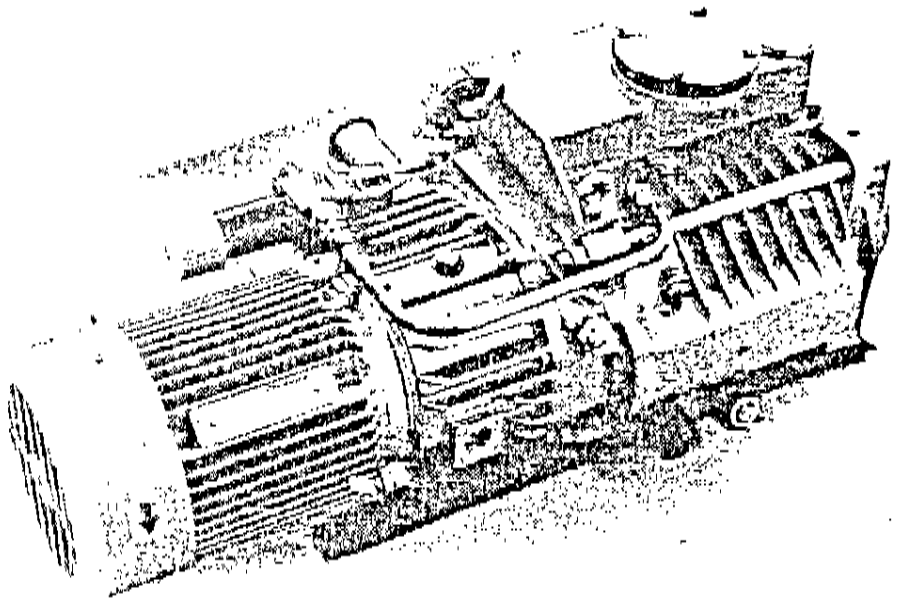
Edwards

INSTRUCTIONS
03-A401-01-880
OCTOBER 1986
I/D 38

EDWARDS MULTI-STAGE DRY PUMP

DP 80



INSTALLATION AND OPERATION MANUAL

SUPPLEMENTARY INSTRUCTIONS

DP 80 Repair and overhaul manual	03-A401-02-880
DP 80 Parts manual	03-A401-03-880

CONTENTS PAGE NUMBER

NOTE For full information on DP 80 'dry pump repair and overhaul see Publication number 03-A401-02-880.

WARNING

Suitable precautions must be taken whilst working on contaminated pumps, when using solvents for cleaning or from process debris in the system.

The exact precautions to be taken will depend on the nature of the materials involved but particular attention must be paid to the danger of inhaling or skin contact with solvent vapours and dust from process materials.

NOTE

1. Always refer to any pink addendum sheets at the front of this manual for details of modifications introduced.

2. To facilitate identification of parts highlighted in the text sectional illustrations (Figs. 12 and 13) are located towards the rear of the publication.

PREFACE

It is important that these working instructions are studied before installation and/or operation of the DP80 dry stage pump. Therefore the following key points must be noted.

(NOTE: Bracketted figures denote appropriate reference to instructions).

1. Connect water supply so that the flow is upwards through the pump body (3.4).

2. Set the thermostatic water flow control valve to zero and allow water to flow through the pump before increasing the valve setting (the maximum recommended setting is 5). (3.4).

3. Fill the timing gear cover to MAX level with recommended oil; in use maintain the oil level between lines showing MAX and MIN. (3.7).

4. Check that outlet ducting is unobstructed. (3.6).

5. Before connecting the power supply, check that the mains supply corresponds to the data on the motor's rating plate. Connect the motor and thermoswitch, via a contactor with overload protection, and check the direction of rotation. (3.3).

6. If a soundproof enclosure is fitted, ensure that the (cooling) air intake and outlet are unobstructed. (3.3).

7. When pumping condensable vapours the pump must be hot (above 50 deg. C at the top); the recommended setting of the thermostatic control valve is 5. (3.4).

8. Open the gas ballast valve when pumping vapours and, also, to purge condensate and contaminants from the pump. (5).

9. Ensure that condensate cannot drain back or be sucked back into the pump from the outlet (whether the pump is in operation of switched off). (3.6).

10. Consult EHV before pumping explosive gases or vapours. (3.8).

11. Supply purge gas to dilute corrosive or explosive gas mixtures. (2).

12. Before stopping the pump, purge it free from condensate and contaminates by pumping at or near atmospheric pressure. If this is not practical, run the pump with full gas ballast for at least 15 minutes. (4.3).

13. If an exhaust valve is used, inspect it regularly and clean or change it as necessary. (7.2).

14. On dusty, dirty (waxy, tarry, gummy) applications regularly clean out the sump which is located at the bottom of the pump (opposite the inlet connexion). (7.4).

15. Do not reduce the setting of the thermostatic water flow control valve while the pump is hot. (4.3).

16. On applications which involve corrosive gases or vapours, isolate the outlet (and inlet) both from atmospheric moisture and from the system when the pump is not in use. (3.6).

