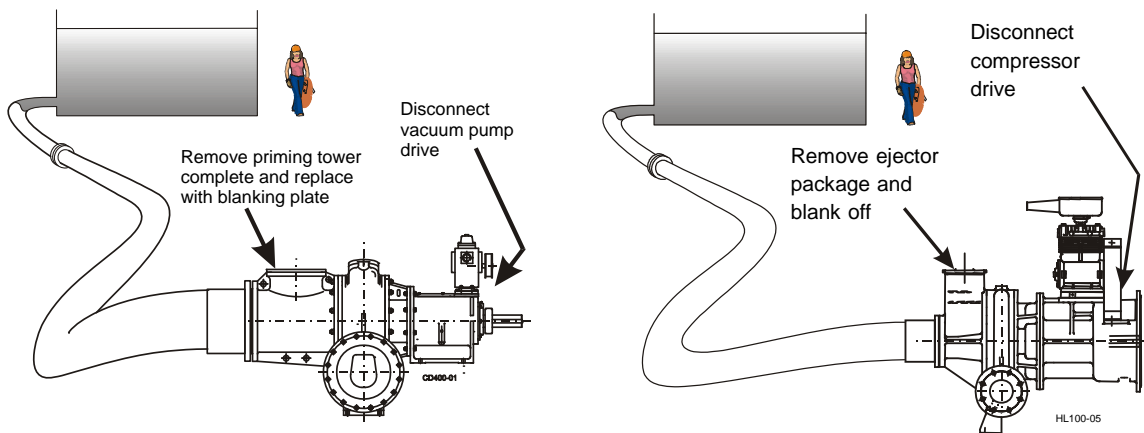


Figure 10 Flooded suction conditions

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

7.3 Compressor/Vacuum pump disconnection



WARNING.

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

To disconnect: -

- a) Ensure that the driver is isolated and the unit cannot be started whilst the pump is being worked on.
- b) 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

- c) Figure 11).

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.

- 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.

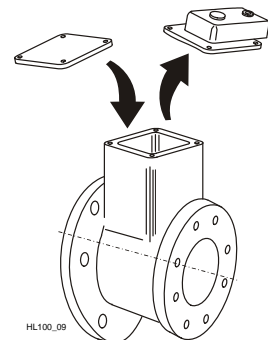


Figure 11 Typical blanking plate fitted in place of ejector housing

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.

7.4 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 12), or on the underside of the discharge flange (see

Figure 13).



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.

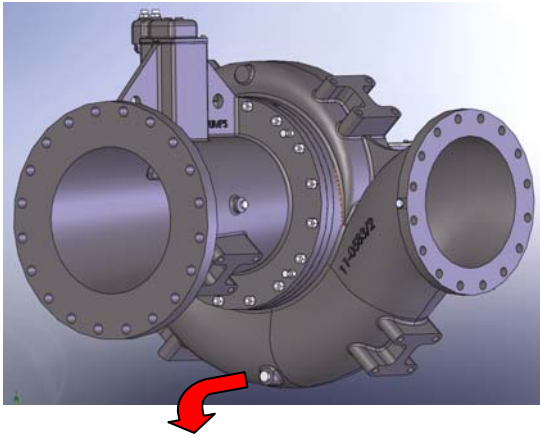
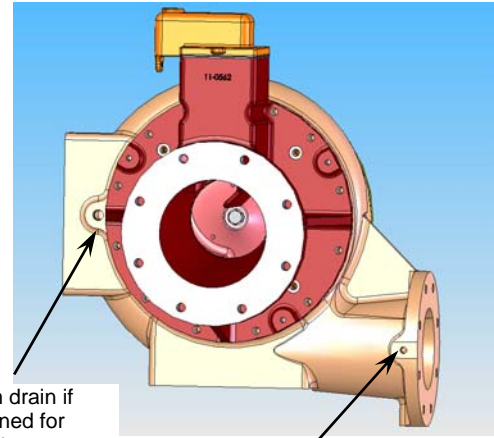


Figure 12 Side/bottom drain plug position



Side/bottom drain if
volute is turned for
vertical discharge

Discharge flange drain

Figure 13 Discharge flange drain plug position

8 MAINTENANCE

8.1 Bearings

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

8.1.1 Re-greasing procedure

Grease specification and greasing interval: - Check every 250 hours and recharge if necessary. Do not overgrease. See Technical Data section for grease types.

Grease nipple positions: - See Figure 14

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 with the correct type of grease 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.

