

CONNECTING ROD TOP END BEARING AND CROSSHEAD

00611

### 5.4.7 Piston Rod Packing Gland (1st & 2nd stage) - Remove & Refit

#### To Remove:

1. Remove access cover from the cylinder distance piece.

**WARNING:** Piston rod clamps **MUST** be fitted to prevent possible uncontrolled movement of the crankshaft and motion work. See Section 5.4 for further details.

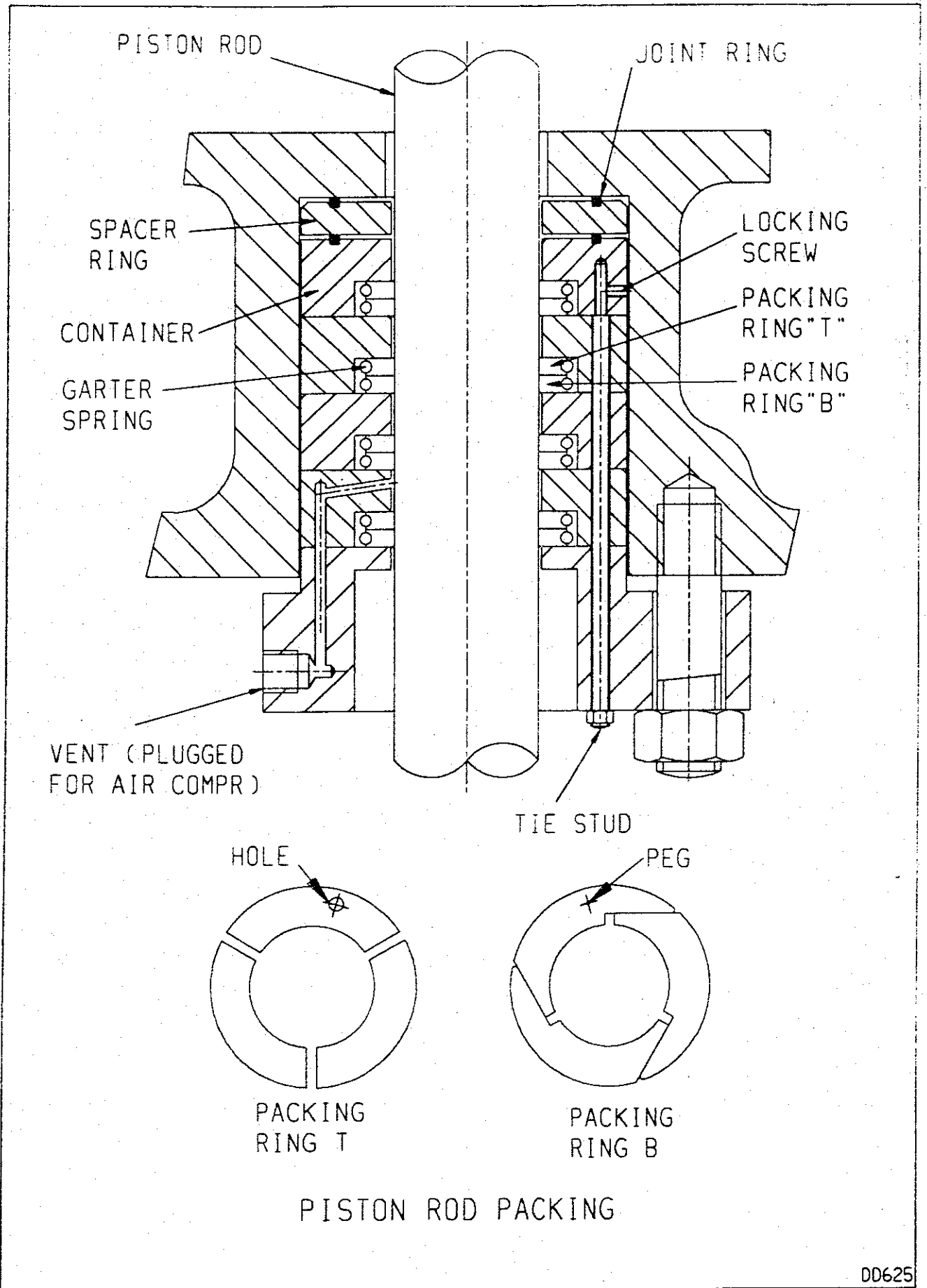
2. Mark the position of the oil shedder on the rod surface and remove shedder with its two clamping screws.
3. Remove the nuts from the small diameter gland assembly tie studs.
4. Remove the securing nuts from the gland cover and lower the cover down the piston rod until it is resting on the oil scraper gland assembly.
5. Slide each container assembly down the piston rod until it is clear of the gland.
6. Slide the container a little way back up the piston rod to expose the packing rings and in turn, unhook the garter springs and remove the packing ring segments.
7. Reassemble and carefully store each ring of segments and garter spring, immediately on removal. Repeat step 6 until all of the packing rings have been removed.

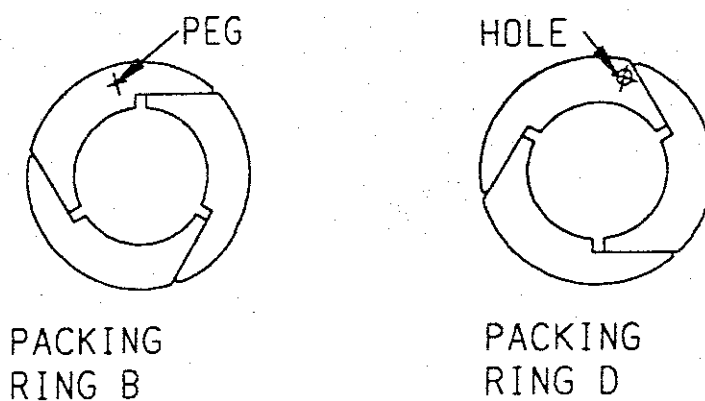
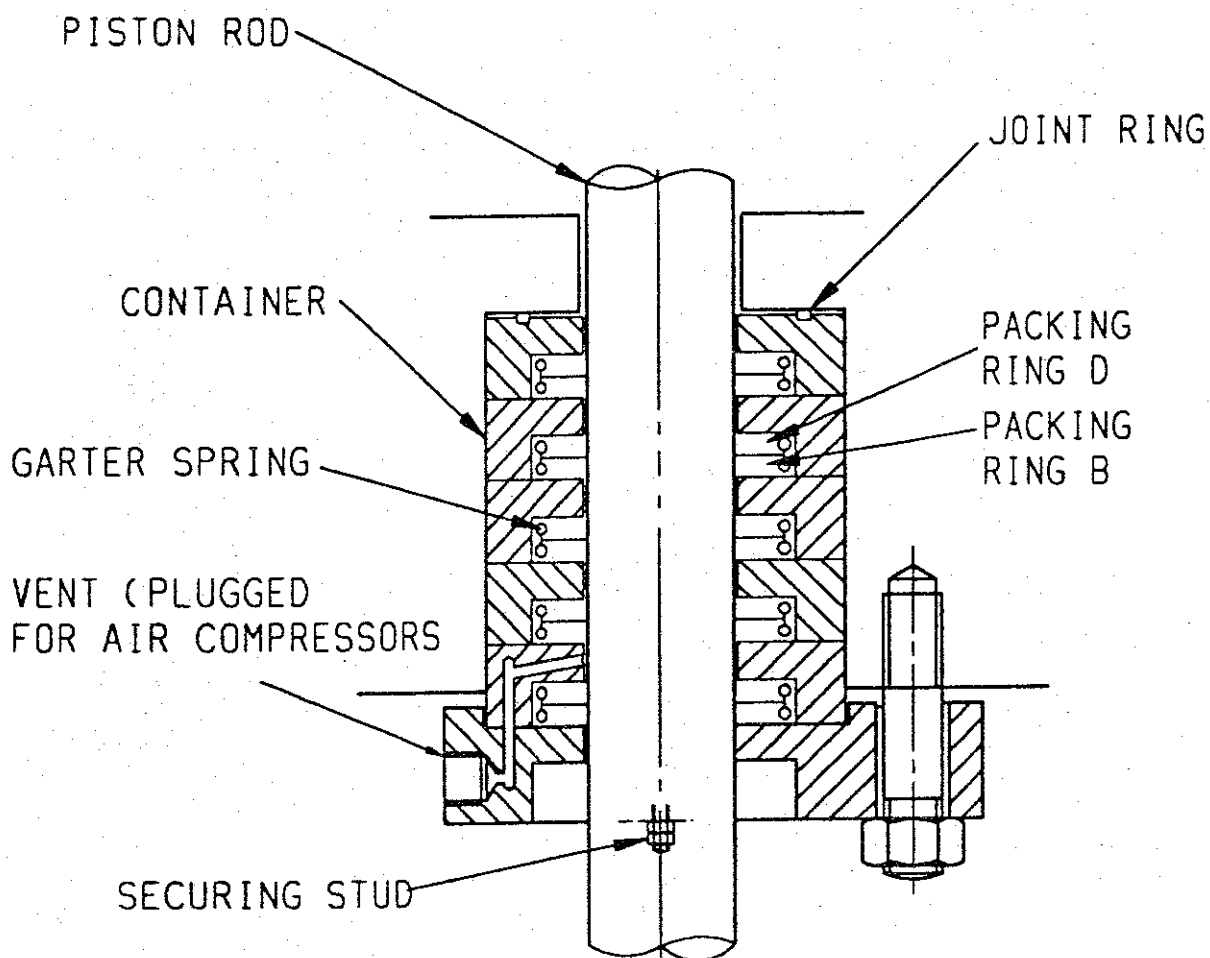
**Note:** Observe that each ring is marked with matching numbers and letters for use in reassemble. Also the lowermost ring has a peg which locates into a hole in the uppermost ring to form a container pair. The rings can be reused depending upon condition after inspection.

#### To Refit

**Note:** The rings and glands refitted completely without oil (the compressor being an oil-free cylinder machine) - on no account introduce oil or grease into the gland. If refitting "used" rings first ensure that there is no dirt or grit embedded - examine also the piston rod surface.

1. If the piston rod is out of the compressor, the gland can be assembled on the work-bench, then fitted into place as a finished unit.
2. If the rod is in place, the rings and their springs are assembled around the rod by working through the distance piece apertures.
3. Assemble each ring onto the piston rod with its garter spring.
4. Fit the rings as pairs into their respective containers (ensure peg is pointing upwards).
5. Slide each container assembly up the piston rod in turn, finally clamping the completed gland assembly with the tie rod nuts.
6. Refit and tighten the packing nuts and secure the gland assembly to the cylinder bottom.
7. Refit the oil shedder to the piston rod in the position marked during removal and secure with its clamping screws. Refit the access cover to the cylinder distance piece.





### SECOND STAGE PISTON ROD PACKING

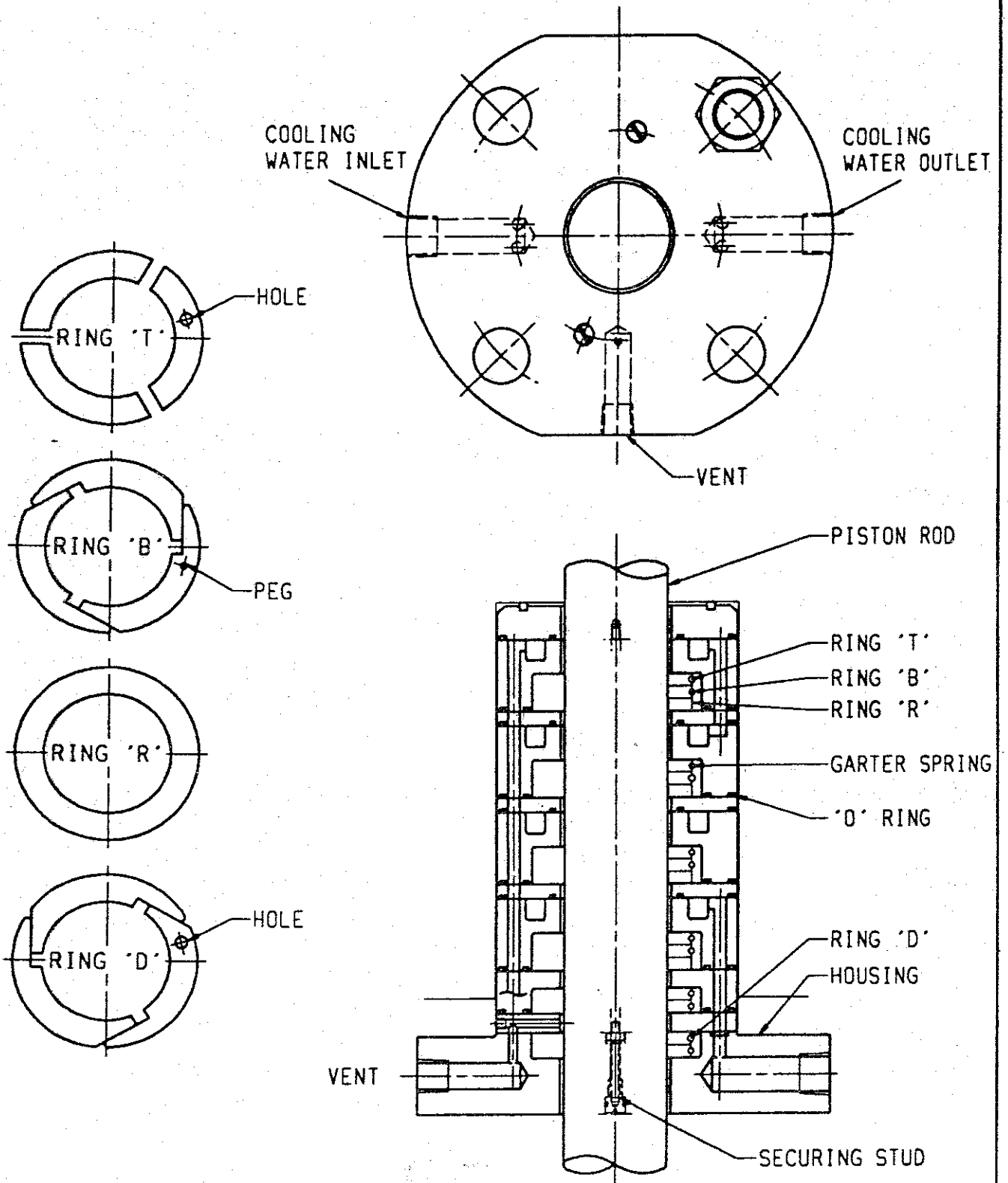
DD1106

#### 5.4.8 Piston Rod Packing Gland (1st & 2nd stage) - Inspect

##### To Inspect

1. The packing rings are checked for wear by reassembling, with garter spring, squarely around the piston rod, or on the wear check tool (See Tools) and examining the butt clearances.
2. When parts are new the butts are each 3mm wide; discard the ring when the butts reduce to 0.5mm total.
3. Examine the soft metal sealing ring on the top-most container of the gland (also on the spacer) to ensure this is in good condition.
4. Assemble and refit the rings as described in Section 5.4.8.

REFER TO BELLISS & MORCOM PART No. PSB032-048



PISTON ROD PACKING ASSEMBLY

DD915

### 5.4.10 Piston Rod Packing Gland (3rd stage) - Inspect

#### To Inspect

1. Remove the tie stud nuts from their studs and carefully withdraw the studs from the gland assembly.
2. Lift off each container in turn and examine the packing ring segments housed within for wear and deterioration.