17. Prevent freezing of water in the cooling jacket. (3.4).

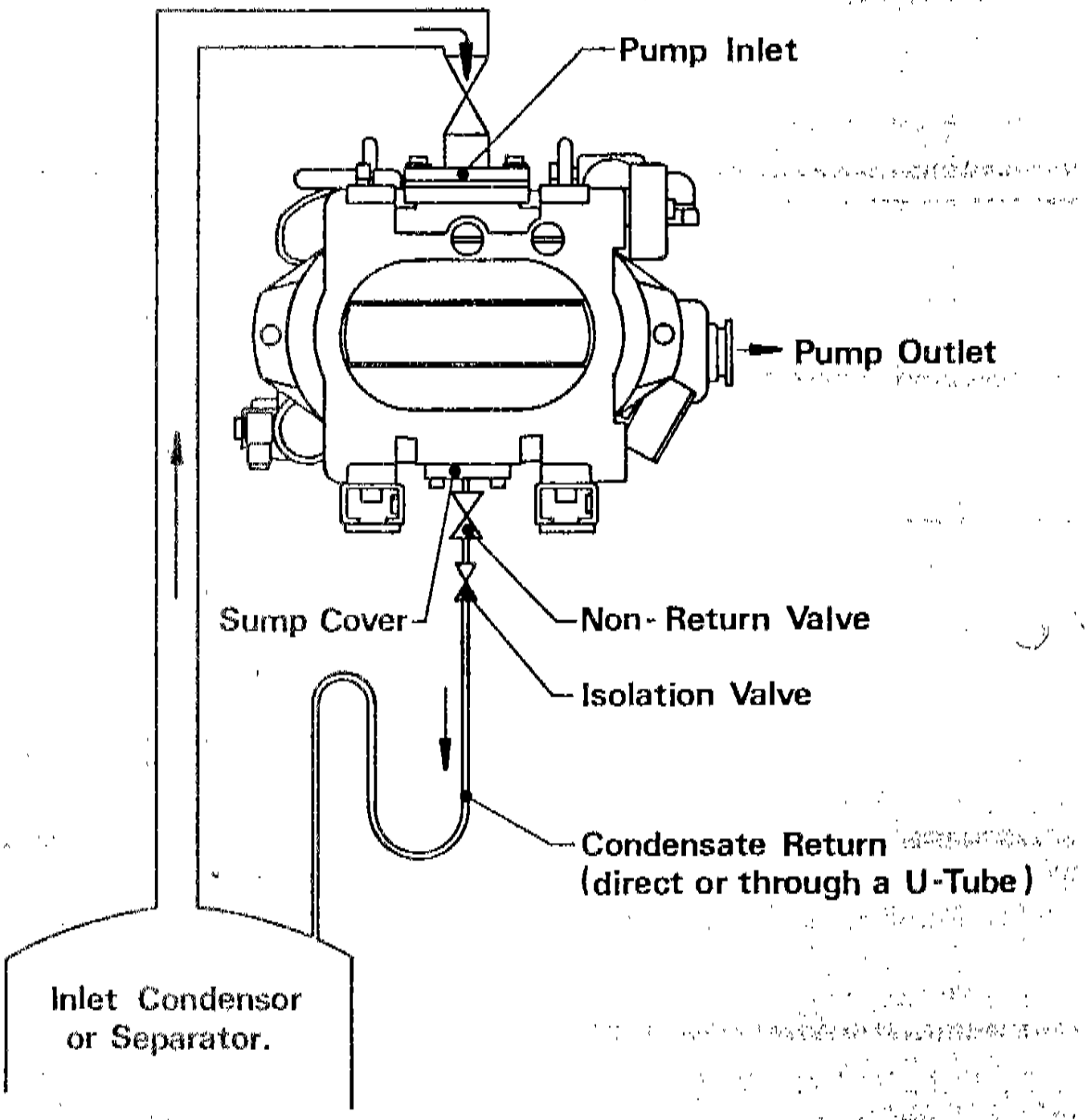
18. Repack the roller bearings with FOMBLIN RT15 or Krytox 240AD grease yearly. (7.3).

ADDENDUM
MARCH 1987
I/D 43

DP80 DRY PUMP

When pumping condensable vapours there is the possibility of liquid accumulating in the sump of the inlet stage. This may interfere with the operation of the pump mechanism. It is recommended therefore that the condensed liquid is drained continuously into a receiver or returned to a suitable location of the vacuum system (see example overleaf). The sump cover shown in the illustration can be used for this purpose.

Alternatively, the pump can be mounted with the axis vertical; this allows condensate to gravitate through the pump from the inlet to the outlet.


Pump Inlet
Pump Outlet
Sump Cover
Non-Return Valve
Isolation Valve
Condensate Return
(direct or through a U-Tube)
Inlet Condensor
or Separator.

1. TECHNICAL DATA

Pump and motor designation	DP 80
Recommended pump rotational speed	2850 rpm
Effective pumping speed for air (see also Fig.1):	
Peak speed at: 1 mbar	82 m^3h^{-1}
1000 mbar	60 m^3h^{-1}
Attainable vacuum (for air) approx:	
With exhaust valve	1×10^{-2} mbar
Less exhaust valve	3×10^{-2} mbar
with gas ballast	3×10^{-2} mbar
Recommended motor power	4.0 kW
Direction of rotation. Clockwise. Facing the motor cooling fan.	
Pump body material	Cast iron
Weight of pump and motor	145 kg
Pump drive:	
50Hz	Direct via coupling
60Hz	Via reduction gears
Timing gears (paired):	
Material	EN24 alloy steel
Dry nitrogen gas ballast:	
pressure	5 - 10 psig
flow (max)	30 l/m
Max outlet pressure	1150 mbar
Purge time (min)	15 minutes
Pump warm up time	15 minutes
Pump running temp. (mounted horizontally):	
Condensable vapour	above 50°C
Max	65°C
Thermoswitch rating	240V 6.3A
Water flow control valve:	
Type	Thermostatic Danfoss AVTA
Setting	5
Range	25-65°C
Working maximum temperature	130°C
Sensor maximum temperature	90°C

Minimum cooling water flow (20-25°C inlet)	50 l/hr
Inlet connexion flange	ISO40
Outlet connexion flange	NW40 mm
Inlet filter (Dusty conditions)	ITM100 low impedance*
Outlet valve type	Stainless steel flapper
Alternative	VITON flapper
Solenoid operated gas ballast valve rating	200-270V, 50 or 60Hz

LUBRICATION

Gear cover oil capacity (pump mounted horizontally)	0.75 litre
Recommended oil for timing gears:	
grade	SAE 40
ISO viscosity grade	150
Hydrocarbon oils	Shell Tellus 150 Vitrea 150
Perfluoropolyether oils	Fomblin Y25 or Krytox 1525
Recommended grease for roller bearings (alternatives may be used subject to Edwards approval).	Fomblin RT15 or Krytox 240AD