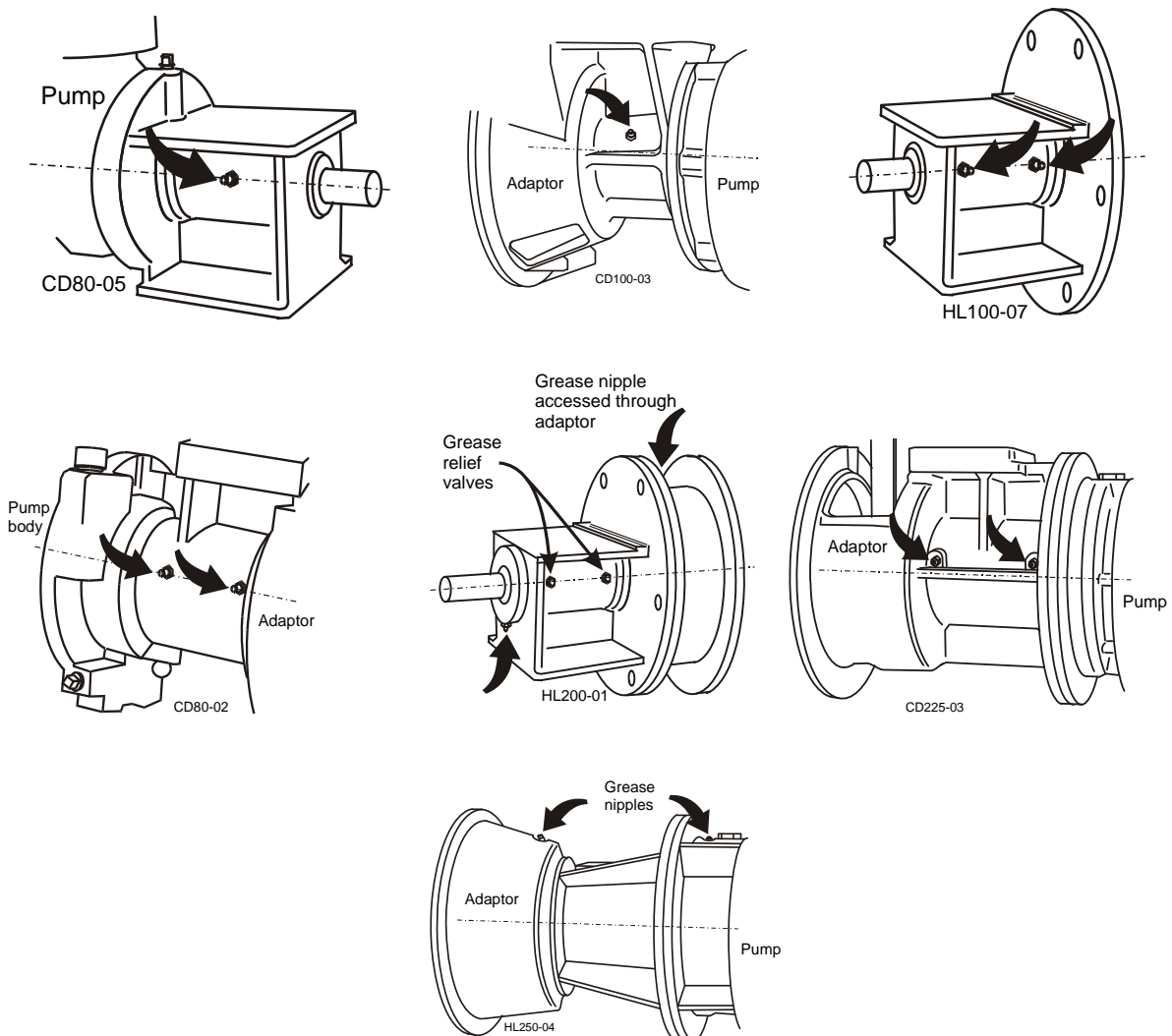


Figure 14 Grease nipple positions

8.2 Seal coolant level

All pumps are fitted with mechanical seals cooled by either oil or a glycol mixture. The HL260M & CD500M are glycol cooled, all others use oil. Seal types and configurations vary across the ranges. Check the coolant level in the seal housing at least once a week – preferably daily.

Please note the seal oil may become emulsified after a short period of operation, this is normal and not cause for concern. 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.

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

Oil and glycol specifications: - see Technical Data section



CAUTION.

Dry running caused by failure to initially fill, subsequently maintain the correct coolant level, or use the wrong coolant in the seal housing will result in seal failure.

Seals that have failed due to lack of operator provision of the correct and sufficient coolant are not covered by the warranty.

The various configurations for filling and draining are shown in Figure 15, Figure 16 or Figure 17.

<p>The seal coolant level for pumps of the style shown in Figure 15 is 10 –15mm below the bottom of the plug. If no coolant is visible then it must be topped up before starting the pump.</p>		
<p style="text-align: center;">Figure 15 Smaller pump fill and drain plugs</p>		
<p>The seal coolant level for pumps of the style shown in Figure 16 is 35-40mm below the filler plug seating face (10 –15mm below the bottom of the filling hole)</p>		
<p style="text-align: center;">Figure 16 Medium sized pump fill and drain plugs</p>		
<p>Larger pumps (Figure 17) have a filler plug combined with a dipstick. The coolant level must be maintained between the maximum and minimum marks.</p>		
<p style="text-align: center;">Figure 17 Larger pump fill and drain plugs</p>		

8.3 Seal removal

**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 4). Disconnect both suction and delivery lines. Ensure that the non-return valve is empty.
- 3) Drain water from the pump (see Section 7.4).
- 4) Drain the coolant oil from the mechanical seal cavity (see Section 8.2).
- 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.