As each container is lifted off the assembly, collect and store the various o rings as they become free (it is recommended that the o rings are renewed, if not, guard the displaced rings against loss or damage).

The packing rings are checked for wear by reassembling, with garter spring, squarely around the piston rod, or on the wear check tool (See Tools) and examining the butt clearances.

Renew the packing rings when wear has reduced the butt gaps to 0.60mm in total.

It is recommended that all the wearing rings are renewed at the same time to prevent unnecessary stopping and servicing of the compressor for each set.

Observe that each ring is marked with matching numbers and letters for use during reassembly.

The lowermost ring has a peg which locates into a hole in the uppermost ring to form a container pair.

The anti-extrusion rings have no butts.

The rings can be reused depending upon condition.

Also inspect the soft metal sealing ring in the top container of the packing gland for wear or damage, renew container if necessary.

4. Refit the tie stud through the gland assembly, whilst ensuring that the containers and packing rings remain in their correct positions, and secure with the tie stud nuts.

#### 5.4.11 Piston Rod Oil Shedder - Renew

The piston rod oil shedder is clamped in halves to the piston rod by socket head screws. The shedder is fitted so as to run clear of the packing gland and the scraper gland covers. If the shedder becomes damaged renew as follows:

**Note:** The oil shedder should only be fitted onto the piston rod when both the oil scraper gland and packing gland are fully fitted in place.

1. Remove the access cover from the cylinder distance piece.

**WARNING:** Piston rod clamps **MUST** be fitted to prevent possible uncontrolled movement of the crankshaft and motion work. See Section 5.4 for further details.

2. Place the piston in BDC position and assemble the shedder onto the piston rod with the hollowed side placed downwards.
3. Position the shedder 2.5mm above the top face of the scraper gland and lightly but firmly tighten the two screws.
4. Turn over the compressor to ensure that the oil shedder does not foul either the upper packing gland or the lower scraper gland.
5. When adjustment is satisfactory, fully tighten the shedder clamping screws.
6. Refit the access cover to the cylinder distance piece.

**Note:** Two small diameter washers of the required thickness placed either side on top of the scraper gland are helpful in setting the shedder position - remove the washers immediately afterwards.

**WARNING:** Keep hands clear of the piston rod at all times when the shedder is tight on the rod to prevent fingers being trapped.

### 5.4.12 Piston Rod Oil Scraper Gland - Remove & Refit

#### To Remove

1. Remove access covers from the cylinder distance piece.

**WARNING:** Piston rod clamps **MUST** be fitted to prevent possible uncontrolled movement of the crankshaft and motion work. See Section 5.4 for further details.

2. Turn the compressor to place the oil shedder towards TDC.
3. Mark the position of the oil shedder on the rod surface before removing.
4. Unscrew the bolts holding the scraper housing to the top of the support plate on top of the crankcase.
5. Raise the housing slightly, taking care not to damage the gasket, and remove the cap screws holding the scraper housing together and then part the halves, taking care not to damage the locating dowel pegs.
6. Unhook the garter springs and remove the scraper ring segments.
7. Reassemble and carefully store each ring of segments immediately upon removal.

**Note:** The segments are marked relative to each other, the lower ring pair having a peg and locating hole arrangement for correct reassembly. The rings can be reused depending upon condition. Check the condition of the gasket.

#### To Refit

1. Lightly oil the gland parts prior to reassembling the scraper rings to the piston rod and their garter springs. Ensure that the correct relationship is maintained between the rings.
2. The halves of the gland cover plate (the mating faces of which must be free of burrs and perfectly clean) are assembled onto the ring pairs and bolted together, using no sealant solution on the faces. Ensure that the locating dowels and holes set in the mating faces are in good order before assembly.
3. Fully tighten the assembled gland onto its support plate using a gasket of 0.2mm thickness under the flange.
4. Refit the oil shedder to the piston rod in the position marked during the removal. Secure with clamping screws.

**Note:** There are drain holes drilled in the bottom of the housing, which (on the inclined cylinders) must be placed lower-most when refitting the gland. Where the cylinder is vertical (centre cylinder on a 'W' machine) the holes should face forwards ie. towards the oil pump.

5. Turn the compressor over a couple of times.
6. Refit the access covers to the cylinder distance piece.

SUPPORT PLATE

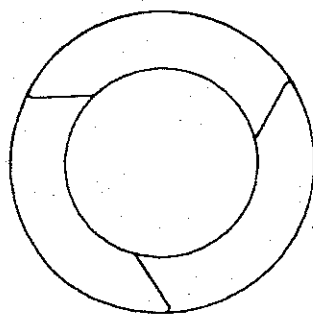
SEALING RING

GARTER SPRING

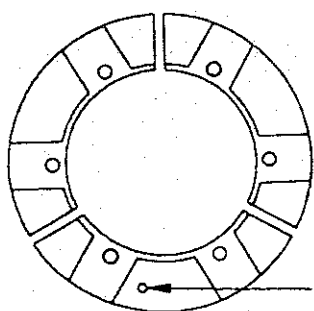
SCRAPER RING 'W2'

PISTON ROD

SCRAPER RING 'W1'

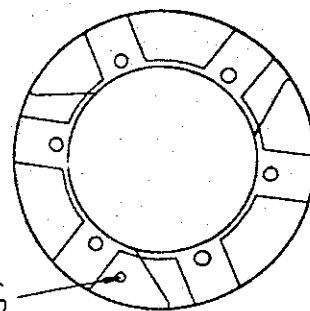


SEALING RING



HOLE

SCRAPER RING 'W1'



PEG

SCRAPER RING 'W2'

PISTON ROD OIL SCRAPER GLAND

DD618

### 5.4.13 Piston Rod Oil Scraper Gland - Inspect

#### To Inspect

1. The oil scraper rings are checked for wear by reassembly, with garter spring, squarely around the piston rod, or on the wear check tool (See Tools), and examining the butt clearances in the case of ring 'W1'.

Note: The segments of the mating ring (ring 'W2') has angle cut contact faces - there are no butts.

2. When parts are new the butts of 'W1' are each 1.0mm wide.
3. Discard the ring, also its mating ring, when the butts reduce to 0.2mm (a total of 0.6mm) or less, and replace by a new pair.
4. In the case of ring 'W2', when parts are new the outside diameter of the ring is 67mm. As this ring wears the point is reached where the garter spring loses its grip and there is then no significant inward springing load.

Discard the ring, also its mating ring, when the outside diameter - the largest diametral measurement remaining across the worn parts - has reduced to 60mm or less.

### 5.4.14 Suction and Delivery Valves - Remove and Refit

#### To Remove

1. Each valve is installed in an individual pocket. The valves are fitted with metal-to-metal contact (ie. no jointing material) to the seating facing in the cylinders and top covers.

**WARNING:** Particular care must be taken with compressor valves to ensure that the suction valves, and associated securing and actuating components, are not fitted into the delivery valve pockets or vice-versa. Failure to comply could result in severe damage. The assembled valves are quite different - observe and carefully note the position of the different valves upon removal.

2. Remove the securing bolts from the valve cover and remove the valve cover and cage complete with o ring(s).

**Note:** On some machines the valve cover and valve cage are a combined casting, whereas on others they are separate items. Equally, some machines may be fitted with a combination of the two. See the diagrams provided to identify which arrangement(s) is/are fitted.

3. Remove the valve from its pocket (using a valve extraction tool for the delivery valves).

**Note:** When removing valves fitted with distance rings, it is essential that these are correctly replaced when refitting the valves.

#### To Refit

The diametric clearance between the valve seat and the seating in the cylinder is small, therefore, the valve has to be fitted very carefully to ensure that it fits squarely on to its seat.

1. Ensure that there are no bruises or burrs on the valve seat/pocket seating.

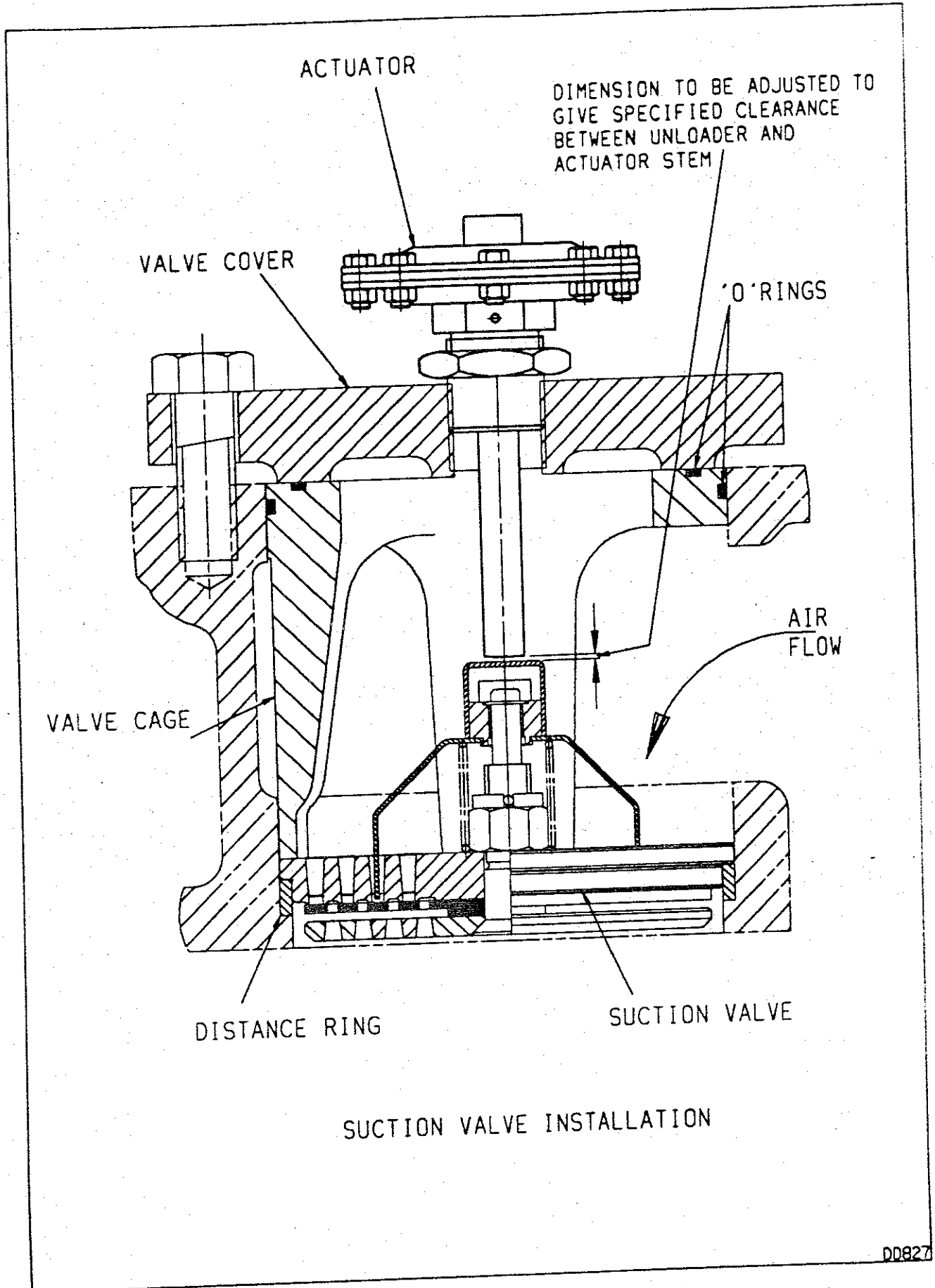
**WARNING:** It is essential that the valve can be rotated easily by hand when in place on its seating, this proving that it is squarely fitted. Where there is a distance ring fitted under the valve seat this too must be similarly inspected and fitted so that it can be rotated easily by hand when in place on its seating.

2. Check that the o rings are in good condition and that their associate grooves are clean before final assembly of valve cage and cover. Renew o rings if necessary.
3. Refit the valve cage and cover, and secure with bolts.

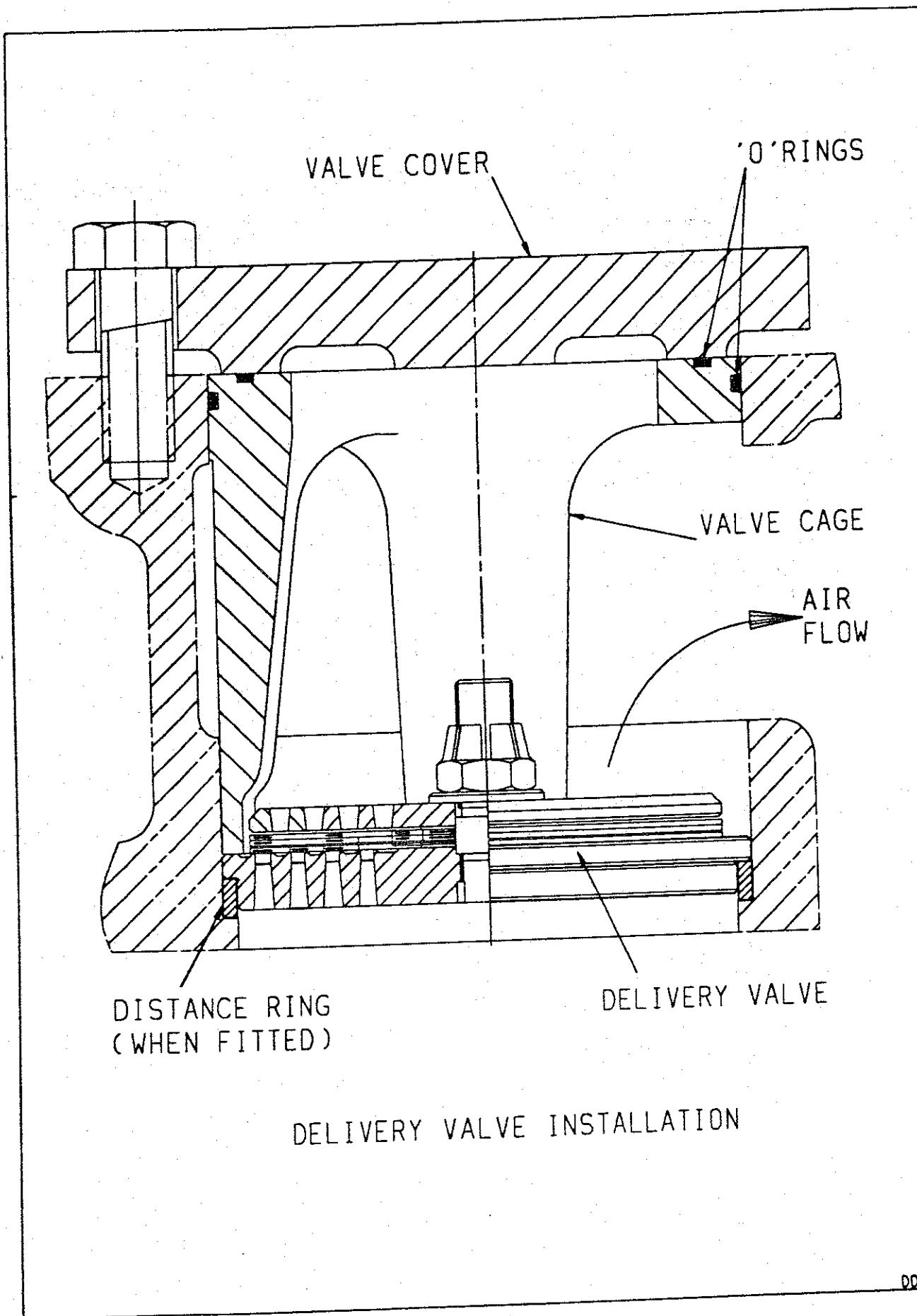
**Note:** If a cylinder top cover has been removed, tighten this down fully on reassembly before finally tightening down the valve securing covers (DO NOT tighten the valves before the cylinder top cover is fully tightened onto its cylinder).