*See ACCESSORIES

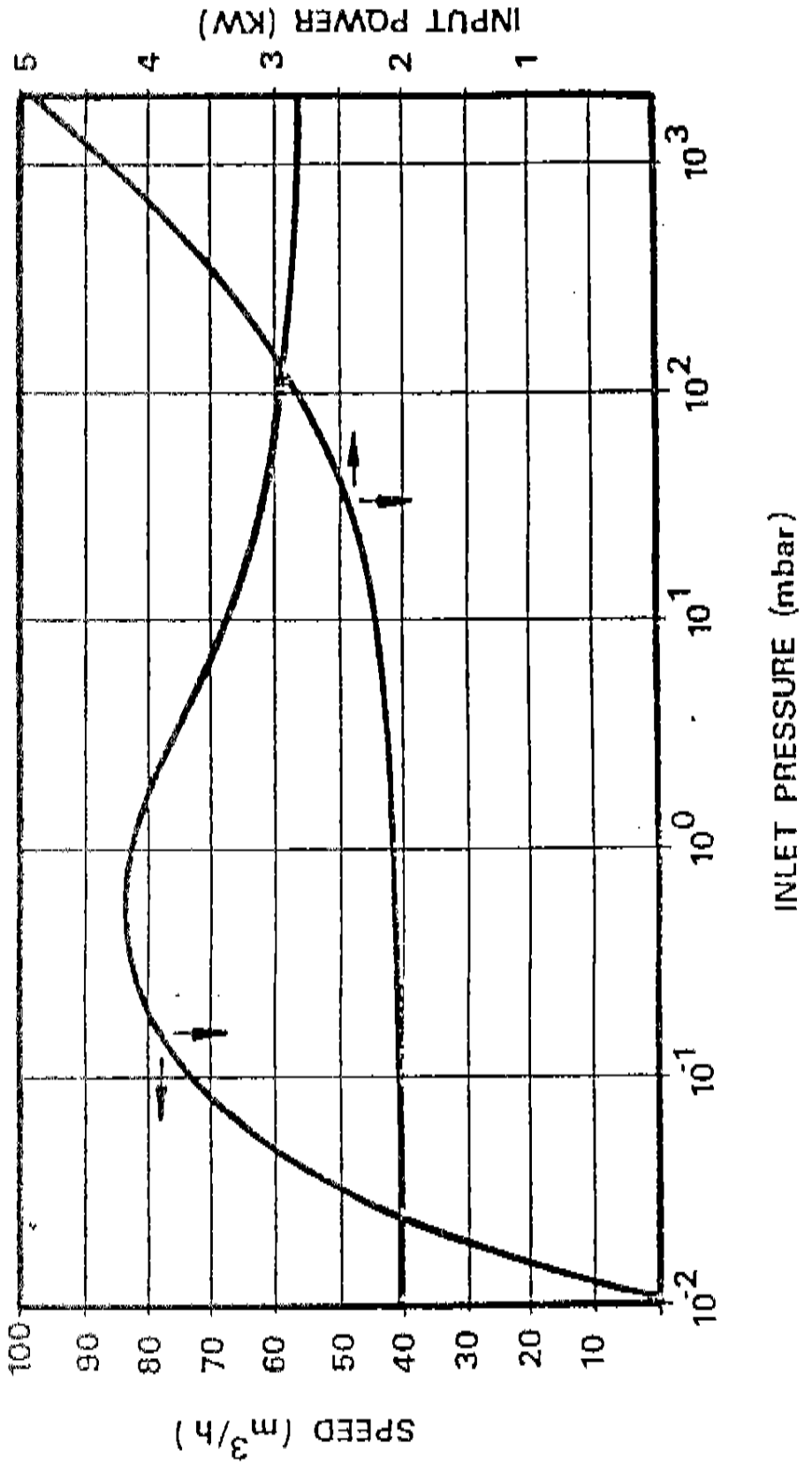


FIG. 1 SPEED (AIR) AND POWER INPUT OF DP 80 'DRY' PUMP

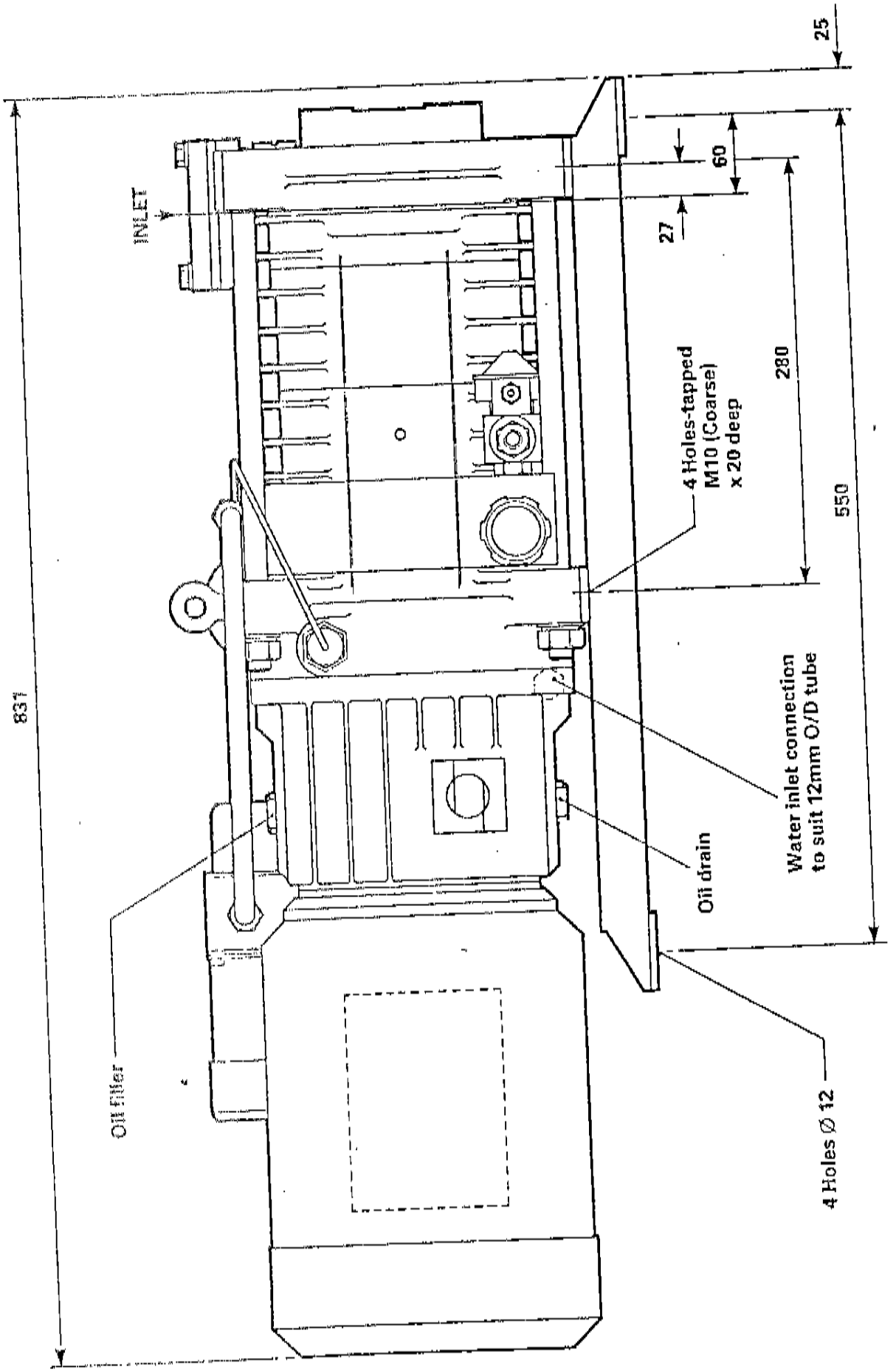
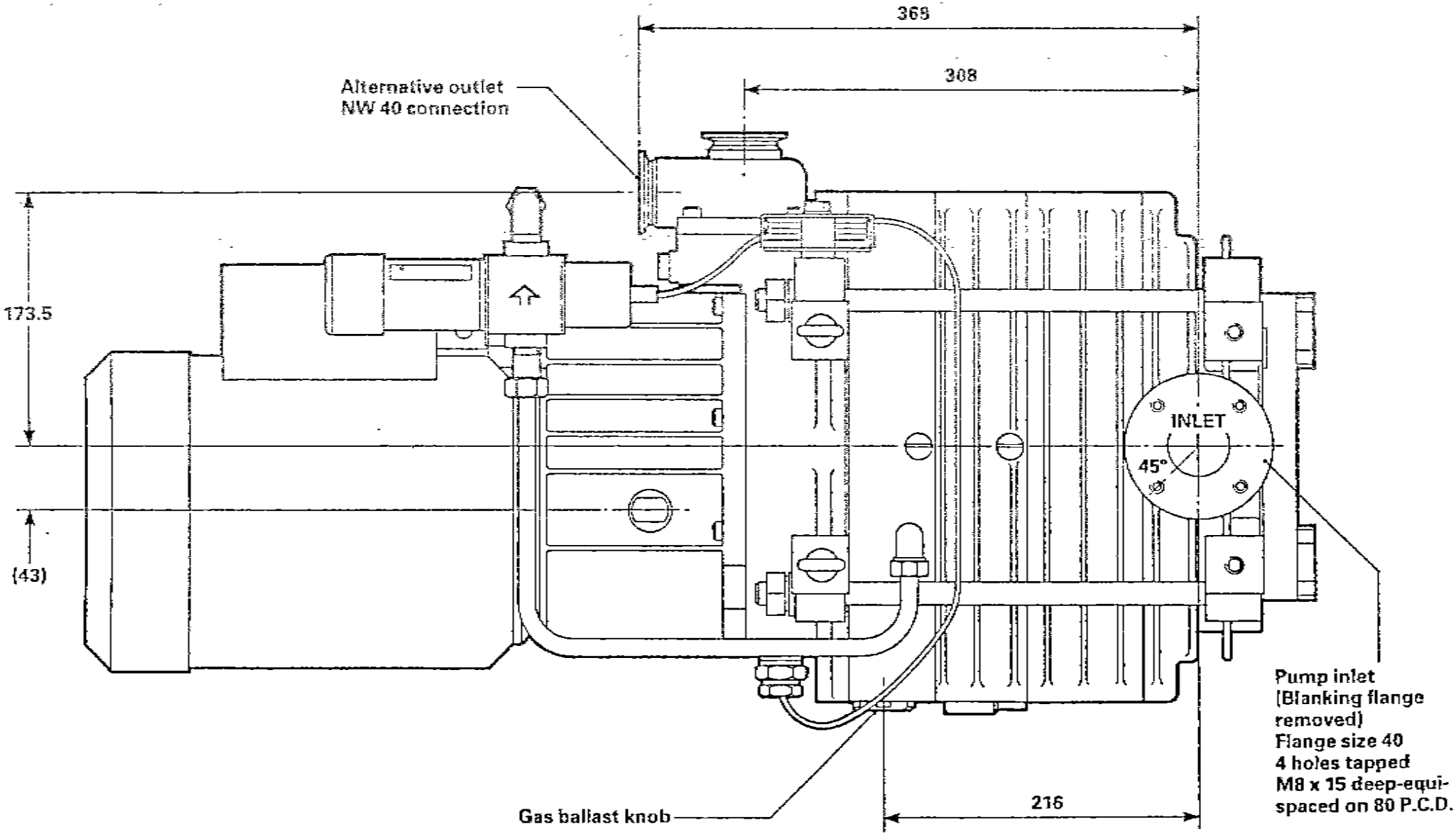