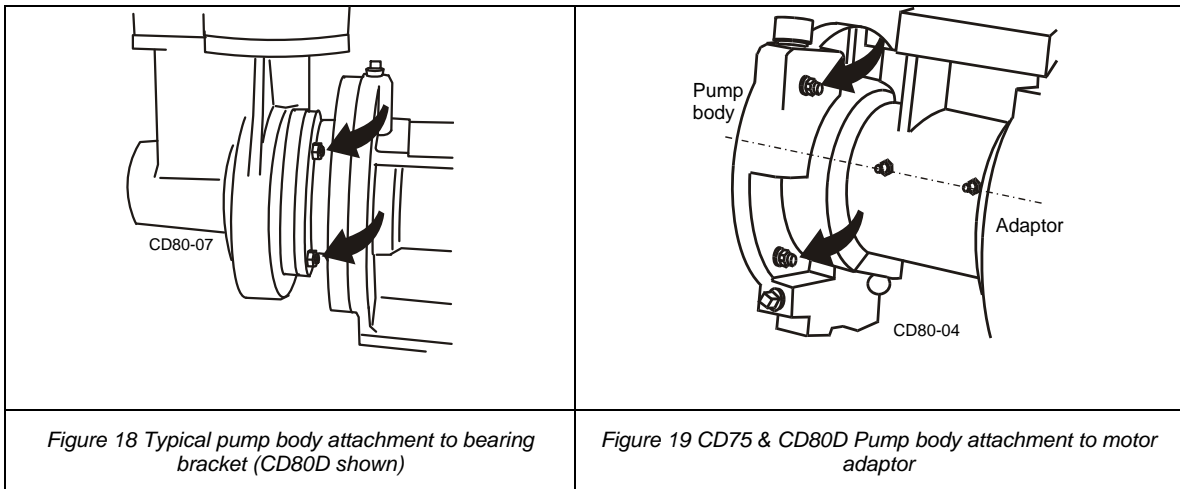
**WARNING.**

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.

8.3.1 Front cover & pump body removal

Pump types 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 18 or Figure 19). Remove the pump body complete with non-return valve and ejector package (if fitted) to expose the impeller.



Pump types CD103M/ CD140M/ CD150M CD160M (Mk 1 & 2)/ CD180M/ CD225/ CD200M/ CD300M/ CD400M/ CD500M
 HL80/ HL100/ HL110M/ HL125MS/ HL150M/ HL150MHD/ HL200M/ HL130M/ HL160M/ HL225M/ HL250M/ HL260M
 NC80/ NC100/ NC150

Due to the weight and size of the parts on these 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 20). 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 and CD500M have 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.

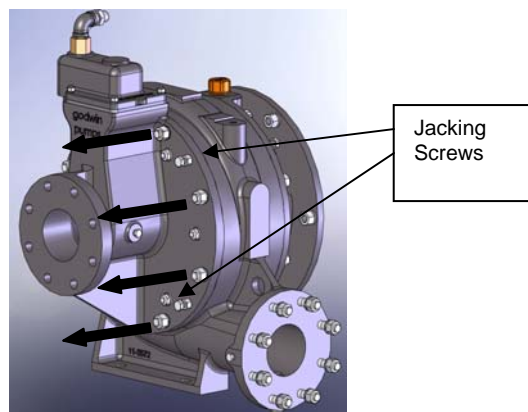


Figure 20 Removal of front cover

Larger pumps (HL80, CD180M, CD300M, CD400M, CD500M, HL160M, HL225M, HL250M and HL260M) 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.

8.3.2 Removing the impeller

Lock the pump shaft to prevent rotation. Tools are available from Godwin Pumps Ltd for this purpose. See Section 9.



WARNING.
Failure to lock the pump shaft could lead to unexpected rotation of the impeller causing entrapment and the possibility of serious injury.

Pump types 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.

**Pump types CD100M/ CD103M/ CD140M/ CD150M/ CD160M (Mk 1 & 2)/ CD180M/ CD200M/ CD225/ CD250M
 HL80/ HL100/ HL110M/ HL125MS/ HL50M/ 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.

Pump types NC80/ NC100/ NC150

These sizes of N pump all utilize a tapered locking sleeve incorporating a left hand threaded adjustment screw. The impeller is locked in place with a cap head screw and washer. The following diagrams show an NC80 pump but the instructions apply to all.

The impeller retaining fittings are shown in Figure 21

Remove one of the access plugs around the periphery of the volute. Insert a suitable bar to prevent the impeller from rotating. Ensure the bar is of a suitable material or is wrapped so that the threads in the hole are not damaged when the bar presses against them.

Unscrew the central retaining socket head cap screw, remove it and the washer.



Figure 21 Impeller retaining fittings

Insert a 65mm long 12 A/F hexagon socket bit through the central hole of the impeller and locate it in the hexagon of the adjustment screw.

Using hexagon socket bit turn the adjustment screw slowly anti-clockwise until the contact between the impeller and the locking sleeve is broken. Remove the impeller

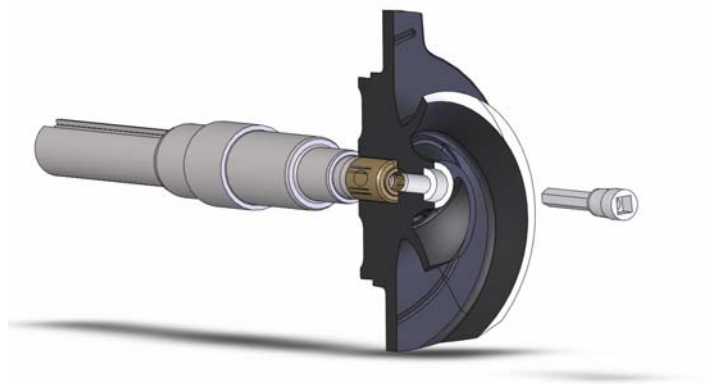


Figure 22 X-section showing the taper sleeve and adjustment screw

Pump types CD300M/ CD400M/ CD500M
HL130M/ HL160M/ HL225M/ HL250M/ HL260M

The impeller retaining fittings are shown in Figure 23

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.