4. Tighten down the suction valve covers and check the actuator spindle operating clearance.
5. Ensure that the instrument air lines are connected correctly to the suction valve unloader actuators.

**WARNING:** It is important after fitting valves (or after work of any kind which has been done inside the cylinders) to ensure that all is clear in the cylinders by turning over the crankshaft a few revolutions).



DD827



CONTROL PRESSURE CONNECTION

DIMENSION TO BE ADJUSTED TO GIVE SPECIFIED CLEARANCE BETWEEN UNLOADER AND ACTUATOR PLUNGER.

ACTUATOR

VALVE COVER

O RING

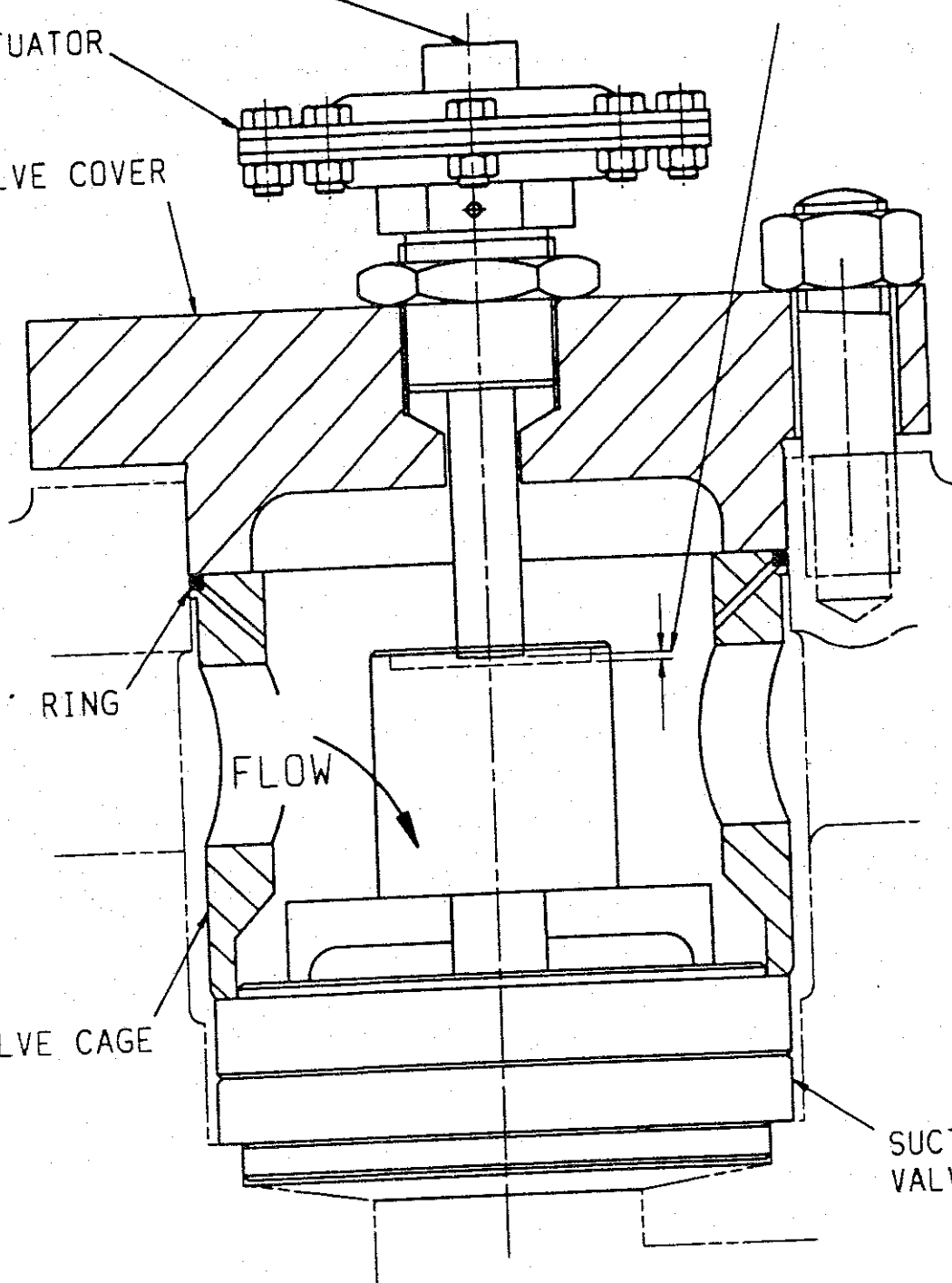
FLOW

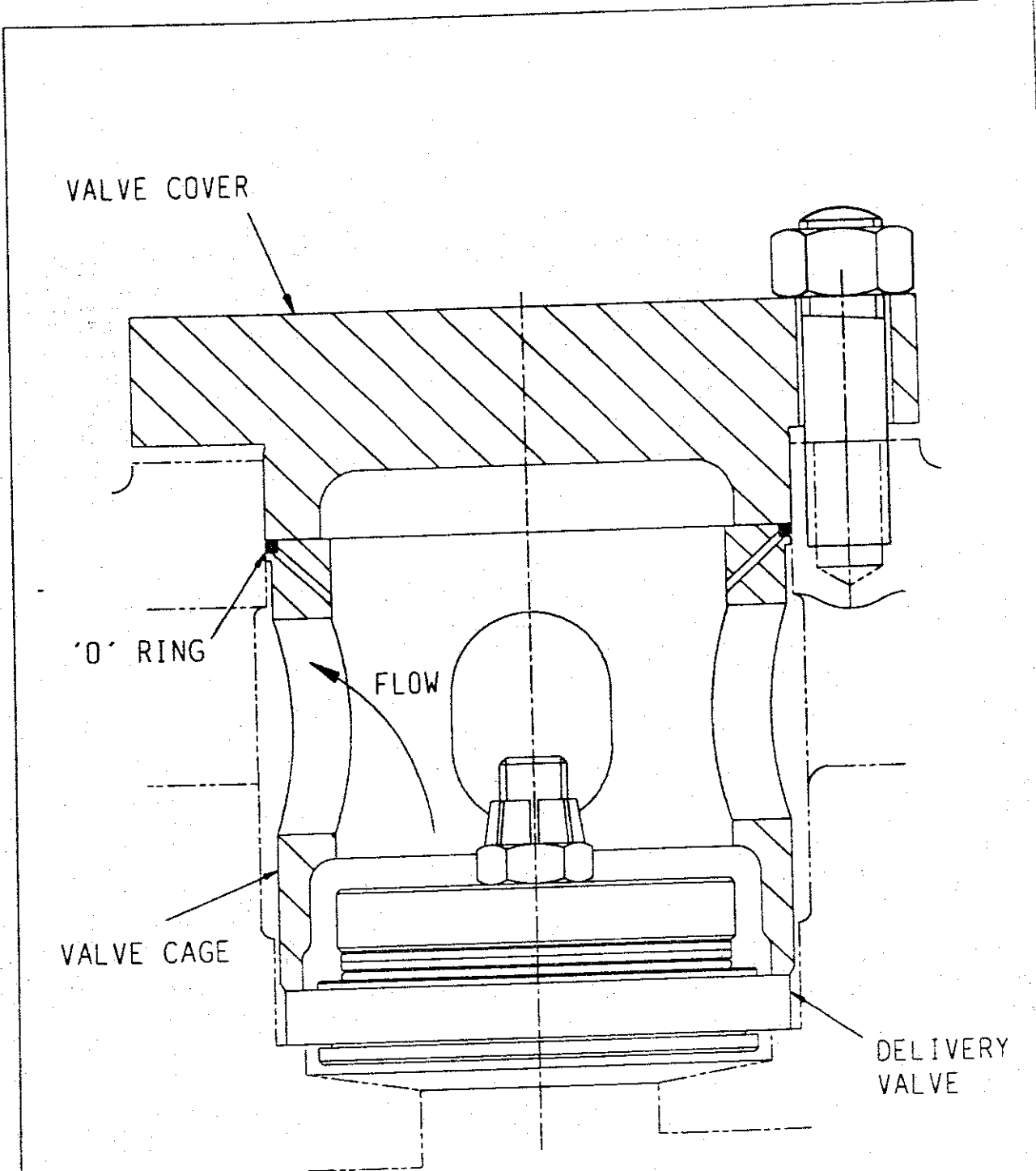
VALVE CAGE

SUCTION VALVE

SUCTION VALVE INSTALLATION (92FDR)

DD693





DELIVERY VALVE INSTALLATION (92FDR)

DD694

### 5.4.15 Suction and Delivery Valves - Inspect & Overhaul

#### To Inspect

Note: The correct holding tool must be used when dismantling and assembling valves. The valves themselves must never be gripped in a vice.

1. Inspect the o ring for each valve cover/cage. Renew if necessary.
2. Disassemble the valves as indicated in the figures are the end of this Section.

Note: There are locating pegs in all valve seats; these ensure correct relationship between various components, except the valve coil springs.

3. Thoroughly clean all parts and examine for signs of fatigue or wear.
4. Check for distortion or damage to the sealing faces of valve seats and also the guards.
5. Check for distortion, wear, cracks or breakages of valve plates.
6. Compare the height of displaced springs, with new spares, to determine any deterioration in spring loading.
7. Replace any part which is found to be defective.

#### To Overhaul

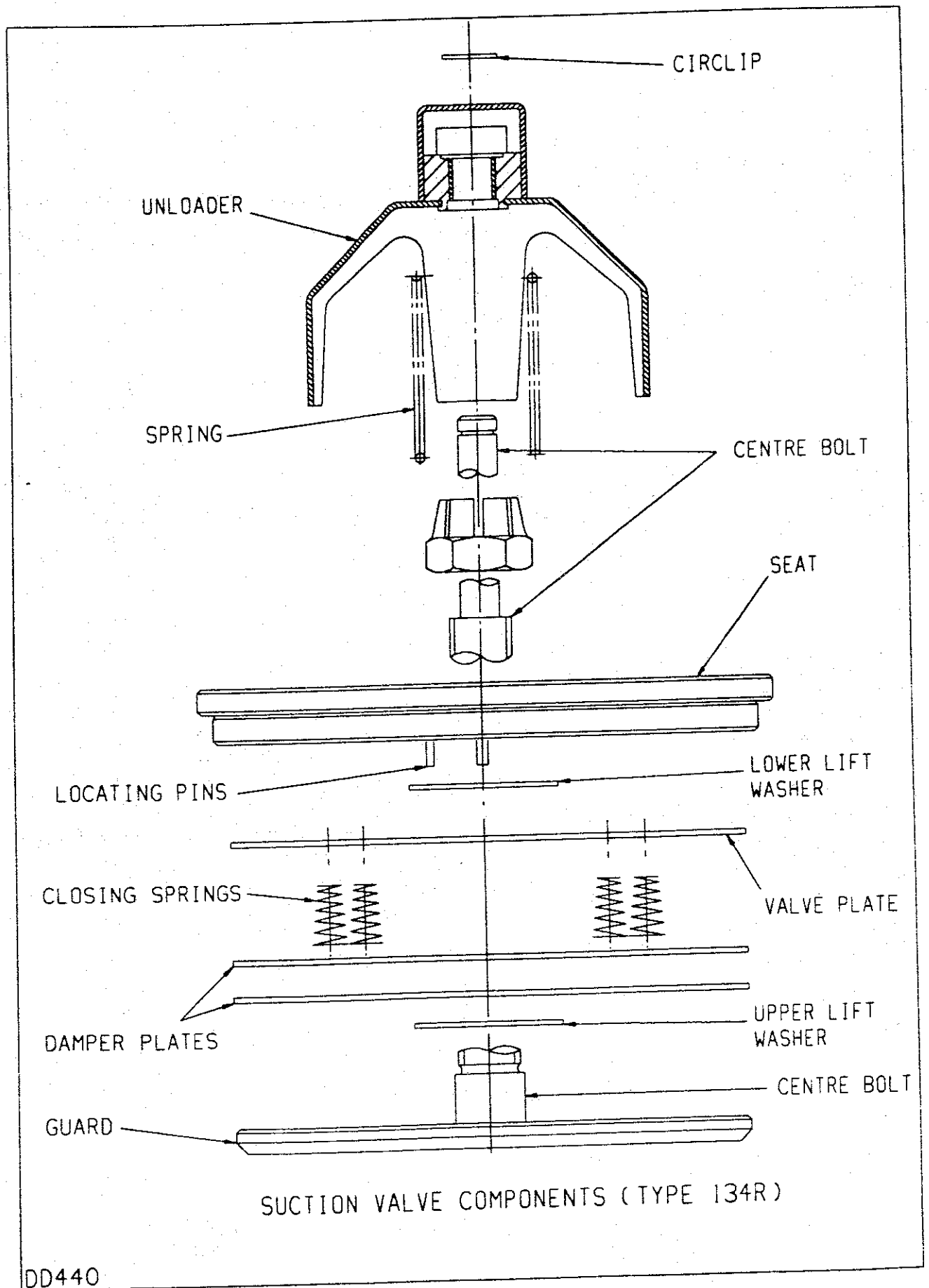
##### Reassembly of Repaired Valves

Care must be taken when reassembling overhauled valve components. The components must be assembled exactly as shown in the figures at the end of this Section. An incorrectly assembled valve will quickly deteriorate in service and consequently damage other parts. Particular care must be taken when assembling valves to ensure that the springs remain correctly in their locations.