FIG.2 DP80 'DRY' PUMP DIMENSIONS AND INSTALLATION (PART 1)


369
368
Alternative outlet
NW 40 connection
173.5
(43)
INLET
45°
Pump inlet
(Blanking flange
removed)
Flange size 40
4 holes tapped
M8 x 15 deep-equi-
spaced on 80 P.C.D.
Gas ballast knob
216

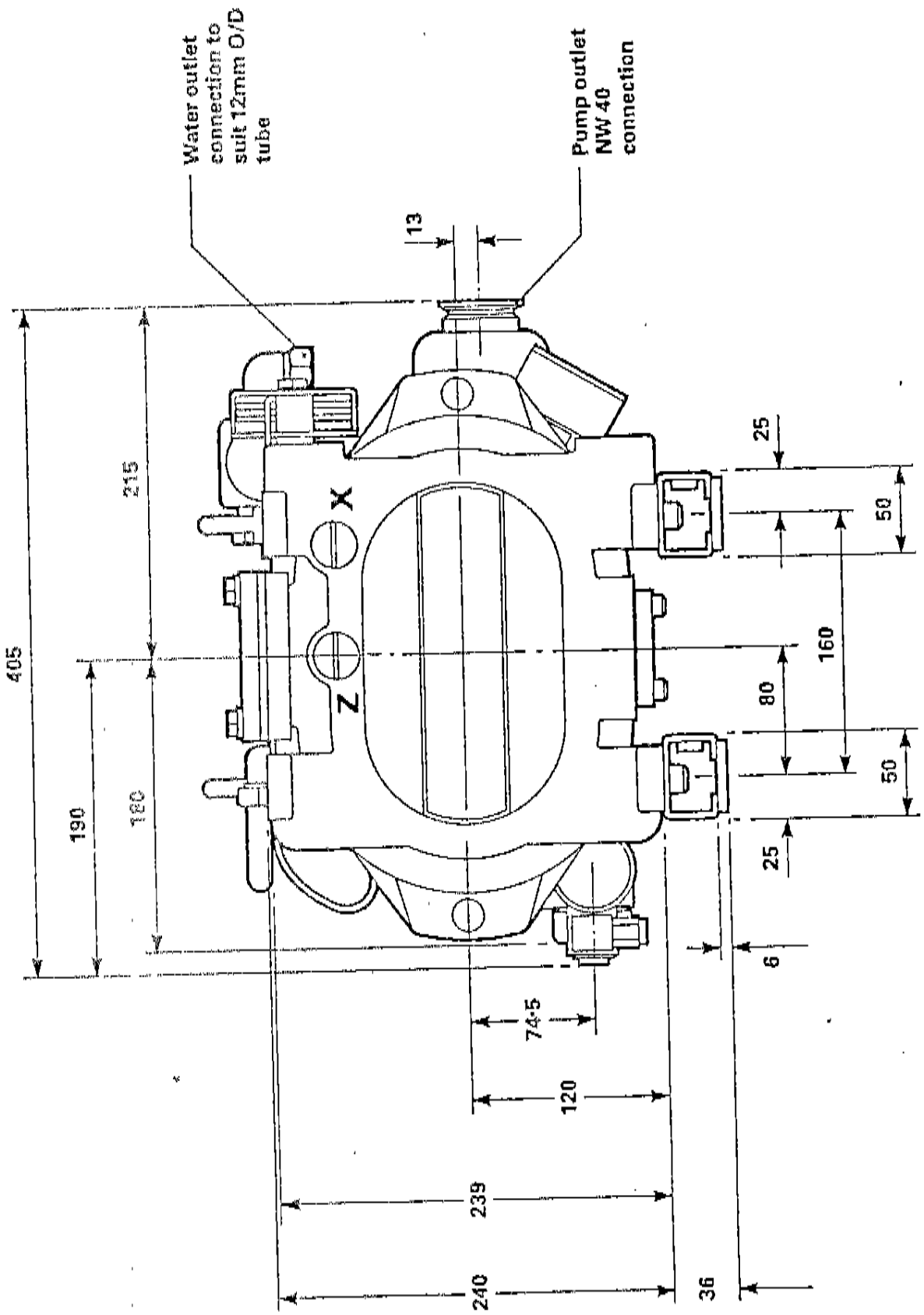


FIG.4 DP80 'DRY' PUMP DIMENSIONS AND INSTALLATION (PART 3)

2. GENERAL DESCRIPTION

The Edwards DP 80 dry multistage vacuum pump is designed to operate between atmospheric pressure down to below 0.01 mbar without any lubricating or sealing fluid within the pumping chamber. The pump is a four stage positive displacement rotary pump in which pairs of intermeshing rotors (of different profiles mounted on common shafts) are held in correct phase relation without contact by a pair of timing gears.