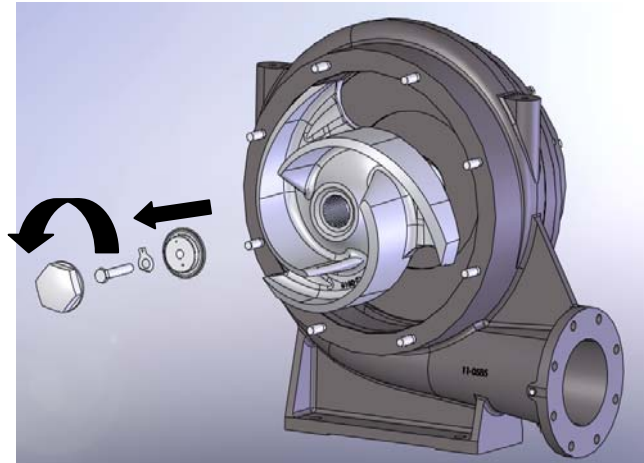


Figure 23 Impeller Retaining fittings

8.3.3 Removing the rear wear plate

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.

Pump types **CD75/ CD80D/ CD80M/ CD100M/ CD103M/ CD150M**
HL80
NC80/ NC100/ NC150

The rear wear plate holds the seal seat retained by a circlip (item 6 in Figure 24). 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.

Pump types **CD140M/ CD160M (Mk 1 & 2)/ CD180M/ CD200M/ CD225/ CD250M/ CD300M/ CD400M**
HL100/ HL110M/ HL125MS/ HL150M/ HL150MHD/ HL200M/ HL130M/ HL160M/ HL225M/ HL250M

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 25 or Figure 26, item 1 in Figure 27) retained by 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.

Pump types **CD500M**
HL260M

The rear wear plate carries the outer seal seat directly on its inner face. Take care in removing the wear plate to avoid damaging the seat on the shaft. The seal seat is retained on the back of the wear plate 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. Later models incorporate a roll pin which protrudes from the back of the wearplate into a groove on the inner seat face. This is an additional device to stop the inner seal seat from rotating.

8.4 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	NC80 NC100 NC150	Single mechanical seal inboard isolating the pumped product Dynamic lip seal outboard retaining the oil	
2	CD160M Mk1 CD180M CD300M	HL130M HL160M HL250M		2 off mechanical seals fitted back to back (double mechanical seal)	Open coupled versions of CD300M only. Earlier versions of HL130M.
3	CD160M Mk2 CD400M	HL110M HL200M		2 off mechanical seals fitted back to back (double mechanical seal)	Similar arrangement to type 2 but differently configured
4	CD300M	HL130M HL225M		2 off mechanical seals fitted back to back in a cartridge (double one piece mechanical seal)	Fitted to later versions of these pumps that share a common bearing bracket.
	CD500M	HL260M			Fitted as standard from first off.

8.4.1 Removing the seal

Pump types CD75/ CD80D/ CD80M/ CD100M/ CD103M/ CD140M/ CD150M/ CD200M/ CD225/ CD250M
 (Figure 24) HL80/ HL100M/ HL125MS/ HL150M/ HL150MHD
 NC80/ NC100/ NC150

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.

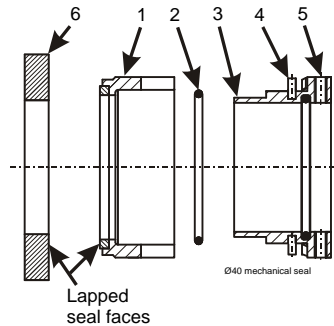


Figure 24 Type 1 single mechanical seal

Pump types CD160M Mk 2/ CD180M/ CD300M
 (Figure 25) HL130M/ HL160M/ HL250M

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.

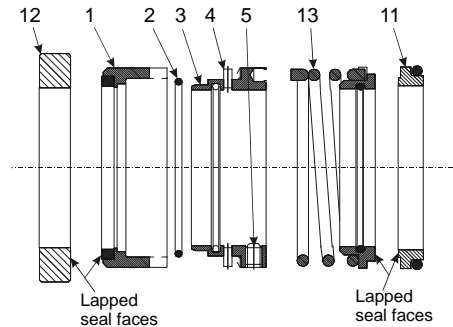


Figure 25 Type 2 two part double mechanical seal

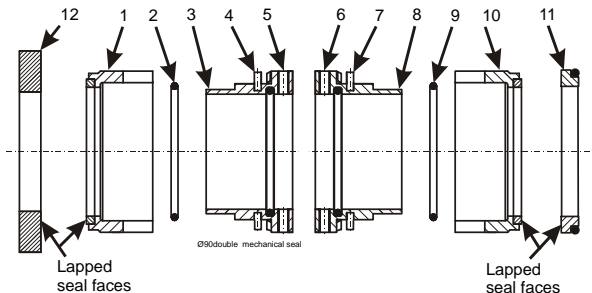
Pump types CD160M Mk 1/ CD400M
 (Figure 26) HL110M/ HL200M

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.

Figure 26 Type 3 double mechanical seal



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

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.

Pump types CD300M/ CD500M
 (Figure 27) HL130M/ HL225M/ HL260M

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.

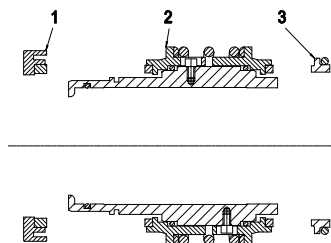
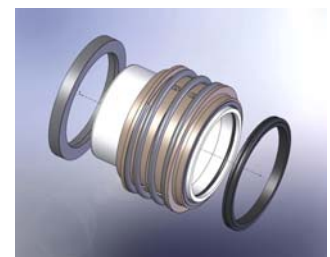


Figure 27 Type 4 one piece double mechanical seal

8.4.2 Inspection

Inspect all items for wear. The seal face for type 1, 2 & 3 seals (item 6 in Figure 24; item 12 in Figure 25 or Figure 26) is double sided. It may be reversed when refitted to provide a second wearing face. Replace any damaged parts and renew all O-rings.