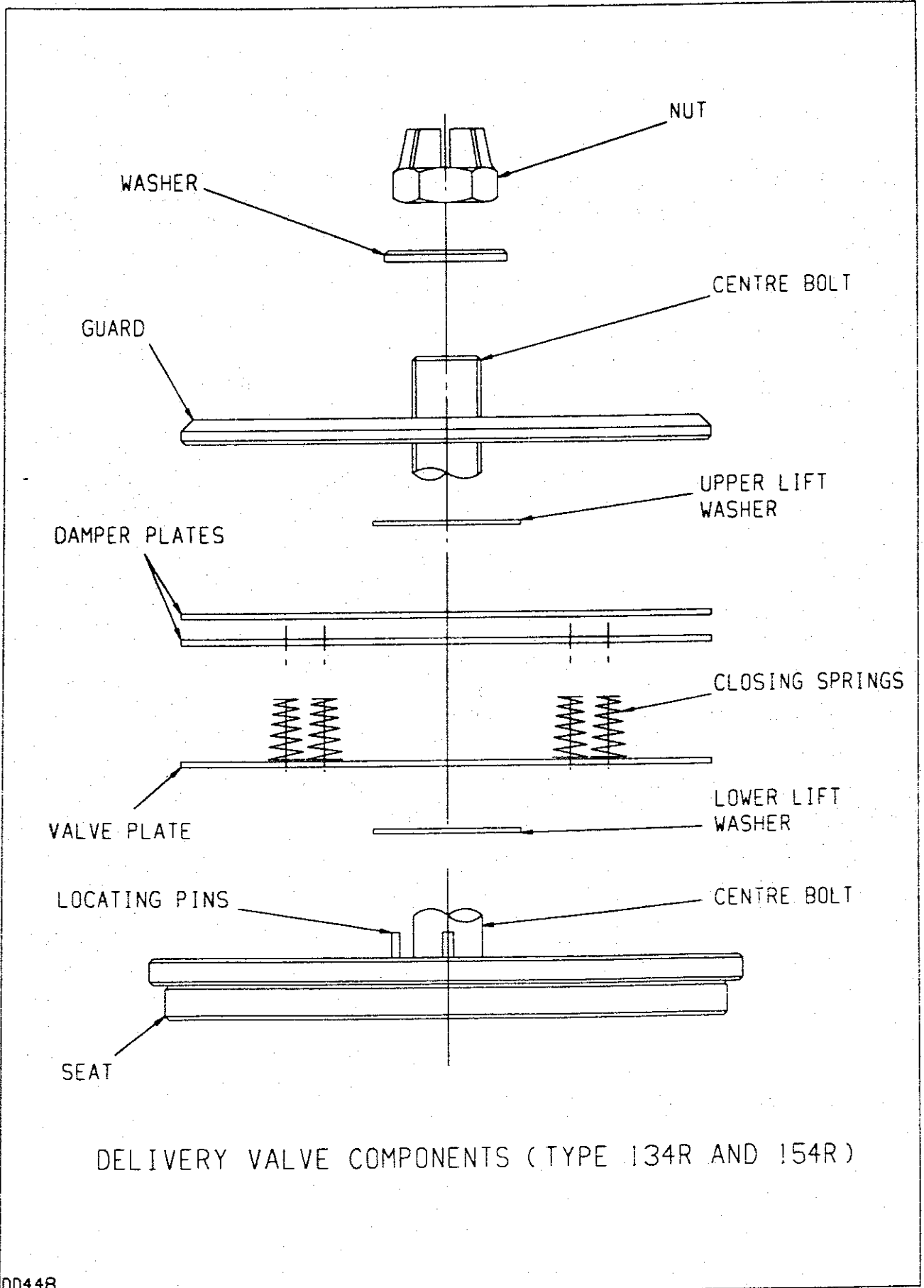
1. The valves have locating pins which ensure that the various components are correctly related radially. The pins are of differing diameters which ensures that the valve seat, valve plate, valve damper plates, and valve guard, are correctly fitted, one to the other.

Caution: If new locating pins are fitted to an old seat it is essential that they re of the correct sizes and positioned exactly as on original valve seats, with correct standout height above the valve seat top surface.

2. Lift Washers - when not of identical thickness - should be fitted with the thinner one next to the valve seat (this thinner one is referred to as the lower lift washer).
3. Conical type springs are fitted with the large diameter end located in the holes in the valve guard.
4. Torque the centre bolt nut to the correct value to complete the assembly.

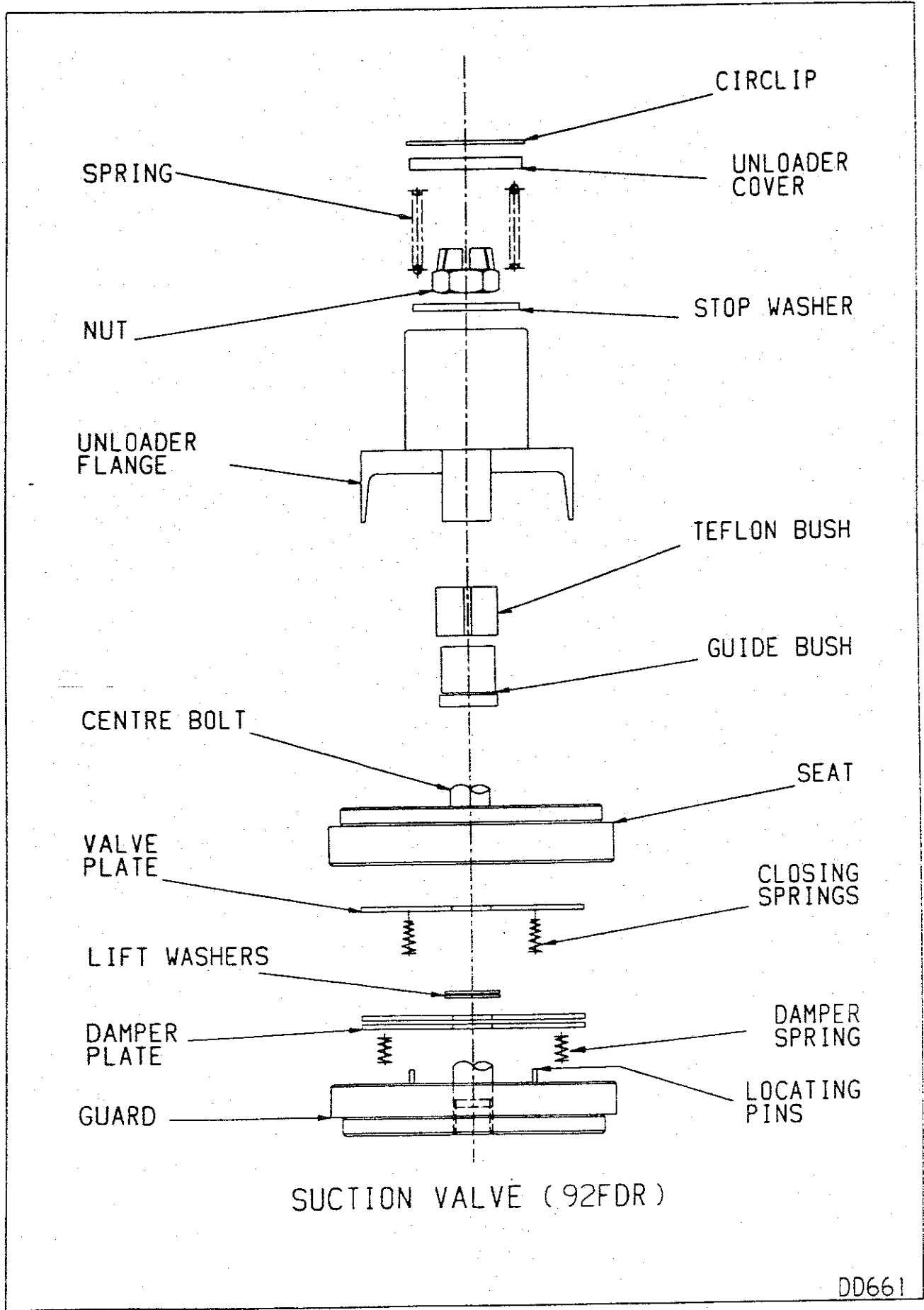


DD440

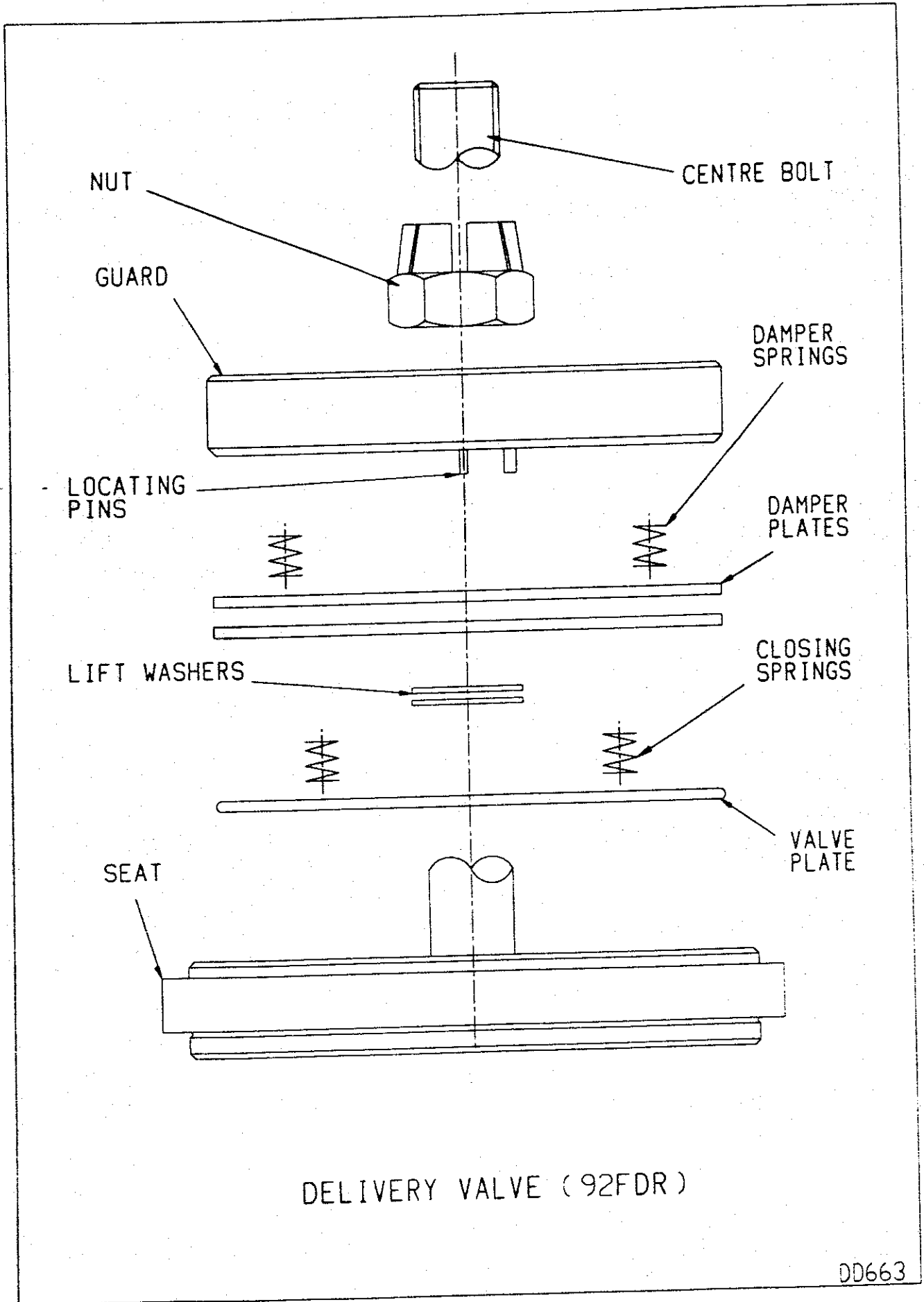


DELIVERY VALVE COMPONENTS (TYPE 134R AND 154R)

DD448



DD661



DELIVERY VALVE (92FDR)

DD663

### 5.4.16 Suction Valve Unloader Actuators - Remove, Inspect & Refit

#### To Remove

1. Disconnect control air pipe from the actuator and cap open ends.
2. Remove the end fittings for the actuators and store carefully.
3. Slacken locknut and screw actuator out of top cover.
4. Place the actuator onto a clean work-surface.

#### To Inspect

1. Remove the diaphragm chamber cover and disassemble the unit for examination of the condition of the diaphragm, spring, bush, spindle and seal ring.
2. Check that the small vent hole in the side of the lower half case is clear (if this becomes blocked then the diaphragm cannot deflect properly due to pressure build-up).
3. If there is deterioration of any part, it is recommended that the complete actuator is replaced. Under normal circumstances actuators given long and trouble free service.

#### To Refit

1. Ensure that the suction valve is fitted correctly and that its securing cover is fully tightened down squarely.

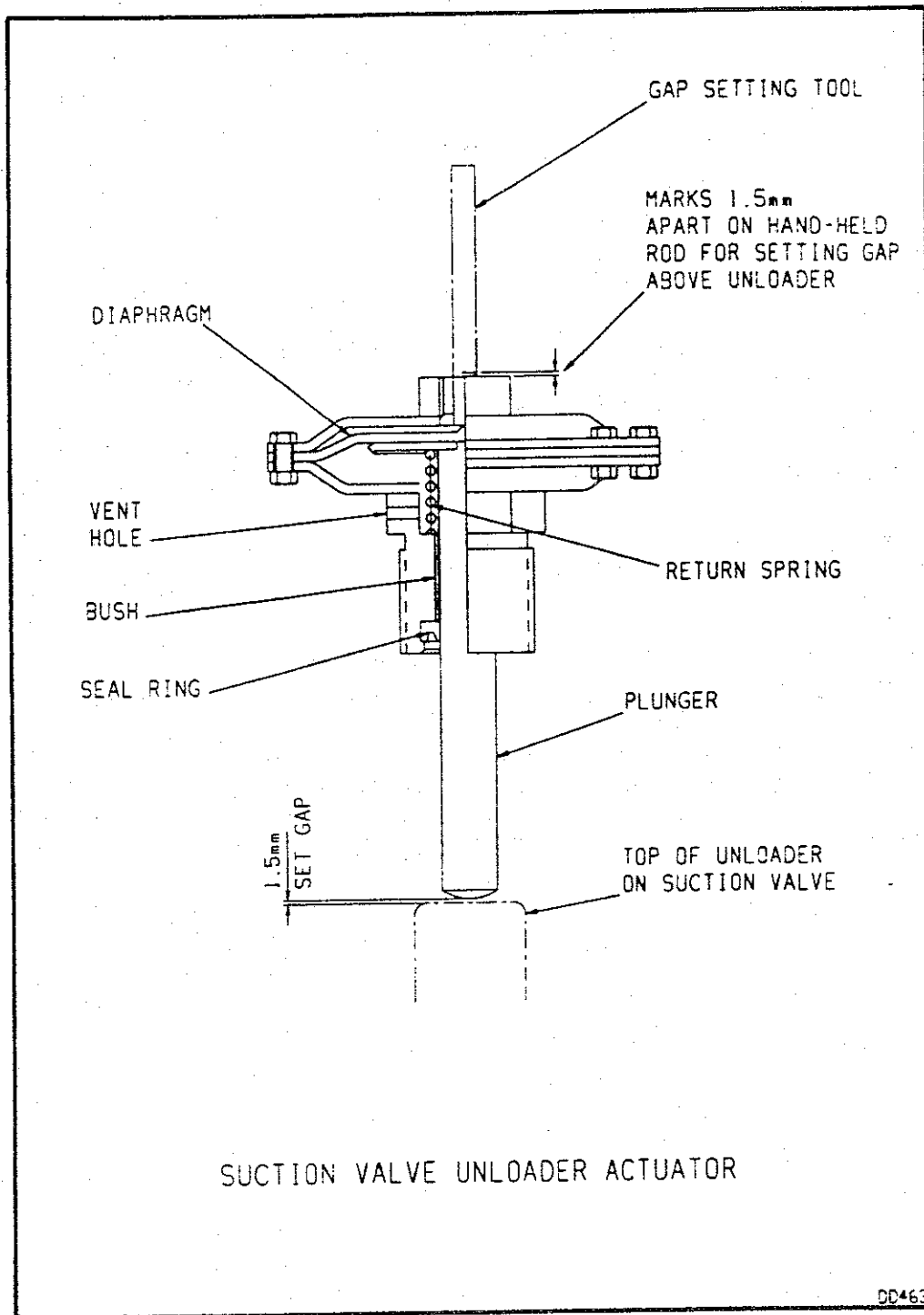
Note: It is essential that the correct gap is present between the actuator and the valve, otherwise the suction valve may not open or close fully.