The pump is of robust construction and designed for clean applications as well as for industrial and chemical vacuum processes which can benefit by the exclusion of lubricants, sealing or working fluids from the swept volume of the pump. The pump casing - integral with cooling jacket - is made from cast iron and sealed by O-rings. The shafts and rotors are made from spheroidal graphite cast iron. The internal shaft seals and the external shaft seals on the motor drive shaft are made in PTFE. The timing gears are made from EN24 alloy steel. The gears and adjacent (locating) double row angular contact ball bearings are oil lubricated. A sight glass is fitted to the gear casing to enable the lubricant level to be checked visually.

Roller bearings located on the rear end of the shaft - near the pump inlet - are packed with Fomblin (RT15) grease; their housing is normally inter-connected with the pump inlet through internal ducts. For chemical applications the ducts can be plugged.

Internal pump components can be protected against corrosion by the action of condensable corrosive gases by introducing a controlled flow of nitrogen gas ballast into the pump at two locations, one line feeding gas ballast to the pump housing gas ballast inlet ports and the other line feeding gas ballast to the auxiliary inlet port to provide a purge point, item Z Fig.4. Nitrogen introduced into the pump for gas ballasting is contained by the pump rotors and exhausted through the pump exhaust.

The pump is cooled by means of an integral cast water jacket on the LV stage only. The other stages are all air cooled. A stable operating temperature is maintained by the use of a thermostatic cooling water flow control. This is a mechanically operated device which senses the temperature in the cooling water jacket and adjusts the cooling water outlet valve according to a pre-set level.

The pump is fitted with a stainless steel reed valve at the outlet as standard. However other valves, VITON flap valve or stainless steel compressor valve, are available depending on the application. For clean applications or where the best vacuum is required the stainless steel compressor valve is most suitable but for dirty duties a flapper valve is recommended. For semi-conductor applications no valve is recommended because the increased pulsation tends to reduce the deposition of corrosive exhaust particulates within the pump and in the vicinity of the pump exhaust. This advantage outweighs the disadvantage of increased noise levels.

It is possible to extend the effective pumping speed to below 0.001 mbar by connecting a small backing pump to the 1/8in BSP connexion near to the pump outlet. The backing pump can also be oil free e.g. a carbon vane or diaphragm pump. The specified vacuum of below 0.01 mbar is for air. For other gases such as helium it may be different:- attainable vacuum and speed is lower; some of the loss can be recovered by using gas ballast.

3. INSTALLATION

NOTE

These instructions are only relevant if the DP 80 'dry' pump is not part of a system. Full information will be found in the system installation and operation manual.

3.1 Unpacking

On receipt of the pump, remove packing materials, transit bolts or brackets. Inspect the unit for any damage which may have been incurred during transit. Contact Edwards immediately if any damage is found.

Remove inlet and outlet connexion blanks. Before installation clean the flange surfaces with a suitable solvent. (Observe the safety precautions when using highly volatile cleaning agents).

3.2 Mounting

The pump outfit is free standing on steel runners. Four 12mm holes are provided in the runners but free standing is normally satisfactory. In this case the use of machine mounting pads or anti-vibration mountings positioned under the runners is recommended.

The pump can, as an alternative, be mounted on its side or with certain internal modifications vertically.

When it is desirable to have the pump inlet on one side and the outlet at the bottom the oil level sight glass is used which is nearest the water inlet connexion. In this orientation of mounting the water outlet must be made to the connexion which is highest on the opposite side of the water inlet.

3.3 Electrical

Check that the mains supply voltage corresponds with the voltage specified on the motor data plate. Connect the power supply using appropriate 4 core mains cable to the motor via a contactor which has an overload protection facility.

The direction of rotation can be checked at this stage, provided the inlet and outlet are fully open. The correct rotation of the motor fan is CLOCKWISE (facing the motor cooling fan as shown in Fig. 5). Care must be taken to ensure no items of clothing and also no parts of the body are in the vicinity of the ports during this test. Wiring instructions for the motor will be found under the motor terminal box cover.