8.5 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.

8.5.1 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.

8.5.2 Fitting the seal

Pump types CD75/ CD80D/ CD80M/ CD100M/ CD103M/ CD140M/ CD150M/ CD200M/ CD225/ CD250M
HL80/ HL100M/ HL125MS/ HL150M/ HL150MHD
(Figure 24) NC80/ NC100/ NC150

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), 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.

Pump types CD160M Mk 2/ CD180M/ CD300M
(Figure 25) HL130M/ HL160M/ HL250M

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, 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.

Pump types CD160M Mk 1/ CD400M
(Figure 26) HL110M/HL200M

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, 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.

Pump types CD300M/ CD500M
 (Figure 27) HL130M/ HL225M/ HL260M

CD500M & HL260M only. Fit a new roll pin into the wear plate, carefully tapping it in from the impeller side until it is flush with that side. It should protrude 2-3mm from the seal side.

All Units. Take the seal seat (Item 3) from the assembly and carefully push into the seat carrier, ensuring that for the CD500M & HL260M the protruding roll pin fits into the groove in the back of the seal seat. 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.

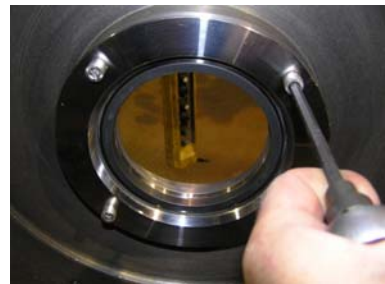


CAUTION.
 Failure to ensure the pin locates in the groove of the seal for CD500M & HL260M units will result in seal seat breakage.

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

Ensure the O-ring(s) is/are 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 (CD300M, HL130M & HL225M), or to the wear plate (CD500M & HL260M) and retain with the retaining clamp. Ensure a new O-ring is fitted.



8.5.3 Fitting the wear plate

Pump types CD75/ CD80D/ CD80M/ CD100M/ CD103M/ CD150M
HL80
NC80/ NC100/ NC150

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

Pump types CD140M/ CD160M (Mk 1 & 2)/ CD180M/ CD200M/ CD225/ CD250M/ CD300M/ CD400M
HL100/ HL110M/ HL125MS/ HL150M/ HL150MHD/ HL200M/ HL130M/ HL160M/ HL225M/ HL250M

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.

Pump types CD500M
HL260M

Carefully place the rear wear plate over the shaft. It is recommended that the seal seat is protected from contacting the shaft end by wrapping the shaft end with a suitable soft material. Attach the wear plate with fasteners from the motor adaptor/bearing bracket/seal housing adaptor side.



8.5.4 Fitting the impeller

Lock the pump shaft to prevent rotation.

Impeller clearance tolerances are given in the Technical Data section.

For all pumps except NC80/ NC100/ NC150:- 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.

NC80/ NC100/ NC150 only. Rear clearance is not measured for these pumps, however impeller hub must be free to turn.

Pump types 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.

**Pump types CD100M/ CD103M/ CD140M/ CD150M/ CD160M (Mk 1 & 2) / CD180M/ CD200M/ CD225/ CD250M
HL80/ HL100/ 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.

**Pump types CD300M/ CD400M/ CD500M
HL130M/ HL160M/ HL225M/ HL250M/ HL260M**

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 to the final torque given in the Technical Data section. The pre-torque figure is only for use with a new shaft.

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.

Pump types NC80/ NC100/ NC150

Lightly grease the shaft taper and the internal conical taper of the sleeve.

Adjust the adjusting screw so that its external face is flush with the external face of the sleeve as shown in figure 28.

NOTE! The adjustment screw is LEFT HAND threaded

Insert the sleeve into the impeller with the taper facing out ensuring that the flat face is seated correctly at the bottom of the impeller bore.

Mount the impeller on the shaft ensuring it is fully pushed back on the taper.

Insert the impeller screw and washer to hold impeller in place to next step.

Hand tighten only.

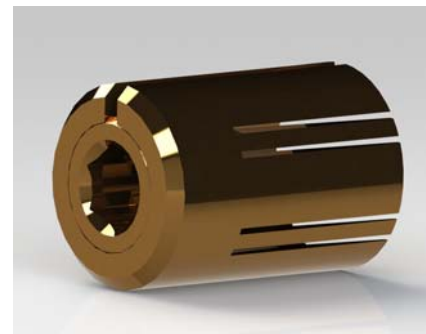


Figure 28 Impeller sleeve and adjustment screw

8.5.5 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.

Pump types 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 18 or Figure 19).

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.

Pump types CD103M/ CD140M/ CD150M/ CD160M (Mk 1 & 2)/ CD180M CD225/ CD200M/ CD250M/ CD300M/ CD400M/ CD500M HL80/ HL100/ HL110M/ HL125MS/ HL150M/ HL150MHD/ HL200M/ HL130M/ HL160M/ HL225M/ HL250M/ HL260M

Larger pump bodies (HL80, CD300M, CD400M, CD500M, 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 20) using the peripheral fasteners.

NOTE: - The CD400M and CD500M have 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 have been dismantled and require refitting.