2. Carefully screw the actuator (with its locknut screwed back) until the spindle just contacts the valve unloader.

Note: The unloader is spring loaded so take care to just contact it and NOT depress it.

3. Screw back the actuator about 1.5mm and pinch tighten the locknut.
4. Insert a hard wood dowel/rod through the control air connection hole in the top of the actuator casing until it just touches the top of the diaphragm.
5. With the dowel/rod in position, mark it accurately in line with the actuator cover plate top.
6. Using the dowel/rod depress the actuator (against the action of the spindle return spring) until it just contacts the unloader, but do not depress it (see figure).
7. While holding the dowel/rod in position, mark it accurately again in line with the actuator cover plate top.
8. Release the dowel/rod (it will rise under the action of the actuator spindle return spring).
9. Remove the dowel/rod and measure the distance between the marks. If it is NOT between 1.4mm and 1.6mm then adjust the actuator position, by screwing it in or, out of the cover plate, as required.

10. When the gap is set correctly, tighten the locknut to the correct torque.
11. When all the actuators on the compressor are correctly set, fit the end fittings to the actuators; reconnect the control air pipework to the actuators and to the associated vent valve and test the compressor for correct operation.



### 5.4.17 Oil Filter - Renew

#### To Renew

**WARNING:** The compressor must not be in service when renewing the filter element unless it is fitted with a Duplex Filter Assembly. Whereupon, care must be taken to ensure that only the isolated filter is renewed.

1. If the compressor is fitted with a Duplex filter assembly, ensure that the selector switch is in the correct position to isolate the filter being renewed.
2. To open the filter body undo the bottom bolt, using a clean bucket to catch spilled oil and remove the filter body and element downwards.
3. Discard the old element and clean out the filter body.
4. When replacing the assembly (with a new filter pack) care should be taken that the ring seal at the top and the washer at the bottom are in their correct positions. A new ring seal is supplied as part of the filter element pack.

**Note:** There is a spring fitted internally onto the bolt - this is installed to hold the filter element up against the top cover and so form the seal; it also provides the automatic safety filter bypass (for use should the element become heavily fouled).

5. Before assembly of the filter body to its cover, fill the body with clean compressor lubricating oil.
6. Assemble the filter body back onto the housing and secure with bolt removed earlier. Do NOT over tighten the fixing bolt.
7. Run the compressor for 10 minutes and check for oil leaks around the seal.
8. Check the oil level and top-up of necessary through the crankcase breather/filler.

### 5.4.18 Oil Pressure Relief Valve - Inspect

#### To Inspect

The oil pressure relief valve is screwed into a boss connecting to the internal oil way of the oil pump end main bearing end cover.

To adjust the relief valve, remove the blank end cap, loosen the locknut and adjust using the hexagon on the relief valve. Screw the hexagon IN to increase pressure and OUT to decrease the pressure.

Note: Adjustment is best carried out with the relief valve removed from the end cover and set using a shop air line and a calibrated pressure gauge.

Tighten the locknut after adjustment and replace the blank end cap.

Normally adjustment is not necessary after initial setting by the manufacturer. If a fault should occur and adjustment has no noticeable effect, the trouble could be a particle of foreign matter trapped under the valve. Dismantling, cleaning and reassembly is then required (first noting the valve cap setting).

#### 5.4.19 Inlet Filter/Silencer - Inspect/Renew

##### To Inspect

Periodic inspection of the inlet filter for interior cleanliness is recommended. The frequency of inspection will vary according to site conditions. Initially, for the first twelve months, a three monthly check on the filter element condition should give an indication to the future frequency of inspections and approximate element life.

##### To Renew

To renew the filter element, proceed as follows:

1. Release and remove the central nut and the top cover plate from the filter.
2. If the element is of the reusable type, proceed as follows:

Clean the element by carefully washing in a commercial detergent solution and then drying before refitting.

Note: If the filter element is heavily soiled or showing signs of wear, renew the element.

2. If the element is the paper disposable type replace the element.
3. Clean the abutting faces in the top of the silencer body before refitting the element.
4. Refit the cover plate and secure into position with the nut.

#### 5.4.20 Inter/After Cooler and Moisture Separator - Inspect & Overhaul

##### Intercooler and Aftercooler

##### To Inspect

The cooler (be it either an intercooler or an aftercooler) MUST be removed completely in order for a complete examination to be made.

Internal and external inspection, to check for fouling or damage, is annual. This period will, however, vary depending on site conditions.

##### To Overhaul

It is not expected that the inside (ie, tube internals) will foul, however, any untoward accumulation at the tube entrance can be removed by blowing backwards with compressed air, the cooler being off the compressor for this purpose.

Should the cooling water side become fouled then use a proprietary procedure as recommended by local water treatment specialists - this to be compatible with the materials of construction (See Technical Information and Data).

When refitting (after cleaning) all joints must be in good condition, and the joint faces on the flange, sealing ring, and expansion end of the tube stack must all be clean and free from burrs.

When re-tightening the flanges at the outlet end of the cooler, after reassembly on the compressor, the nuts must be tightened evenly all round so as not to distort the flange faces over the sealing ring, which fits inside the ring of bolts.

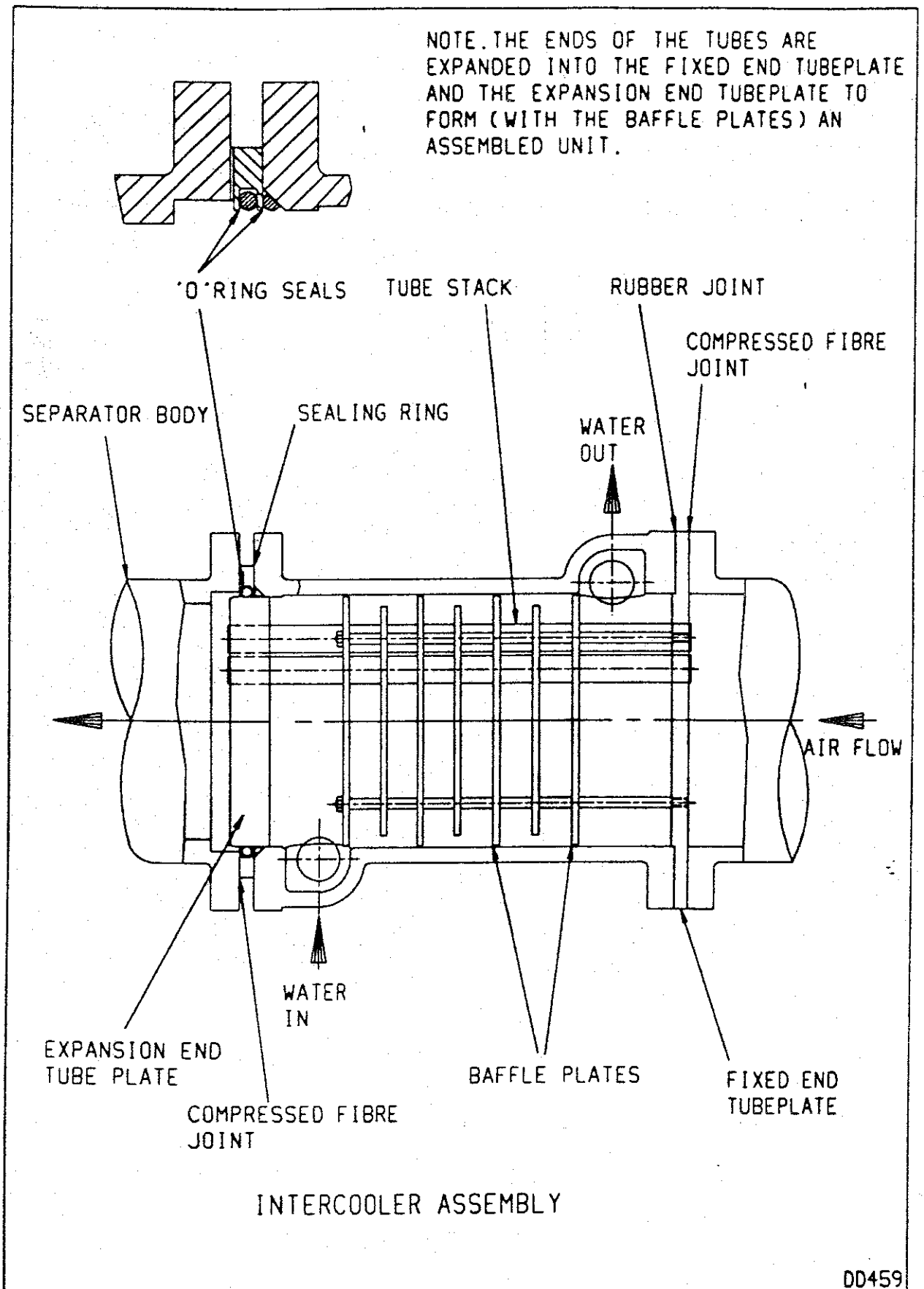
##### Moisture Separator

##### To Inspect

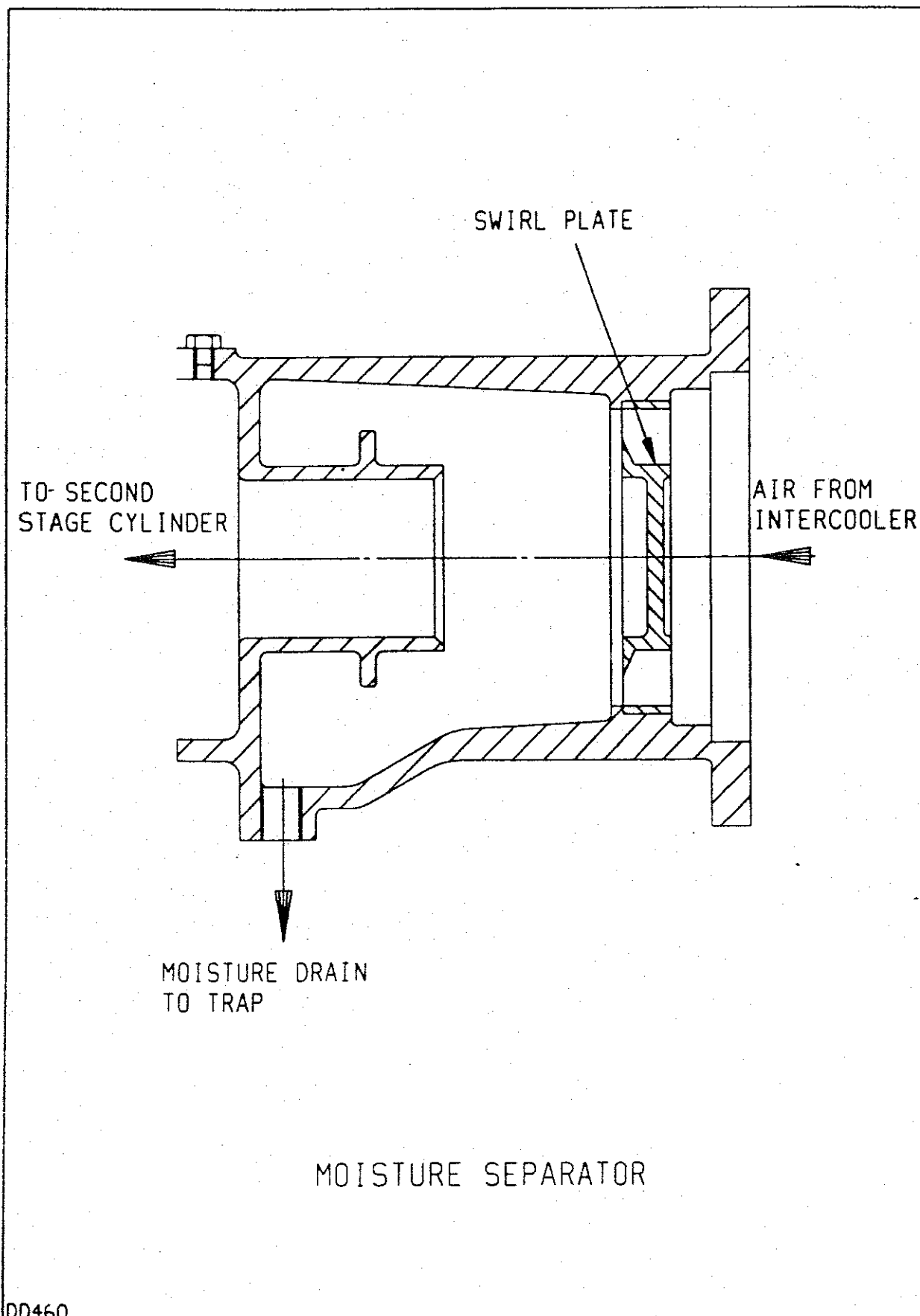
There are no moving parts in the separator - moisture separation being centrifugal, by vortex action, liquid then passing out to the drain trap.

Other than checking to ensure that the separator is clean internally, and that the drain from the separator is clear, no servicing is required.

NOTE. THE ENDS OF THE TUBES ARE EXPANDED INTO THE FIXED END TUBEPLATE AND THE EXPANSION END TUBEPLATE TO FORM (WITH THE BAFFLE PLATES) AN ASSEMBLED UNIT.



DD459



DD460

## 5.4.21 Moisture Drain Traps - Inspect & Overhaul

### Inverted Bucket Type Drain Traps

Maintenance involves periodic checking; the intervals between inspections will be infrequent with a clean system.

#### To Remove

1. Partially undo the six bolts which secure the trap cover to the body.
2. Prise open the joint of the trap cover to loosen it, to ensure that no pressure is present within the trap.
3. Remove the six bolts and lift off the cover (to which the inverted bucket of the trap is hooked, via the valve lever).

Important: Take care not to allow the bucket to become unhooked from the valve lever during the operation, and fall with risk of damage.

4. Unhook the bucket from the valve lever, and thread it off the orifice cleaning wire.

#### To Examine

1. Clean all parts. Inspect the valve and valve seat. It is not expected that valve or valve seat wear will occur with clean moisture condensate flow.
2. If the valve seat has a sharp undamaged edge, and if there is a narrow bright ring (contact line) all the way round the ball valve this indicates that the valve is tight.

Note: If a valve or seat has become damaged then they must be changed as a pair together with a new lever and guide pin assembly.

3. When renewing valve parts check to see that the parts are correctly matched with the numbers stamped on.

Parts having different numbers stamped on must not be fitted together.

Note: Replacement valve parts are supplied only in matched sets comprising the complete mechanism.

4. Examine the bucket, if this is cracked or corroded it should be replaced by a new one.
5. Ensure that the cover joint is in good condition - if not then renew.

#### To Refit

1. If a new valve seat is being fitted, this must be installed without any sealant or lubricant on the threads of the seat.

The joint seal is made, not by the threads, but by contact between the ground end of the valve seat and the bevelled seating area at the bottom of the tapped hole. Ensure that this seating area is perfectly clean when fitting.

2. If a new valve lever and guide pin assembly is being fitted it is important to align the guide pins with the holes in the lever.

To check the alignment of the guide pins, hold the lever assembly against the valve seat with the valve contacting its seat, and the two fulcrum points of the lever resting on the face of the seat.

When the lever is held in this position, the guide pins should be central in the guide pin holes and there should be equal side-to-side movement of the lever pins. If they are found not to be central, then it is permissible to bend carefully the pins until they are centrally located. Care should be taken so that the pins will remain perpendicular to the guide pin plate, so that the lever can drop until it rests on the guide pin hooks.