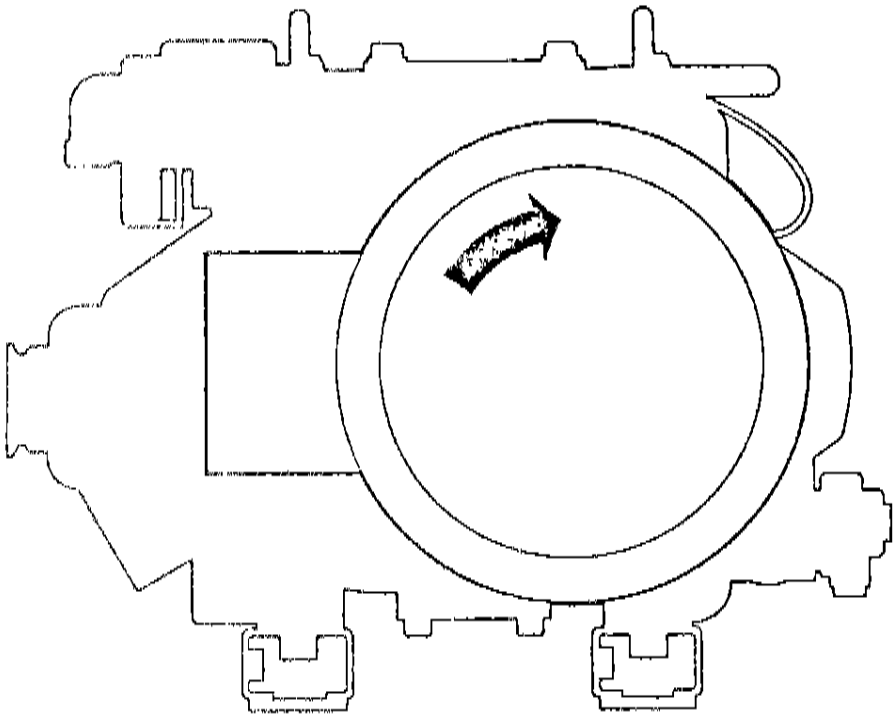


FIG.5 CORRECT DIRECTION OF ROTATION FOR MOTOR

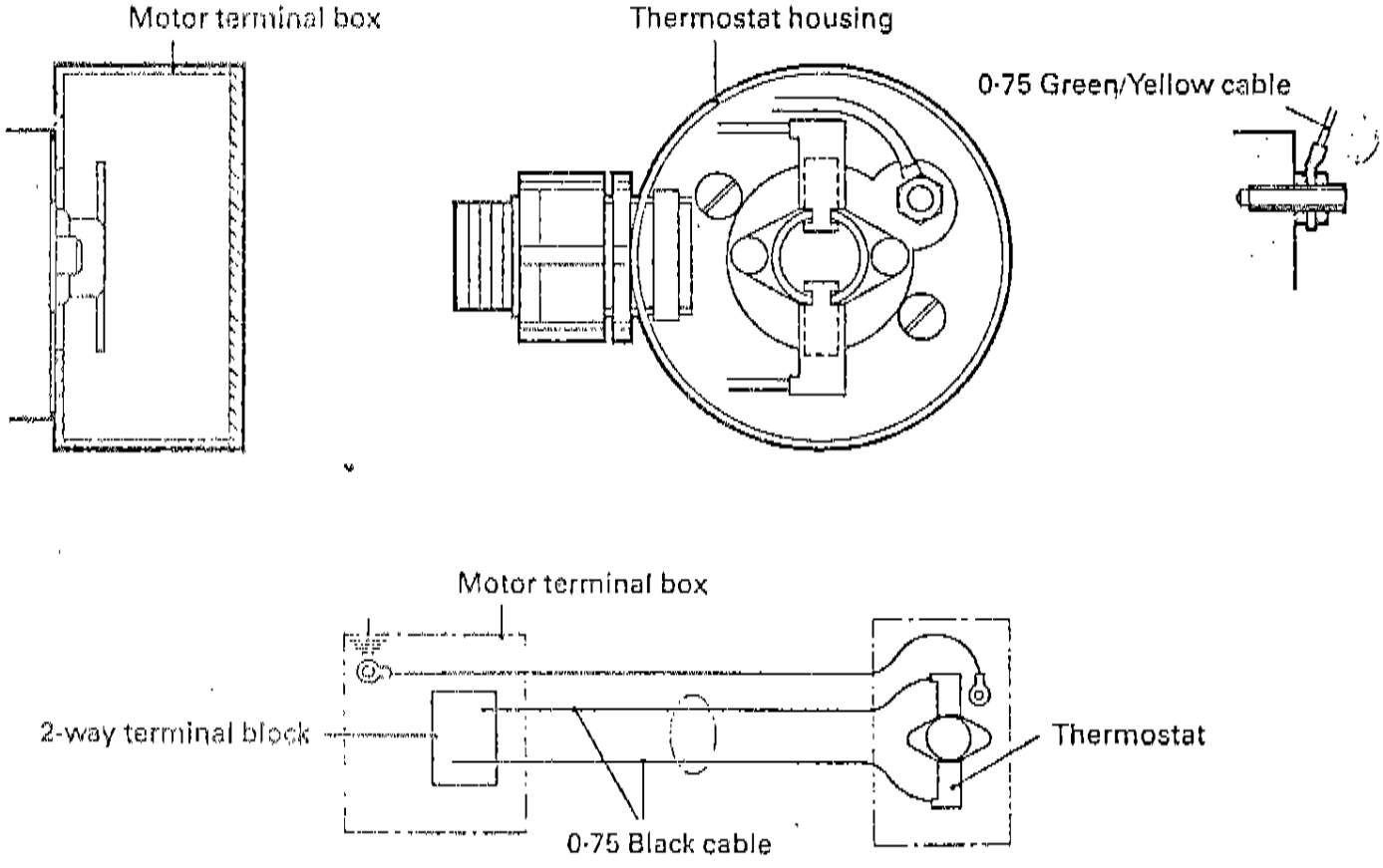


FIG.6 THERMOSWITCH ASSEMBLY

The thermoswitch (which is normally closed - see Fig. 6) is attached to the cooling water jacket and should be wired into the overload control loop of the motor starter to trip the contactor on excessive rise of pump temperature. The thermoswitch is rated at 240V, 6.3A. With a standard motor, its terminals are brought into the terminal box of the motor.

If a solenoid operated gas ballast valve is fitted it can be wired to a supply between 200 and 275V, 50 or 60Hz.

NOTE: All wiring to the electrical supply must be undertaken by experienced and competent personnel.

3.4 Water

IMPORTANT

Incorrect fitting of the water supply can cause pump seizure due to overheating.

Connect the water supply so that the flow is UPWARDS through the pump body.

Set the thermostatic water flow control to ZERO and allow water to flow through the pump before increasing the valve setting: As the setting is increased water flow will cease until the pump temperature reaches that which corresponds to the setting of the valve. (The maximum recommended setting is 5).

When pumping condensable vapours the pump must be extra hot (above 50°C) in order to prevent condensation occurring in the pump. The recommended temperature measured at point T (Fig. 7) is 65°C (pump mounted horizontally) and the corresponding setting of the valve is 5 (approx).

Should the pump be stored or installed in an area subject to freezing temperatures suitable precautions must be taken to ensure water does not freeze in the cooling jacket or thermostatic valve.

IMPORTANT

In order to prevent seizure caused by differential expansion between the casing and rotating mechanism of the pump, the setting of the thermostatic control valve MUST NOT be lowered while the pump is hot.

On pump combinations, connect the water supply to the pumps in parallel and not series.

The water cooling inlet must be the cooler of the two pipe connexions. This can be determined by feel after 10-15 minutes of pump operation.

3.5 Vacuum connexion (inlet)

The vacuum inlet flange has four M8 threaded holes 15mm deep and equispaced on a 80mm PCD. It is suitable for connexion to ISO40 vacuum flanges.