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

Pump types NC80/ NC100/ NC150

Fit the body, guiding the body studs into the adaptor holes. Secure the peripheral fasteners.

Attach the front cover and wear plate assembly to the pump body (see Figure 20) using the peripheral fasteners.

Unscrew and remove the impeller retaining screw and washer.

Insert a 65mm long 12 A/F hexagon socket bit through the central hole of the impeller and locate it in the hexagon of the adjustment screw.

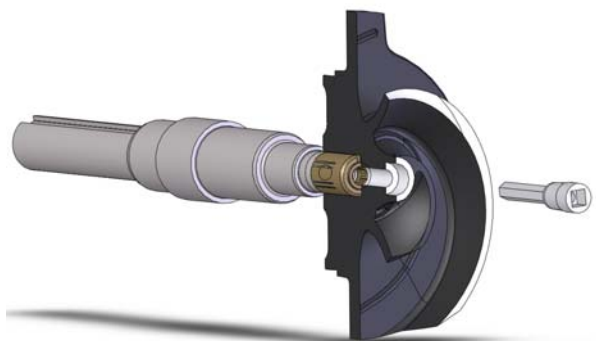
Using an extension bar turn the adjustment screw slowly clockwise until the impeller makes contact with the wear plate and the impeller cannot be rotated by hand.

Remove the tools.

Install the anti rotation bar through the access plug hole in the volute.

Lightly grease the impeller retaining screw and washer. Fit and tighten to the correct torque (see Technical Data section). Then tighten the impeller retention screw an extra 1/8 turn (45°), this procedure will ensure the correct front clearance is obtained.

Remove the anti rotation bar and replace access plug.



8.5.6 Preparing for service

Reconnect compressor or vacuum pump lines.

Fill the chamber around the mechanical seal with the correct quantity and grade of coolant. See Section 8.2 for positions and Technical data section for grade and quantity.

8.6 Bearing Bracket & Motor Adaptor Dismantling

8.6.1 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 8.11.1 for details.

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

Carry out the instructions for seal removal (Section 0) before commencing any work detailed in this section.

8.6.2 Dismantling

Pump types CD75/ CD80D/ CD80M/ CD100M/ CD103M/ CD140M/ CD150M/ CD160M/ CD180M/ CD200M/ CD225/
CD250M
NC80/ NC100/ NC150

- 1) **CD160M, CD180M**
Undo the fasteners holding the seal-housing adaptor to the bearing housing and remove the seal housing adaptor.
Undo the fasteners holding the SAE adaptor to the bearing housing and remove the SAE 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, NC80, NC100, & NC150** 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.

Pump types 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.

Pump types CD300M/ CD400M (Open Coupled)

- 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.

**Pump types HL130M/ HL160M/ HL225M/ HL250M/ HL260M
CD300M (Close Coupled)/ CD500M**

- 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.

8.7 Bearing Bracket & Motor Adaptor Assembly

8.7.1 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. A purpose designed 'top-hat' type of assembly tool as acceptable. Direct hammering will damage the bearing or rollers. Drift hammering will introduce swarf into the assembly. Either will result in early bearing failure.



8.7.2 Assembly

Pump types 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.

Pump types	CD75	BB Units
	CD80M/ CD100M/ CD150M/ CD200M	MA & BB Units
	NC80/ NC100/ NC150	MA Units
	CD103M	

- 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.

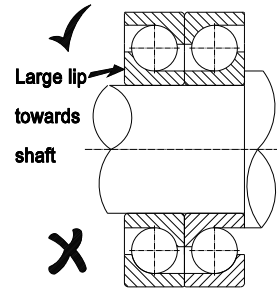
Pump types	CD140M/ CD160M/ CD180M HL110M	MA Units
	CD225 HL100M/ HL125MS/ HL150M/ HL150MHD/ HL200M	All Units
1)	Heat the bearings detailed below: - CD140M, CD225, CD250M, HL100M, HL110M, HL125MS, HL150M motor adaptor Single roller bearing inner race (pump end) and the complete spherical roller bearing (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	

Pump types CD300M/ CD400M/ CD500M
 HL130M/ HL160M/ HL225M/ HL250M/ HL260M

- 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.



8.8 Air Compressor

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

8.8.1 Filter Replacement

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

8.9 Vacuum Pump

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

8.10 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.

8.11 Drive Belts

8.11.1 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).

8.11.2 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.