3. Hook the valve lever onto the guide pin assembly (which is screwed onto the underside of the cover), together with the bucket (which must have its cleaning wire carefully threaded through).
4. Lower the whole assembly into the trap body and tighten the cover evenly into place with the six bolts.
5. Before returning it to service, the trap requires priming in order to promote correct operation.

This is done by removing the priming plug from the cover, and filling the body of the trap with clean water - use about one quarter of a litre to ensure that the body is filled (some water will over-flow during the operation).

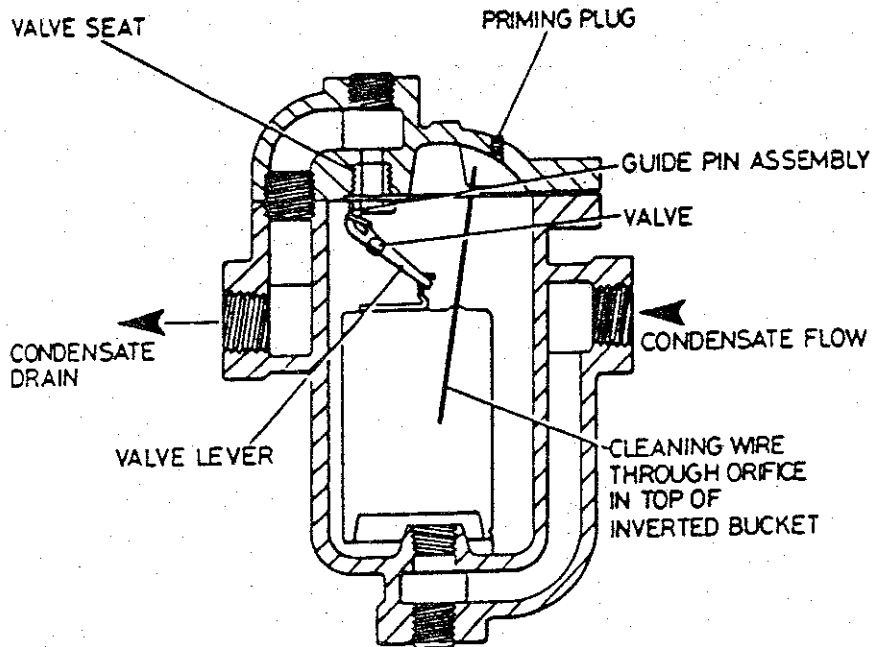
### Float Type Drain Traps

#### To Inspect

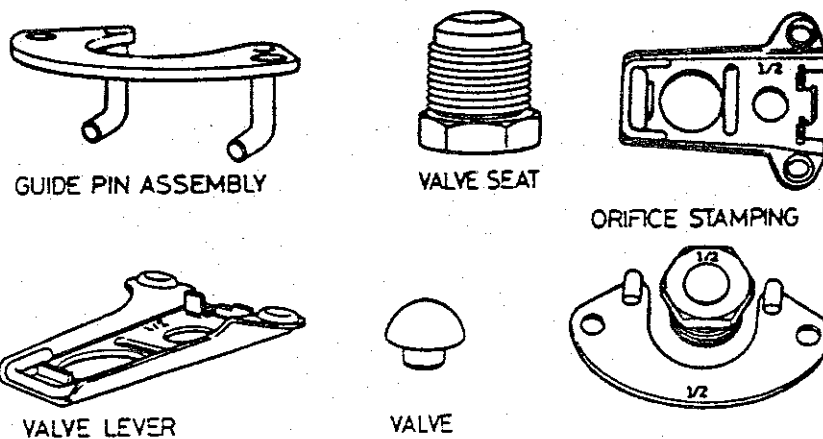
Maintenance of this drain trap involves periodic checking; the intervals being determined by the site conditions. If the compressor is operating in conditions of high humidity, the intervals between checks can be more frequent than if the compressor is working in "dry air" conditions.

Access to the drain trap internals is by removal of the top cover, then of the drain plug to release any residual condensate.

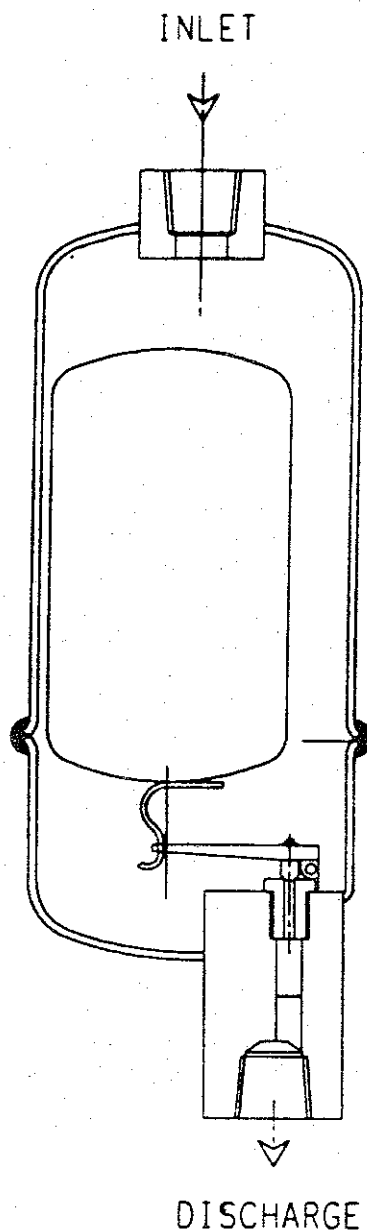
Clean the trap at regular intervals; the site conditions determining these, and inspect the ball, valve and valve seat for evidence of wear. It is not expected that these items will wear much under clean condensate conditions, however, if excessive wear is present renew the trap as an assembly.



VISUAL IDENTIFICATION OF MECHANISM PARTS



INTERCOOLER AND AFTERCOOLER SEPARATOR  
MOISTURE (CONDENSATE) DRAIN TRAP



MOISTURE SEPARATOR DRAIN TRAP

DD795

### 5.4.22 Vee Belt Drive - Renew

When renewing vee belts, the replacement belts must be a matched set. A matched set, as specified by BS 3790, are permitted a length variation of no more than 10mm between individual belts. All belts are marked with numbers to enable matching to take place. A matched set of belts can either be all of the same number, or selected from up to three consecutive numbers:

- e.g.
- (a) A five belt set can ALL be marked 52
  - (b) Three belts can be marked 52, one marked 53 and one marked 54
  - (c) Two belts can be marked 52, one marked 53 and two marked 54
  - (d) Four belts can be marked 52, and one belt marked 53.

These, and any similar combinations, satisfy the requirements of BS 3790.

Note: Belt length is referenced as a number. This number being the actual overall length of the belt in inches with a "0" added; e.g. a 190 inch belt is referenced 1900.

#### To Remove

1. Remove the belt guard.
2. Slacken the nuts on the motor hold down bolts by one turn.
3. Screw out the motor jacking bolts on the side nearer the compressor. This allows the motor to be moved towards the compressor, thereby slackening the belts sufficiently to allow removal.
4. Remove the belts.

#### To Refit

1. Place the belts around the pulleys.

Note: Do not force the belts over the pulleys. If tight, slacken off the motor jacking bolts further to permit easy fitting.

2. Screw in the motor jacking bolts on the side nearer to the compressor until the belts are in tension.
3. Measure the belt span. This is the distance between the pulley centres.
4. At the centre of the span, apply a perpendicular force (ie. at 90 degrees to) each belt in turn using a push spring balance.
5. The force should be sufficient to deflect the belt by 1mm perpendicularly for every 64mm (ie 1/64 inch for every inch) of span length.
6. Adjust the jacking bolts until the settings are within the specified limits.

Note: A new belt should be tensioned to the maximum deflection force recommended.

7. Using a suitable straight edge, check the alignment of the two pulleys. Adjust the jacking bolts if necessary to achieve alignment.

8. Recheck the belt tensions and adjust if necessary.
9. Fully tighten the nuts on the motor hold down bolts.
10. Refit the belt guard and check that the belts are clear of the guard.

Notes:

a: The majority of stretch occurring in new vee belts takes place during the initial running hours. The belt tension must be checked and readjusted as necessary after approximately 8 to 10 hours of 'Full Load' running. This adjustment will require repeating at subsequent 8 to 10 hourly intervals until a total of five checks have been made. After this period, the belts can be considered to have settled down.

b: After adjusting the belt tensions, always check the pulley alignment before restarting the compressor.

## 5.5 Tools

In addition to the tools supplied with the compressor and the normal range of machinery fitters tools, efficient maintenance and overhaul of the compressor requires suitable (certified), safe lifting equipment.

### 5.5.1 Commercially Available Tools List

There follows a specific list of tools required to perform maintenance tasks on this compressor:

- |                |   |  |
|----------------|---|--|
| Torque wrench  | - | tightening range 0 to 1200 Nm.   |
| Circlip pliers | - | for removal and refitting of crosshead gudgeon pin retaining circlips.   |
| Dial gauges    | - | for measuring crankshaft main bearing 'lift' and motor to crankshaft alignment (two dial gauges, preferably with magnetic bases, are required).            |
| Eyebolts       | - | M24 x 3.0 male thread for cylinder top cover lifting (thread length 65mm - to allow for leaving the valve cage/covers in place).                           |
|                |   | If eyebolts of this length are not available then the appropriate valve cage/covers will need to be removed to enable standard length eyebolts to be used. |
| Fitters tools  | - | M12 x 1.75 (for piston rod lifting).   |
|                | - | feeler (thickness) gauges, standard sizes.   |
|                |   | long-nosed pliers (thin ended, for removal of circlip from suction valve unloader).  |
|                |   | a set of hexagonal section Allen keys.   |
|                |   | a range of open-jaw, ring, and socket type spanners.   |
|                |   | hammer, pliers, screw-drivers, etc.  |

### 5.5.2 Specialist Service Tools List

The following specialist service tools are designed to aid compressor maintenance work and are available from Belliss & Morcom.

<u>Tool No</u>	<u>Description</u>
MB021-09	Nut (M16)
MB072-02	Collared steel eyebolt (M16)
MB072-03	Collared steel eyebolt (M20)
MB073-03	Eyebolt adaptor M20 x 2.5mm
PSB038-006	Bearing nut spanner
PSB038-008	Valve cage extractor (complete)
PSB038-009	Valve cage extractor assembly
PSB038-010	Socket spanner - piston rod
PSB038-011	1" square drive - short extractor bar
PSB038-012	Drive adaptor 1" square
PSB038-013	Valve cage extractor
PSB038-014	Delivery valve extractor stud
PSB038-015	Delivery valve extractor nut
PSB038-021	Delivery valve extractor

In addition, the tools listed below are referred to in the corrective maintenance procedures. These tools can be made locally and drawings of these are included for this purpose.

<u>Drawing No</u>	<u>Description</u>
DD579	Piston rod clamp
DD594	Valve extractor (2nd stage delivery)
DD600	Piston rod gland wear checking tool
DD615	Thread guard cap - piston rod
DD622	Valve extractor (1st stage delivery)
DD816	Valve holding clamp
N/A	Valve supporting details (use of clamp DD816)
DD938	Tool for assembling piston rod packing gland
DD???	Fitting cone - bearer ring (2nd stage piston)

**SECTION 6: STORAGE & DISPOSAL****Contents**

<b>Title</b>	<b>Reference</b>
Safety Precautions	6.1
Storage	6.2
Storing a New Compressor	6.2.1
Storing an Old Compressor	6.2.2
Long Term Shut Down	6.3
De-commissioning Procedure	6.4
Transporting	6.5
Preparation for Transport	6.5.1
Transport Requirements	6.5.2
Re-installation Procedure	6.6
Disposal of Equipment	6.7

## **SECTION 6: STORAGE & DISPOSAL**

### **6.1 Safety Precautions**

Before carrying out any work related to this Section, it is a requirement that you read and work in accordance with, the Safety Precautions given in Section 1.3 of this Manual. For your own protection, be sure to read and obey the WARNING and Caution notices you find in this Section and any associated literature.

### **6.2 Storage**

#### **6.2.1 Storing a New Compressor**

Storing a new compressor is easy because the factory has already prepared the compressor for storage prior to shipment. All of the water and oil will have been removed, the air passages will have been treated with DAG dispersion 559 and silica gell bags will have been placed in certain valve pockets. Provided none of the above have been touched or removed, the compressor can be stored for quite a long period of time with little or no deterioration. The only requirements are that the compressor is kept under cover and not exposed to extremes of temperature or humidity.

#### **6.2.2 Storing an Old Compressor**

Storing an old compressor requires proper preparation of the machine prior to storage. All of the water must be drained out, all of the air passages must also be dried. DAG dispersion 559 colloidal graphite paint or similar must be applied to prevent rusting. All of the oil must be drained out and the sump wiped clean. Silica gell bags must be applied to the correct valve pockets and mouldable wrapping must be applied to the piston rods to protect them from the elements.

The procedure for storing old compressors is similar to the procedure for preparation for shipment. We recommend you read Section 6.5 for more details. Once the compressor is prepared for storage, it must be kept under cover and not exposed to extremes of temperature or humidity.

### **6.3 Long Term Shut Down**

The compressor can be left idle for long periods of time provided that it is run periodically to prevent deterioration of parts. Under normal conditions running the compressor for about an hour once a month should be sufficient to keep the oiled surfaces lubricated and prevent rusting of internal passages. If the compressor is outside, or exposed to weather, more frequent runs may be necessary to prevent deterioration.

### **6.4 De-commissioning Procedure**

Decommissioning the compressor is a reversal of the procedure found in Section 3.5 of this manual. Should further information be required, please contact Belliss and Morcom directly or their approved Agents.

### **6.5 Transporting**

If the compressor is to be moved from site or placed into storage, it must be properly prepared. Proceed as follows:

### 6.5.1 Preparation for Transport

1. Drain the crankcase sump and wipe out with lint-free cloth (do NOT use cotton waste or rags). Fit wood chocks to prevent crankshaft rotating..
2. Drain the cooling water system completely.
3. Dry off the air passages in the interstage pipework.
4. Remove all valve covers, cages, valve assemblies and distance rings from the cylinders.
5. Treat the cylinder bore and all air passageways with rust resistant paint (DAG dispersion 559, colloidal graphite in CTV solvent naphtha). Use the same paint to treat the valve covers, cages, distance rings and the parts of the piston rods inside the cylinders.
6. Refit the distance rings, valves, cages and covers to those cylinder pockets which are not to receive silica-gel bags.

Note: Re-activate the silica-gel by heating the bags in an oven at 100°C for three to four hours. Place the requisite number of bags in the specified valve pockets.

7. Refit these valve covers and attach the adhesive labels. Attach the warning plate to the pressure gauge plate.
8. Wrap the displaced valves, distance pieces and cages in mouldable wrapping and pack in a separate container.
9. Lightly smear the exposed parts of the piston rods with clean grease and wrap in mouldable wrapping.
10. Ensure that the inlet and discharge passages are dry and wrap the flanges with mouldable wrapping.
11. Cover the water inlet and outlet connections with mouldable wrapping.
12. Plug the separator drains.

### 6.6 Re-installation Procedure

Recommissioning the compressor is a repeat of Section 3.5 of this manual. Should further information be required, please contact Belliss and Morcom directly or their approved Agents.

### 6.7 Disposal of Equipment

There are no harmful materials used in the construction of this compressor. Once the oil, condensate and coolant have been drained from the system the compressor can be sold for scrap to any reputable metal reclamation company. Due to the size and weight of some of the components, care should be exercised when dismantling: See Section 1.3 of this Manual.