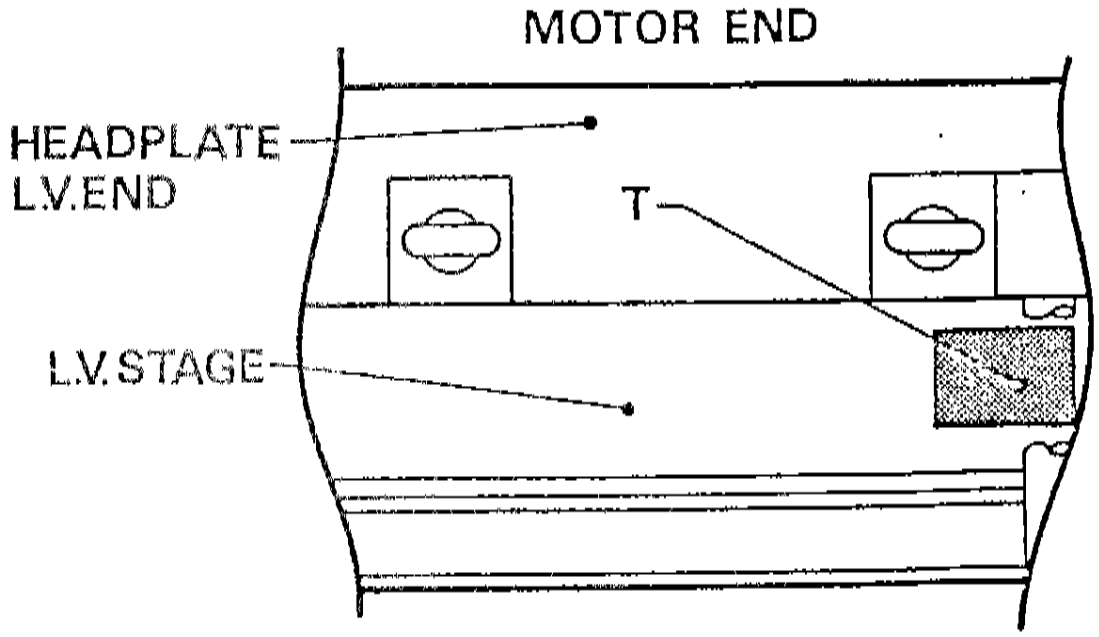


FIG.7 PUMP TEMPERATURE MEASUREMENT LOCATION

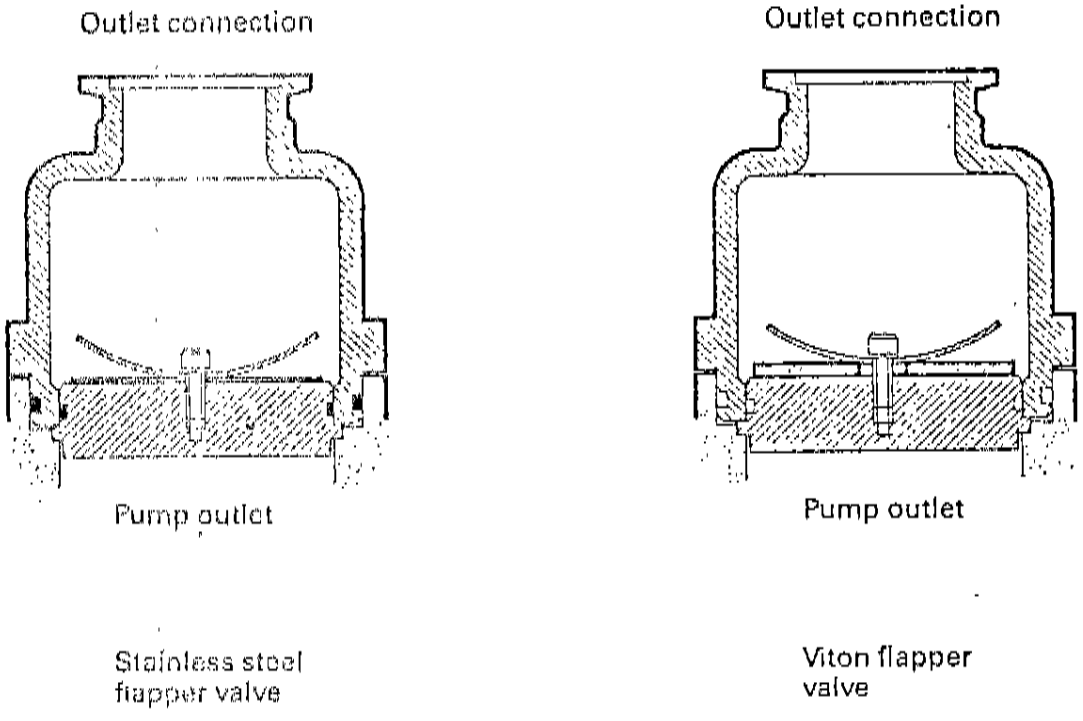


FIG.8 ALTERNATIVE EXHAUST VALVES

For optimum pumping speed the connecting pipeline should be of minimum length and bore size not less than the inlet port dimensions. A flexible connexion should be positioned in the pipeline from the pump to the system. This is most essential if anti-vibration mountings are utilised. On very dusty applications fit a low impedance inlet filter so as to minimise abrasion in the pump.

3.6 Pump discharge (outlet)

The pump outlet connexion is suitable for connecting directly to a NW40 coupling system.

NOTE

To prevent noxious gases or vapours being discharged to the surroundings it may be necessary to pipe the exhaust to a suitable treatment plant. In this case a catchpot must be employed to prevent condensate from the effluent pipe draining back into the pump whether the pump is in operation or switched off.

If only harmless gases are being emitted an exhaust silencer must be fitted.

The attainable vacuum depends on operating temperature and type of outlet valve fitted (if any). On applications which do not require the best vacuum, the outlet valve may be left out. However an outlet valve prevents sudden venting of the pump and vacuum system when the pump is switched off.

For clean applications and the best vacuum, the stainless steel compressor valve is recommended, (see accessories). On dirty duties (which may tend to clog the compressor valve) a flapper valve is recommended. Depending on the required chemical resistance, the flapper valve can either be in VITON rubber or in stainless steel.

NOTE: Only one type of flapper valve should be fitted - NOT BOTH. Without a valve fitted some reverse flow will result causing more pulsation and noise in the outlet and also a higher inlet pressure.

The attainable vacuum (for air) approx is as follows:

With metal valve or VITON valve	1×10^{-2} mbar
Without a valve	3×10^{-2} mbar

To gain access to the valve, undo and remove the four screws securing the outlet connexion (13), Fig.12, to the low vacuum headplate (10). Remove the outlet connexion (13).

Lift the valve from its housing noting which way round it is fitted.

Before reassembly clean the outlet and outlet duct and also mating faces of the outlet connexion and the headplate. Ensure the sealing O-ring is still in a serviceable condition, otherwise renew. Lubricate the O-ring with Fomblin RT15 or Krytox 240AD grease.

Reassembly is the reverse sequence to removal.

3.7 Oil filling and level checking

Remove the oil filler plug and fill the gear cover to the MAX level with recommended oil. (See Technical Data). The capacity is 0.75 litre. Refit the oil filler plug.

During normal operation, the oil level must always be visible in the sight-glass between the MAX and MIN lines. (Fig. 9).

3.8 Noxious, corrosive or acidic gases and vapours

On applications which involve corrosive gases or vapours, facilities must be available to isolate the outlet and inlet from atmospheric moisture and from the system when the pump is not in use.

Always consult Edwards High Vacuum International before pumping explosive gases or vapours particularly if they fall into the classification VDE-0171/2-61.

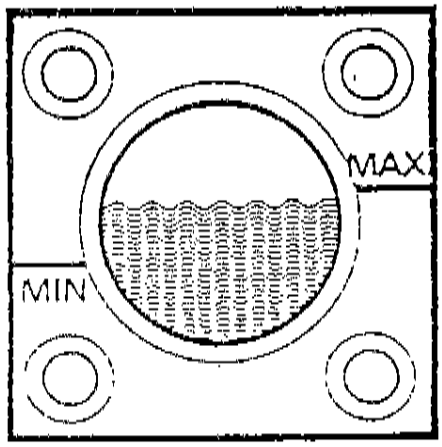


FIG.9 SIGHT GLASS SHOWING CORRECT OIL LEVEL

4. OPERATING

WARNING Ensure the pump outlet is not obstructed. This may cause a dangerous internal pressure build-up. Depending on their thermodynamic properties and rate of mass flow pumped gases or vapours can reach in excess of 250 degrees C within the pump.