8.11.3 Link belt tensioning and replacement

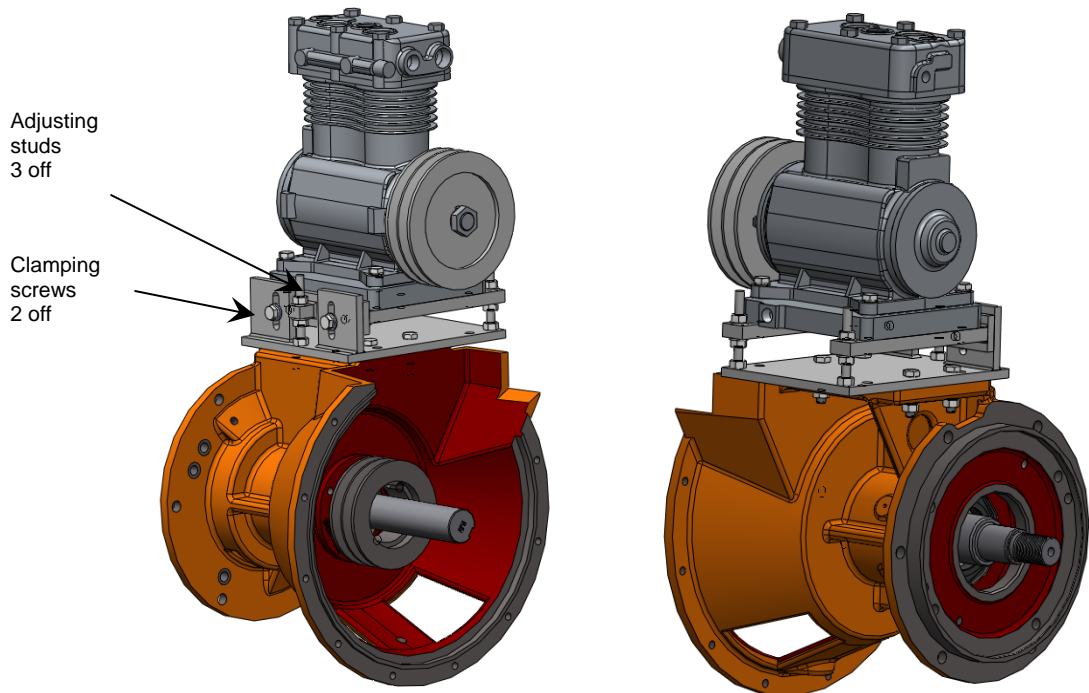


Figure 29 Link belt driven compressor (shown on a CD150 bearing bracket - guards and belt removed)

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 29) 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 29).
- 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 29) 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 29).
- 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.

9 TOOLS

9.1 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
CD400M		ACC-PT-38
CD500M		ACC-PT-40

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	
HL130M HL160M HL225M HL250M	ACC-PT-37	
HL200M	ACC-PT-34	
HL260M	ACC-PT-41	

Pump	MA version	BB version
NC80	ACC-PT-42	ACC-PT-43
NC100	ACC-PT-44	ACC-PT-45
NC150	ACC-PT-46	ACC-PT-47

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.

9.2 Special Tools

Pump	Tool Purpose	Tool Part Number
HL110M/ HL200M	First seal setting	54-2320-9811
CD300M HL130M/ HL160M/ HL250M	First seal setting (multi-piece seal)	54-1394-9811 (Not required for one piece seal builds)
CD300M/CD400M HL130M/ HL160M/ HL250M	Shaft aligning jig	54-1468-9811
CD400M/ CD500M HL130M/ HL160M/ HL225M/ HL250M/ HL260M	Workshop combination tool for fitting/removing impellers with or without volutes fitted (requires lifting gear).	54-2215-9801

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

11.1.1 CD range

CD Range	Suction / Delivery bore (ins)	Max flow (m ³ /hr)	Max. head (m)	Max solids handling (mm)	Max working temp (°C)	Max work 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
CD500M	20/18	2700	75	137	80	7.5	1730 ⁽⁴⁾ 555 ⁽⁵⁾		800	1000	1200

11.1.2 HL Range

HL Range	Suction / Delivery bore (ins)	Max flow (m ³ /hr)	Max. head (m)	Max solids handling (mm)	Max working temp (°C)	Max work 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
HL260M	10/8	1081	150	50	80	16	1440		1200	1800	1800

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.

11.1.3 NC Range

NC Range	Suction / Delivery bore (ins)	Max flow (m ³ /hr)	Max. head (m)	Max solids handling (mm)	Max working temp (°C)	Max work pressure (bar)	Weight ⁽¹⁾ (kg)		Speed Range		
							Engine driven	Motor driven	Min	Norm	Max
NC80	4/3	138	32	31	80	4			1200	1800	2200
NC100	4/4	230	45	35	80	5.5			1200	1800	2200
NC150	6/6	400	59	42	80	4.8			1200	1800	2200

11.2 CD Range data

Detail	Pump Type	CD75	CD80D	CD80M	CD100M	CD103M	CD150M	CD140M	CD160M Mk1	CD160M Mk 2 CD180M	CD200M	CD225	CD250M	CD300M	CD400M	CD500M	
MA Flange SAE		5			4			3	2 or 3	4	3			1 (2)	N/A	0 or 1	
Shaft end float mm (ins)		0.075 to 0.10mm (0.003" to 0.004")															
Impeller clearances front & rear (rear only on CD75)mm(ins)		Cast Iron Imp/Wear Plate = 0.50 to 0.625mm (0.020" to 0.025") Hard Iron & Stainless Steel Imp/Wear Plate = 0.625 to 0.762mm (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	40.0 (54.2)														
Shaft diameter at seal position (mm)		40															
Seal working length (mm)		32.0±0.3															
Grease		Texaco Starplex EP2, Shell Nertia HV, Mobil SHV 46, Total Multis Complex EP2, Belesta XPG															
Seal Coolant	Type	Oil. Any SAE 20/20 or BIOPUS 46 Biodegradable															
	Capacity (litres)	0.5			1.75			3.8			6			6.8			
	Vol – Max to Min (litres)	N/A			N/A			N/A			0.6			0.6			
Compressor oil (if not fed from engine)		Total Cortusa 100															
NOTES:-		(1) Seal length is not applicable for units with a one piece seal. The seal length is set automatically on installation. Where other figures are given these are for units with a multi piece seal. (2) Only for close coupled units.															