## SECTION 7: LIST OF PARTS

### Contents

<b>Title</b>	<b>Reference</b>
Recommended Spares	7.1
Service Pack	7.1.1
Wearing Parts Pack	7.1.2
List of Parts	7.2
Compressor	7.2.1
Cooling System	7.2.2
Gauges and Safety Devices	7.2.3
Plates and Labels	7.2.4
Ancillary Parts	7.3

### IMPORTANT

When ordering spare parts please quote the following details:

- a. Compressor Serial Number
- b. Description of Part required.
- c. Part Number (if available)
- d. Quantity required

## 7.1 Recommended Spares

We recommend that users our compressors should hold in stock a 'Spares Service Pack' which contains all the items required for a full service and also carry stock of those items which, on a long term basis, may be considered as consumable.

The stock should be maintained at the original level, replacements being ordered in good time to ensure availability when required. Parts must be kept in good order with appropriate preservation precautions to meet the climatic conditions.

ALWAYS quote machine serial number when ordering spare parts. The quantities given below are the recommended minimum holding.

### 7.1.1 Service Pack

The 'service pack' should comprise of the following items:

<u>Item</u>	<u>Description</u>	<u>Qty</u>	<u>Part No.</u>
01	Ring & Spring Kit - p/rod scraper	3	PSB032-004
02	Element & Seal Kit - oil filter	2	PSB025-010
03	Bearings for connecting rod bottom end	3	PSB014-004
04	Piston pressure rings (1st stage piston)	2	PSB022-001
05	Piston bearer rings (1st stage piston)	1	PSB022-005
06	Piston pressure rings (2nd stage piston)	2	PSB022-003
07	Piston bearer rings (2nd stage piston)	1	PSB022-007
08	Piston pressure rings (3rd stage piston)	5	PSB022-054
09	Piston bearer rings (3rd stage piston)	1	PSB022-055
10	Piston nut (1st, 2nd & 3rd stage)	3	PSB002-010
11	Ring & Spring Kit - packing gland (1st & 2nd stage)	2	PSB032-007
12	Ring & Spring Kit - packing gland (3rd stage)	1	PSB032-049
13	Valve plate (1st & 2nd stage)	20	PSB027-014
14	Valve plate (3rd stage)	8	PSB027-006
15	Damper plate (1st & 2nd stage)	40	PSB027-015
16	Damper plate (3rd stage)	16	PSB027-007
17	Closing spring - suction (1st & 2nd stage)	80	PSB027-018
18	Closing spring - delivery (1st stage)	48	PSB029-007

19	Closing spring - delivery (2nd stage)	32	PSB029-006
20	Closing spring - suction (3rd stage)	16	PSB029-007
21	Damper spring - suction (3rd stage)	16	PSB029-006
22	Closing spring - delivery (3rd stage)	16	PSB029-006
23	Damper spring - delivery (3rd stage)	16	PSB029-040 <sup>022-040</sup>
24	Unloader circlip (1st & 2nd stage)	10	PSB027-024
25	Unloader circlip (3rd stage)	4	PSB027-125
26	O Ring - valve cage (1st & 2nd stage)	20	MB133-048
27	O Ring - valve cover (1st & 2nd stage)	20	MB133-049
28	O Ring - valve cover (3rd stage suction)	4	MB133-56
29	O Ring - valve cover (3rd stage delivery)	4	MB133-55
30	Diaphragm - actuator (1st, 2nd & 3rd stage)	14	PSB028-003
31	Gasket - top cover (1st stage)	1	PSB008-001
32	Gasket - top cover (2nd stage)	1	PSB008-003
33	Gasket - top cover (3rd stage)	1	PSB008-044
34	O Ring - top cover (3rd stage)	1	PSB006-008

### 7.1.2 Wearing Parts Pack

These are parts that may need renewing from time to time during the compressors operating life:

<u>Item</u>	<u>Description</u>	<u>Qty</u>	<u>Part No.</u>
01	Oil seal for crankshaft	1	PSB007-006
02	Strainer for oil pump suction	1	PSB025-005
03	1st Stage Suction Valve Assembly (See modification drawing 2-70-503)	3	PSB027-001
04	Actuator Assembly	3	PSB028-001
05	1st Stage Delivery Valve Assembly (See modification drawing 2-70-521)	3	PSB029-083
06	2nd Stage Suction Valve Assembly (See modification drawing 2-70-503)	2	PSB027-001
07	Actuator Assembly	2	PSB028-001
08	2nd Stage Delivery Valve Assembly (See modification drawing 2-70-504)	2	PSB029-066
09	3rd Stage Suction Valve Assembly	2	PSB027-113
10	Actuator Assembly	2	PSB028-038
11	3rd Stage Delivery Valve Assembly	2	PSB029-058

1 Set of flat gaskets and o rings (this set should include a repeat of the O rings listed above).  
See List of Parts for numbers.

## 7.2 List Of Parts

The parts included between Item Numbers 0000 to 6999 are STANDARD compressor features, whereas the parts included between Items 7000 and 9999 are SPECIAL Order Features that have been fitted at the request of the Customer.

The quantity of parts given against each component item listed is the total number for the compressor, unless otherwise stated.

ALWAYS quote machine serial number when ordering spare parts.

### 7.2.1 Compressor Parts

#### 0001 to 0999 - Parts for Crankcase Assembly:

<u>Item</u>	<u>Description</u>	<u>Qty</u>	<u>Part No</u>
0001	Crankcase	1	2-03-288-01
0003	Door - crankcase access	2	PSB009-007
0004	Gasket - crankcase door	2	PSB008-027
0006	Cover - main guide access	3	PSB009-002
0007	Gasket - main guide access cover	3	PSB008-006
0009	Bearing Housing - crankcase non-drive end	1	2-25-121-01
0010	Gasket - crankcase bearing housing	1	PSB008-026
0012	End Cover - crankcase drive end	1	2-25-123-01
0013	Gasket - crankcase drive end cover	1	PSB008-028
0014	Oil Seal - crankcase drive end cover	1	PSB007-006
0016	Drain Plug - oil sump	1	MB118-08
0017	Window Nut - sump oil level indicator	1	MB130-01
0018	Breather - crankcase	1	PSB024-001
0020	Main Guide	3	2-07-280-01
0021	O Ring - guide flange/distance piece	3	PSB006-001
0025	Oil Scraper Gland Box Assembly	3	PSB032-001
0026	Gasket - gland box assembly	3	PSB008-016
0027	Ring & Spring Kit - gland box assy	3	PSB032-004
0035	Support Plate - oil scraper gland box	3	PSB032-003
0036	Gasket - support plate	3	PSB008-015

0100	Crankshaft	1	2-06-383-01
0101	Main Bearing - crankshaft drive end	2	PSB014-006
0102	Main Bearing - crankshaft non-drive end	1	PSB014-006
0104	Distance Ring - drive end bearing	1	PSB003-010
0105	Clamping Ring - drive end main bearing	1	PSB015-003
0106	Clamping Nut - main bearing	2	PSB002-008
0107	Locking Washer clamping nut	2	PSB004-003
0120	Key - drive end of crankshaft	1	2-06-312-02
0121	Coupling - slotted drive to oil pump	1	2-06-310-02
0200	Oil Pump - bearing lubrication	1	PSB017-011
0201	Gasket - oil pump/crankcase bearing housing	1	PSB008-023
0203	Strainer (suction) - oil pump	1	PSB025-005
0204	Washer - strainer	1	PSB025-008
0206	Hose Assembly (suction) - oil pump	1	PSB026-099
0207	Copper Washer - oil pump suction fittings	3	MB040-18
0209	Filter Assembly (delivery) - oil pump	1	PSB025-009
0210	Element & Seal Kit - filter	1	PSB025-010
0212	Pressure Relief Valve (delivery) - oil pump	1	PSB013-033
0213	Hose Assembly (exhaust) - PRV	1	PSB026-149
0215	Gasket - oil filter/filter manifold block	1	PSB008-009
0250	Oil Cooler	1	2-34-459-05
0251	Bracket - oil cooler mounting	1	2-34-459-03
0252	Hose Assembly - to oil cooler	1	2-34-436-03
0253	Hose Assembly - from oil cooler	1	2-34-436-04
0254	Copper Washer - hose end fitting	4	MB040-63
0256	Manifold Block - oil cooler	1	2-34-459-01
0257	Gasket - manifold block	1	PSB008-009

1140	Piston Rod - first stage	1	2-30-144-01
1141	Nut - crosshead	1	PSB002-009
1142	Nut - piston	1	PSB002-010
1150	Oil Shedder - piston rod	1	PSB032-002
1160	Packing Gland Box Assembly	1	PSB032-005
1161	Spacer Seal Ring - packing gland box	1	PSB032-006
1162	Ring & Spring Kit - packing gland box	1	PSB032-007
1200	Suction Valve Assembly - first stage (See modification drawing 2-70-503)	6	PSB027-001

<u>Parts for Suction Valve Assembly:</u>		<u>Qty per valve</u>	
1210	Seat	1	PSB027-020
1212	Valve Plate	1	PSB027-014
1214	Damper Plate	2	PSB027-015
1216	Lift Washer - upper	1	PSB027-016
1217	Lift Washer - lower	1	PSB027-016
1219	Closing Spring	8	PSB027-018
1222	Locating Pin in valve seat (2.3mm)	1	PSB029-016
1223	Locating Pin in valve seat (3.8mm)	1	PSB029-017
1225	Valve Guard	1	PSB027-021
1227	Centre Bolt	1	PSB027-023
1228	Locking Peg	1	PSB005-003
1230	Nut - centre bolt	1	PSB027-012
1231	Guide Bush - unloader	1	See Note 1
1232	Teflon Bush - unloader	1	See Note 1
1233	Spring - unloader return	1	PSB027-025
1235	Unloader Flange Assembly	1	PSB027-019
1237	Cover - Unloader	1	See Note 1
1238	Stop Washer	1	See Note 1
1239	Circlip - unloader	1	PSB027-024

Note 1: To order these parts, quote item description and then assembly part number.  
eg. Unloader Cover for 1st stage suction valve assembly (PSB027-001).

1250	Distance Ring (under valve seta)	6	PSB003-006
1260	Valve Cage	6	2-70-126-01
1261	O Ring - valve cage	6	MB133-048
1262	Valve Cover	6	2-70-126-02
1264	O Ring - valve cover	6	MB133-049
1275	Actuator Assembly	6	PSB028-001

<u>Parts for Actuator Assembly:</u>		<u>Qty per actuator</u>	
1278	Diaphragm	1	PSB028-003
1280	Spring	1	PSB028-006
1281	Spindle	1	PSB028-005
1287	U Ring Seal (spindle)	1	PSB028-004
1290	Nut Seal	1	PSB028-002

0300	Connecting Rod Assembly (complete)	3	2-05-090
0302	Bottom End Bearing - connecting rod	3	PSB014-004
0303	Bolt - bottom end bearing	6	2-05-090-02
0304	Snug - bolt	6	PSB005-003
0305	Nut - bottom end bearing	6	2-05-090-03
0306	Split Pin - nut	6	NSBP-220-025
0308	Bush (top end bearing) - connecting rod	3	PSB014-005
0400	Crosshead - 1st & 2nd Stage	2	2-31-066-01
0400	Crosshead - 3rd Stage	1	2-31-067-01
0402	Gudgeon Pin - crosshead	3	2-31-045-02
0403	Circlip - gudgeon pin	6	MB137-09
0405	Securing Pin - crosshead/piston rod (1st & 2nd stage)	2	PSB001-002
0405	Securing Pin - crosshead/piston rod (3rd stage)	1	2-31-052-04
0406	Locking Plate - securing pin	3	PSB004-001

1000 to 1999 - Parts for First Stage Cylinder Assembly:

1001	Cylinder - first stage	1	2-01-431-01
1003	Gasket - inlet cylinder flanges	1	PSB008-002
1004	Gasket - outlet cylinder flanges	1	PSB008-002
1005	Drain Cock - cylinder gas spaces	1	PSB026-143
1006	Drain Cock - cylinder water spaces	1	MB120-01
1008	Distance Piece - cylinder/crankcase	1	2-07-281-01
1010	O Ring - distance piece/cylinder	1	PSB006-001
1014	Access Cover - (distance piece)	2	PSB009-006
1017	Top Cover - first stage cylinder	1	2-04-259-01
1018	Gasket - top cover	1	PSB008-001
1100	Piston (top half) - first stage	1	2-28-420-01
1101	Piston (bottom half) - first stage	1	2-28-419-02
1103	Pressure Ring - piston	2	PSB022-001
1104	Bearer Ring - piston	1	PSB022-005
1106	Reinforcing Washer - top	1	PSB003-008
1107	Reinforcing Washer - bottom	1	PSB003-009

1300	Delivery Valve Assembly - first stage (See modification drawing 2-70-521)	6	PSB029-083
	<u>Parts for Delivery Valve Assembly:</u>	<u>Qty per valve</u>	
1310	Seat	1	PSB027-067
1312	Valve Plate	1	PSB027-014
1314	Damper Plate	2	PSB027-015
1316	Lift Washer - upper	1	PSB027-017
1317	Lift Washer - lower	1	PSB027-017
1319	Closing Spring	8	PSB029-007
1322	Locating Pin in valve seat (2.3mm)	1	PSB029-016
1323	Locating Pin in valve seat (3.8mm)	1	PSB029-017
1325	Valve Guard	1	PSB029-068
1327	Centre Bolt	1	PSB029-069
1328	Locking Peg	1	PSB005-003
1329	Washer - centre bolt	1	MB031-009
1330	Nut - centre bolt	1	PSB027-012
1350	Distance Piece (under valve seat)	6	PSB003-006
1360	Valve Cage	6	2-70-126-01
1361	O Ring - valve cage	6	MB133-048
1362	Valve Cover - cylinder	6	2-70-127-02
1364	O Ring - valve cover	6	MB133-049

2000 to 2999 - Parts for Second Stage Cylinder

2001	Cylinder - second stage	1	2-01-432-01
2003	Gasket - inlet cylinder flanges	1	PSB008-004
2004	Gasket - outlet cylinder flanges X	1	PSB008-004
2005	Drain Cock - cylinder air compartment	1	MB120-01
2006	Drain Cock - cylinder water compartment	1	PSB026-143
2008	Distance Piece - cylinder/crankcase	1	2-07-281-01
2010	O Ring - distance piece/cylinder	1	PSB006-001
2014	Access Cover - distance piece	2	PSB009-006
2017	Top Cover - second stage cylinder	1	2-04-260-01
2018	Gasket - top cover	1	PSB008-003
2100	Piston (top half) - first stage	1	2-28-428-01
2101	Piston (bottom half) - first stage	1	2-28-428-02
2103	Pressure Ring - second stage piston	2	PSB022-003
2104	Bearer Ring - second stage piston	1	PSB022-007
2106	Reinforcing Washer - piston top	1	PSB003-008
2107	Reinforcing Washer - piston bottom	1	PSB003-009

2140	Piston Rod - second stage	1	2-30-144-01
2141	Nut - crosshead	1	PSB002-009
2142	Nut - piston	1	PSB002-010
2150	Oil Shedder - piston rod	1	PSB032-002
2160	Packing Gland Box Assembly	1	PSB032-005
2162	Spacer Seal Ring - packing gland box	1	PSB032-006
2162	Ring & Spring Kit - packing gland box	1	PSB032-007
2200	Suction Valve Assembly - second stage (See modification drawing 2-70-503)	4	PSB027-001

<u>Parts for Suction Valve Assembly:</u>		<u>Qty per valve</u>	
2210	Seat	1	PSB027-020
2212	Valve Plate	1	PSB027-014
2214	Damper Plate	2	PSB027-015
2216	Lift Washer - upper	1	PSB027-016
2217	Lift Washer - lower	1	PSB027-016
2219	Closing Spring	8	PSB027-018
2222	Locating Pin in valve seat (2.3mm)	1	PSB029-016
2223	Locating Pin in valve seat (3.8mm)	1	PSB029-017
2225	Valve Guard	1	PSB027-021
2227	Centre Bolt	1	PSB027-023
2228	Locking Peg	1	PSB005-003
2230	Nut - centre bolt	1	PSB027-012
2231	Guide Bush - unloader	1	See Note 1
2232	Teflon Bush - unloader	1	See Note 1
2233	Spring - unloader return	1	PSB027-025
2235	Unloader Flange Assembly	1	PSB027-019
2237	Cover - Unloader	1	See Note 1
2238	Stop Washer	1	See Note 1
2239	Circlip - unloader	1	PSB027-024

Note 1: To order these parts, quote item description and then assembly part number.  
eg. Unloader Cover for 2nd stage suction valve assembly (PSB027-001).

2250	Distance Piece (under suction valve seat)	4	PSB003-006
2260	Valve Cage - suction	4	2-70-126-01
2261	O Ring - valve cage	4	MB133-048
2262	Valve Cover - suction	4	2-70-126-02
2264	O Ring - valve cover	4	MB133-049
2275	Actuator Assembly	4	PSB028-001

<u>Parts for Actuator Assembly:</u>		<u>Qty per actuator</u>	
2278	Diaphragm	1	PSB028-003
2280	Spring	1	PSB028-006
2281	Spindle	1	PSB028-005
2287	U Ring Seal (spindle)	1	PSB028-004
2290	Nut Seal	1	PSB028-002

2300	Delivery Valve Assembly - second stage (See modification drawing 2-70-5043)	4	PSB029-066
	<u>Parts for Delivery Valve:</u>	<u>Qty per valve</u>	
2310	Seat	1	PSB029-067
2312	Valve plate	1	PSB027-014
2314	Damper Plate	2	PSB027-015
2316	Lift Washer - upper	1	PSB027-016
2317	Lift Washer - lower	1	PSB027-017
2319	Closing Spring	8	PSB029-006
2322	Locating pin in valve seat (2.3mm)	1	PSB029-016
2323	Locating pin in valve seat (2.8mm)	1	PSB029-017
2325	Valve Guard	1	PSB029-068
2327	Centre Bolt	1	PSB029-069
2328	Locking Peg - centre bolt	1	MB031-009
2330	Nut - centre bolt	1	PSB027-012
2360	Valve Cage - delivery	4	2-70-129-02
2361	O Ring - valve cage	4	MB133-048
2362	Valve Cover - delivery	4	2-70-127-02
2364	O Ring - valve cover	4	MB133-049

### 3000 to 3999 - Parts for Third Stage Cylinder

3001	Cylinder - third stage	1	2-01-481-01
3003	Gasket - inlet cylinder flanges X	1	PSB008-089
3004	Gasket - outlet cylinder flanges	1	PSB008-089
3005	Drain Cock - cylinder gas compartment	1	MB142-01
3006	Drain Cock - cylinder water compartment	1	PSB026-143
3008	Distance Piece - cylinder/crankcase	1	2-07-281-01
3010	O Ring - distance piece/cylinder	1	PSB006-001
3014	Access Cover - distance piece	2	PSB009-006
3017	Top Cover - third stage cylinder	1	2-04-305-01
3018	Gasket - top cover	1	PSB008-044
3019	O Ring - top cover	1	PSB006-008
3102	Piston (solid) - third stage	1	2-28-430-01
3103	Pressure Ring - third stage piston	5	PSB022-054
3104	Bearer Ring - third stage piston	1	PSB022-055

3140	Piston Rod - third stage	1	2-30-202-01
3141	Nut - crosshead	1	PSB002-009
3142	Nut - piston	1	PSB002-010
3150	Oil Shedder - piston rod	1	PSB032-002
3160	Packing Gland Box Assembly	1	PSB032-048
3162	Ring & Spring Kit - packing gland box	1	PSB032-049
3200	Suction Valve Assembly - third stage	4	PSB027-113
	<u>Parts for Suction Valve Assembly:</u>	<u>Qty per valve</u>	
3210	Seat	1	See Note 1
3212	Valve Plate	1	PSB027-006
3214	Damper Plate	2	PSB027-007
3216	Lift Washer - upper	1	PSB027-008
3217	Lift Washer - lower	1	PSB027-009
3219	Closing Spring	4	PSB029-007
3220	Damper Spring	4	PSB029-006
3222	Locating Pin in valve seat (2.3mm dia)	1	PSB027-079
3223	Locating Pin in valve seat (1.8mm dia)	1	PSB027-044
3225	Valve Guard	1	See Note 1
3227	Centre Bolt	1	See Note 1
3228	Locking Peg	1	See Note 1
3230	Nut - centre bolt	1	PSB027-012
3231	Guide Bush - unloader	1	PSB027-121
3232	Teflon Bush - unloader	1	PSB027-123
3233	Spring - unloader return	1	PSB027-120
3235	Unloader Flange Assembly	1	PSB027-119
3237	Cover - Unloader	1	PSB027-124
3238	Stop Washer	1	PSB027-122
3239	Circlip - unloader	1	PSB027-125

Note 1: To order these parts, quote item description and then assembly part number.  
eg. Valve Guard for 3rd stage suction valve assembly (PSB027-113).

3260	Valve Cage - suction	4	2-70-150-02
3261	O Ring - cage	4	MB133-056
3262	Valve Cover - suction	4	2-70-150-03
3275	Actuator Assembly	4	PSB028-038
	<u>Parts for Actuator Assembly:</u>	<u>Qty per actuator</u>	
3278	Diaphragm	1	PSB028-003
3280	Spring	1	PSB028-006
3281	Spindle	1	See Note 1
3287	U Ring Seal (spindle)	1	PSB028-004
3290	Nut Seal	1	PSB028-002

3300	Delivery Valve Assembly - third stage	4	PSB029-058
	<u>Parts for Delivery Valves:</u>		
		<u>Qty per valve</u>	
3310	Seat	1	See Note 1
3312	Valve Plate	1	PSB027-006
3314	Damper Plate	2	PSB027-007
3316	Lift Washer - upper	1	PSB027-009
3317	Lift Washer - lower	1	PSB027-008
3319	Closing Spring	4	PSB029-006
3320	Damper Spring	4	PSB029-010 022-01
3322	Locating Pin in Valve Seat (2.3mm dia)	1	PSB027-079
3323	Locating Pin in Valve Seat (1.8mm dia)	1	PSB027-044
3325	Valve Guard	1	See Note 1
3327	Centre Bolt	1	See Note 1
3328	Locking Peg - centre bolt	1	See Note 1
3330	Nut - centre bolt	1	PSB027-012

Note 1: To order these parts, quote item description and then assembly part number:  
eg. Valve Guard for 3rd stage delivery valve assembly (PSB029-058).

3360	Valve Cage - delivery	4	2-70-151-02
3362	Valve Cover - delivery	4	2-70-151-03
3364	O Ring - valve cover	4	MB133-055

### 7.2.2 Cooling System Parts

#### 4000 to 4499 - Intercoolers and Interstage Pipework:

#### 4000 to 4199 - 1st Intercooler and Interstage Pipework:

4003	Air Discharge Pipe to Intercooler	1	2-71-413-01
4004	Elbow - air pipe/intercooler	1	2-71-413-03
4005	Gasket - R/H discharge pipe or elbow	1	PSB008-018
4006	Gasket - intercooler inlet	1	PSB008-018
4020	Body - intercooler	1	2-71-354-01
4021	Joint (rubber) - body/tubestack	1	PSB008-017
4022	Tubestack - intercooler	1	PSB033-018
4024	Ring Seal - intercooler expansion end	1	2-71-465-01
4025	O Ring - ring seal	2	PSB033-002
4026	Gasket - ring seal/separator	1	PSB008-019
4040	Body - separator	1	2-71-542-03
4042	Deflector Dish	1	2-71-413-06
4045	Cover - separator bottom	1	2-71-413-05
4046	Gasket - cover	1	PSB008-029

4060	Drain Trap	1	PSB036-005
4062	Tee fitting - drain trap	1	PSB026-287-06
4070	Test Cock - drain trap	1	MB120-03

4200 to 4399 - 2nd Intercooler and Interstage Pipework:

4210	Anti-surge Tank - 2nd stage	1	2-71-573-01
4211	Gasket - anti-surge tank outlet ✕	1	PSB008-004
4220	Body - intercooler	1	2-71-488-01
4221	Joint (rubber) - body/tubestack ✕	1	PSB008-021
4222	Tubestack - intercooler ✕	1	PSB033-004
4223	Gasket - air side (tubestack)	1	PSB008-020
4224	Ring Seal - intercooler expansion end	1	2-71-513-01
4225	O Ring - ring seal ✕	2	PSB033-005
4226	Gasket - ring seal/separator	1	PSB008-022
4241	Body - separator/inlet pipe	1	2-71-585-01
4260	Drain Trap	1	MB036-005
4270	Test Cock - drain trap	1	MB120-03

4400 to 4499 - 3rd Interstage Pipework:

Not Applicable

4500 to 4999 - Pipe & hose fittings for C/W system:

4502	Hose - inlet to 2nd intercooler from C/W inlet	1	PSB026-227
4503	Hose - inlet to 1st cylinder from intercooler	1	PSB026-224
4506	Hose - outlet 1st cylinder top cover to 2nd cylinder	1	PSB026-225
4518	Hose - outlet 2nd cylinder top cover to C/W outlet	1	PSB026-226
4520	Hose - inlet 3rd cylinder from 2nd intercooler	1	PSB026-228
4525	Hose - outlet 3rd cylinder to C/W outlet	1	PSB026-229
4534	Hose - outlet 3rd stage packing to C/W outlet	1	PSB026-230

4536	Ball Valve (1/4") - air vent	1	MB120-01
4537	Ball Valve (1/2") - air vent	1	MB120-03
4541	Water Flow Switch - outlet 2nd stage cylinder	1	ASB525-002
4542	Water Flow Switch - outlet 3rd stage cylinder	1	ASB525-001
4545	Flow Sight Glass - packing gland	1	PSB012-038
4552	Globe Valve (1.25") - flow rate balance	2	2-45-1678-06
4560	Ball Valve (0.75") - packing gland isolation	4	PSB026-223
4570	Strainer (water) - inlet pipe/packing gland	2	PSB026-213

5000 to 5999 - Aftercoolers and Fittings:

Not Applicable to this machine.

**7.2.3 Gauges and Safety Devices**

6000 to 6799 - Gauges and protection equipment:

Pressure and Temperature Gauges:

6029	Board - gauge	1	2-46-899-01
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Pipes and fittings for pressure/temperature gauges:

6030	Tube (nylon) 6mm O/D	a/r	MB103-05
6032	Tube (copper) 6mm O/D	a/r	MB101-03
6038	Valve - blow down - pilot operated	1	PSB012-012
6038	Valve - blow down - pneumatic actuated	1	PSB012-063
6041	Adaptor - pressure gauge	4	PSB026-107
6048	Isolating Valve - 1/4" BSP	2	MB120-01

Protection/Safety Devices:

6050	Relief Valve - 1st stage	1	PSB013-001
6052	Relief Valve - 2nd stage	1	PSB013-053
6054	Relief Valve - 3rd stage	1	PSB013-072
6087	Temperature Switch - high final air	1	PSB012-015
6092	Combined Switch - temp/press lube oil	1	PSB012-001

**7.2.4 Plates and Labels**

6800	Foil Label - CAUTION - oil free compressor	3	PSB023-007
6801	Plastic Label - IMPORTANT - aperture covers	3	PSB023-008
6802	Warning Label - barring the compressor	1	PSB023-009
6803	Rating Plate - inc. serial number etc.	1	2-61-193-01
6805	Aluminium Plate - CAUTION - oil free comp.	1	2-61-195-01
6806	Safety Plate operator instruction manual	1	2-61-196-01
6809	Nameplate - Belliss & Morcom	1	2-61-188-01
6810	Label - CAUTION - oil filter/vent drain	1	PSB023-061

**7.3 Ancillary Parts**

7010	Inertia Block	1	2-20-803
7020	Mounts - vibration isolating	8	ASB501-016
7030	Bolts - hold down (compressor)	4	MB138-36
7030	Bolts - hold down (mounts)	16	PSB031-006
7043	Packing Plates - 6mm thick	16	PSB031-001
7043	Packing Plates - 3mm thick	8	PSB031-002
7150	Pipe - flexible air	1	2-45-1890
71650	Pipe - flexible water	2	2-45-1593-01
7180	Non-Return Valve	1	2-109-011
7300	Filter/Silencer Assembly - inlet	1	ASB511-007
	Element Kit	1	ASB511-005
7370	Drive Motor	1	QAP13-85-8656

**SECTION 8: ENGINEERING DIAGRAMS****Contents**

<b>Title</b>	<b>Reference</b>
List of Inclusions	8.1
Engineering Drawings	8.1.1
Supplier Literature	8.1.2
Supplements	8.1.3

## SECTION 8: ENGINEERING DIAGRAMS

### **8.1 List of Inclusions**

The following supplier information/supplements/drawings have been included with this manual:

#### **8.1.1 Engineering Drawings**

<u>Drawing No.</u>	<u>Description</u>
2-54-2857	Compressor General Arrangement
2-24-185	Compressor Sectional Arrangement
2-45-1974	Cooling Water Pipes Diagram
2-46-900	Pressure Gauge Pipework Diagram
2-68-371	Unloader Pipework Diagram

#### **8.1.2 Supplier Information**

TBA

#### **8.1.3 Supplements**

TBA

## SECTION 9: PRODUCT RETURN

### Contents

Title	Reference
Warranty Procedure/Claim Form	9.1

### 9.1 Warranty Claims

Should the need arise for Parts and/or Service to be supplied during the Warranty Period then this can be claimed by communication direct to Belliss & Morcom, or through their appointed Agents, by any of the following (whichever is most convenient) when all necessary action will be taken.

- (a) Telephone
- (b) Telex
- (c) Facsimile (Fax)
- (d) Post
- (e) In person
- (f) Warranty Claim Form (document no. CM4F2)

Whichever means (a) to (e) is used it is requested that the Warranty Claim Form (document no. CM4F2) always be completed and faxed to Belliss & Morcom - followed by sending a duplicate copy of the Warranty Claim Form in the post.

When submitting a Warranty Claim, this must be accompanied by a purchase order number. If the claim is found to be valid then an invoice for zero value will be sent in response. If the claim is found to be NOT valid then the purchase order will already be with Belliss & morcom and will speed up processing and supply of new parts.

**IMPORTANT:** Please return any failed parts for warranty appraisal and all correspondence to Belliss & Morcom Ltd., at the following address:

Belliss & Morcom Ltd.,  
Icknield Square,  
Birmingham, B16 OQL.  
ENGLAND.

Telephone: 0121 454 3531  
Facsimile: 0121 455 8607