11.3 HL Range data

Detail	Pump Type		HL80		HL100M		HL110M		HI125MS		HL150M		HL150MHD		HL200M		HL130M		HL160M		HL225M		HL250M		HL260M	
	MA Flange SAE		4	3	2 or 3	3	2 or 3	3	3	2	3	2	3	2	2	2	2	2	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	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") m	0.127 to 0.33mm (0.005" to 0.013")	0.127 to 0.33mm (0.005" to 0.013")	0.127 to 0.33mm (0.005" to 0.013")	0.127 to 0.33mm (0.005" to 0.013")	Nominal bearing clearance only 0.05mm (0.002") max																
Impeller clearances front & rear			Cast Iron Imp/Wear Plate = 0.50 to 0.625mm (0.020" to 0.025") Hard Iron & Stainless Steel Imp/Wear Plate = 0.625 to 0.762mm (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)	563.0 (763.0)	378.0 (513.0)	563.0 (763.0)	517.0 (701.0)	563.0 (763.0)	N/A														
Impeller bolt torque lbs.ft(N-m)			40 (54.2)	100.0 (135.6)		New shaft 570.0 (776.0) then relax to 177.0 (240) Existing shaft 177.0 (240)																				
Shaft diameter at seal position (mm)			40	50	60	50	60	50	60	75	60	75	110													
Seal working length (mm)			32.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3	34.0±0.3
Grease	Type	Texaco Starplex EP2, Shell Nertia HV, Mobil SHV 46, Total Multis Complex EP2, Beltesta XPG																								
	Initial fill	160 grms																								
Seal Coolant	Relubrication period/quantity	1500 – 2300 hrs 80 – 130 grms																								
	Type	Oil. Any SAE 20/20 or BIOPUS 46 Biodegradable																								
Seal Coolant	Capacity (litres)	5.5 litres initial fill. Top up to full mark on dipstick after 1 hr running																								
	Vol – Max to Min (litres)	N/A																								
Compressor oil (if not fed from engine)	Total Cortusa 100																									
NOTES:-	(1) Seal length is not applicable for units with a one piece seal. The seal length is set automatically on installation. Where other figures are given these are for units with a multi piece seal.																									

11.4 NC Range Data

Detail	Pump Type		
	NC150	NC100	NC80
MA Flange SAE	4		
Shaft end float mm (ins)	0.075 to 0.10mm (0.003" to 0.004")		
Impeller clearance front	0.2 - 0.8 mm		
Impeller bolt torque lbs.ft(N-m)	56.0 (76.0)		
Shaft diameter at seal position (mm)	40		
Seal working length (mm)	32.0±0.3		
Grease	Texaco Starplex EP2, Shell Nertia HV, Mobil SHV 46, Total Multis Complex EP2, Belesta XPG		
Seal Coolant	Type	Oil. Any SAE 20/20 or BIOPUS 46 Biodegradable	
	Capacity (litres)	0.5	
	Vol – Max to Min (litres)	N/A	
Compressor oil (if not fed from engine)	Total Cortusa 100		

11.5 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	Steel		Stainless
	Torque (N-m)		
	Nuts & Bolts	Nuts on Studs	All
M6 x 1.0	11.7	4.6	9
M8 x 1.25	28	11	22
M10 x 1.5	56	22	44
M12 x 1.75	98	38	76
M16 x 2.0	244	95	187
M20 x 2.5	476	185	364
M24 x 3.0	822	320	629
M30 x 3.5	1633	633	1240

Table 2 UNC Fasteners

Thread Size	Steel		Stainless
	Torque (N-m)		
	Nuts & Bolts	Nuts on Studs	All
¼" - 20	13.5	5.4	10.5
5/16" - 18	27.1	10.5	21.0
3/8" - 16	48.8	20	37.8
7/16" - 14	74.6	30	57.8
½" - 13	122	48	94.6
5/8" - 11	237.3	95	183.9
¾" - 10	420.4	167	325.8
7/8" - 9	664.4	266	514.9
1" - 8	1003	401	777.3

Table 1 figures are for Metric fasteners to BS3692. Steel fasteners: - Grade 8.8 for bolts, Grade 4.6 for studs, Grade 10 for nuts; Stainless Steel fasteners: - Grade A2.

Table 2 figures are for UNC fasteners to BS1768 Steel fasteners: -Grade S and Grade 3 for nuts; Stainless Steel fasteners: - Grade A2.

If steel 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 NUT	PLATING CONDITION OF BOLT	
	BLACK	ZINC
	BLACK	1.0
ZINC	0.9	0.8

11.6 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

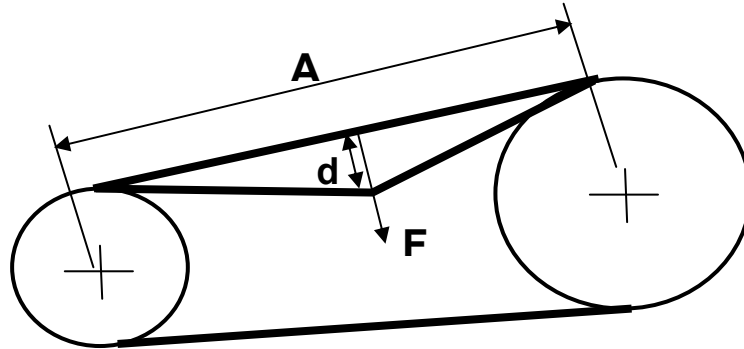
11.7 Belt Tensioning

11.7.1 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.

11.7.2 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.



11.7.3 Belt tension figures –HTD/Timing belts

Pump type	Speed Ratio	Pulley Centres A (mm)	Belt 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 NC80 NC100 NC150	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 NC80, NC100 NC150	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

11.7.4 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

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