4.1 Start up

1. Before starting the pump check that the oil level is visible between the MAX and MIN lines on the sight-glass.

2. On a new installation double check the direction of rotation. Switch on the motor momentarily and ensure pump rotation is CLOCKWISE when viewed from the motor end. If incorrect rotation switch off immediately and interchange any two of the phase leads.

3. Ensure that the cooling water supply is turned on fully.

4. Make sure that the outlet is unobstructed.

5. The delivery pressure should be below 1150 mbar absolute when roughing.

6. The attainable vacuum improves with running time as the pump rotors expand and working clearances decrease. After about 15 minutes of operation the optimum performance is approached.

7. The pump is of rugged construction, designed for long term, trouble-free service, provided the recommended operating and servicing procedure is adhered to. Before despatch, each pump is inspected and tested for performance. Many cases of suspected failure or poor pump performance are in fact due to leakage in the vacuum system, faulty gauges or unsuspected contamination of the oil in the gear cover or roller bearings grease located at the high vacuum headplate end.

8. Once the pump has reached its normal operating temperature check all water hoses, vacuum pipes and gas ballast connexions for leaks.

4.2 Ingress of dust

If there is any likelihood of solid particles from the vacuum system entering the pump a low impedance inlet filter should be fitted.

4.3 Shut down

WARNING: Before stopping the pump, purge it free from contaminants by pumping at or near atmospheric pressure. If this is not practical run the pump with full dry nitrogen gas ballast for at least 15 minutes. To prevent moisture or corrosive vapours from entering the pump isolate the outlet and inlet when the pump is not in use.

In order to prevent seizure caused by differential contraction between the casing and rotating mechanisms of the pump, the setting of the thermostatic control valve must not be lowered whilst water is still flowing through the pump water jacket. After shut down switch off the water flow and allow the pump to cool naturally.

5. GAS BALLAST

Gas ballast should be used when pumping vapours and to purge condensates and contaminants from the pump.

A non-return device is built into the gas ballast line. However, some gas may leak through in the reverse direction during roughing (above 650 mbar inlet pressure) whilst the gas ballast valve is open. This is relevant if the vacuum system is filled with noxious gases. If the gas ballast is supplied from a gas bottle or a closed system, there should be no problem.

If the pump stops or is switched off, gases from the delivery side will slowly leak back through an all-metal outlet valve and so bring the pump to outlet pressure.

If the gas ballast valve is left open, it will also vent the pump to atmospheric pressure.

To connect gas ballast supplied from a gas bottle, disconnect the air ballast filter silencer.

When using any nitrogen gas for ballast the supply should be set to a pressure of 5-10 psig (0.35 to 0.7 bar) with a maximum flow of 30 l/m.

6. DUCT SEALING

1. To seal internal evacuation of the roller bearings (30) Fig. 12 located at the high vacuum headplate end undo and remove the six screws securing the end cover (12) to the headplate (6).

2. Lift away the cover (12). Note the sealing O-ring (113).

3. Using a small screwdriver or suitable pointed tool ease the felt insert (42) from its location in the headplate (6).

4. Smear a little Loctite 275 on ¼in BSP tapered plug and insert into the felt plug location.

5. Reassembly in the reverse sequence to dismantling. Ensure both headplate (6) and bearing end cover (12) faces are clean and that the sealing O-ring (113) lubricated with Fomblin RT15 or Krytox 240AD grease and is correctly positioned in its groove in the headplate (6).

OPTIONAL EXTERNAL DUCT EVACUATION

If external evacuation is required blank off internal evacuation as decribed in section 6 and connect to 3/8 BSP O-ring sealed plug as shown at "X" on Fig.4.

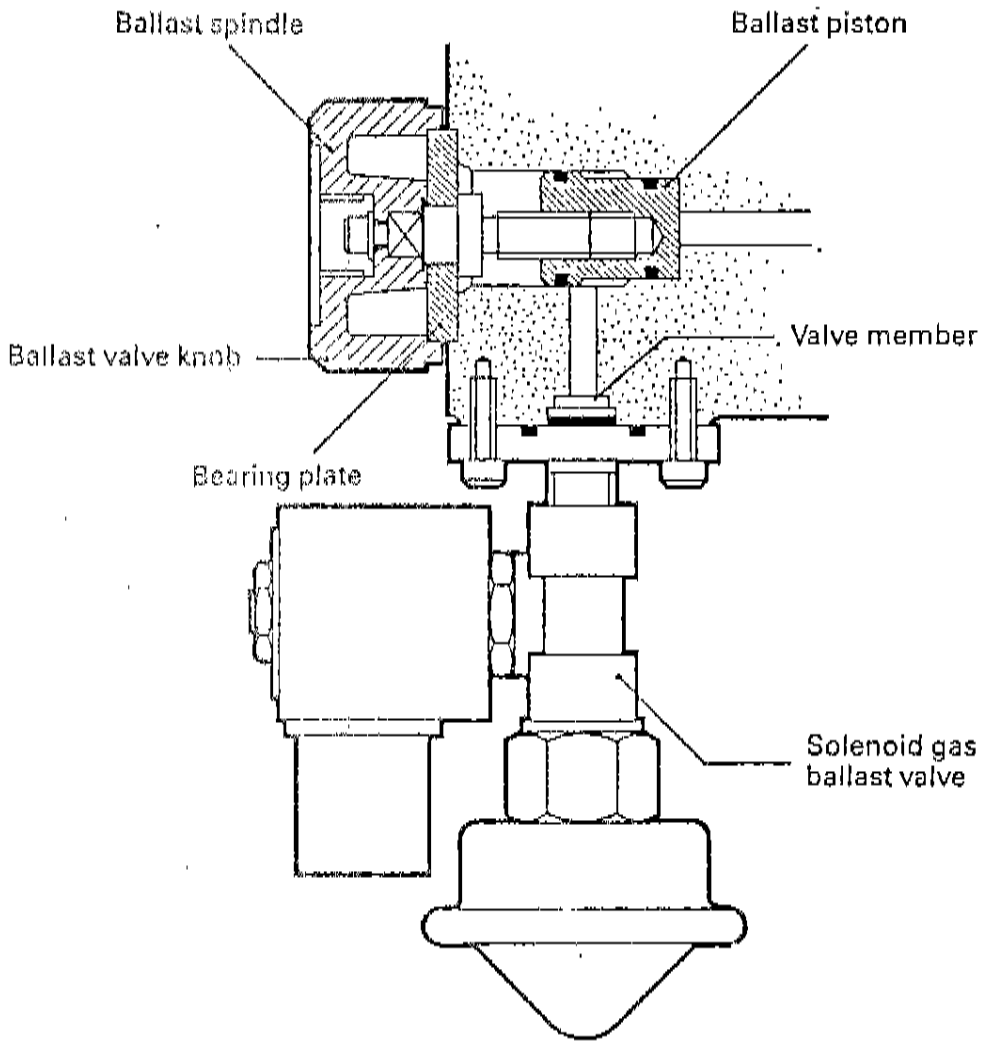


FIG. 10 GAS BALLAST ASSEMBLY

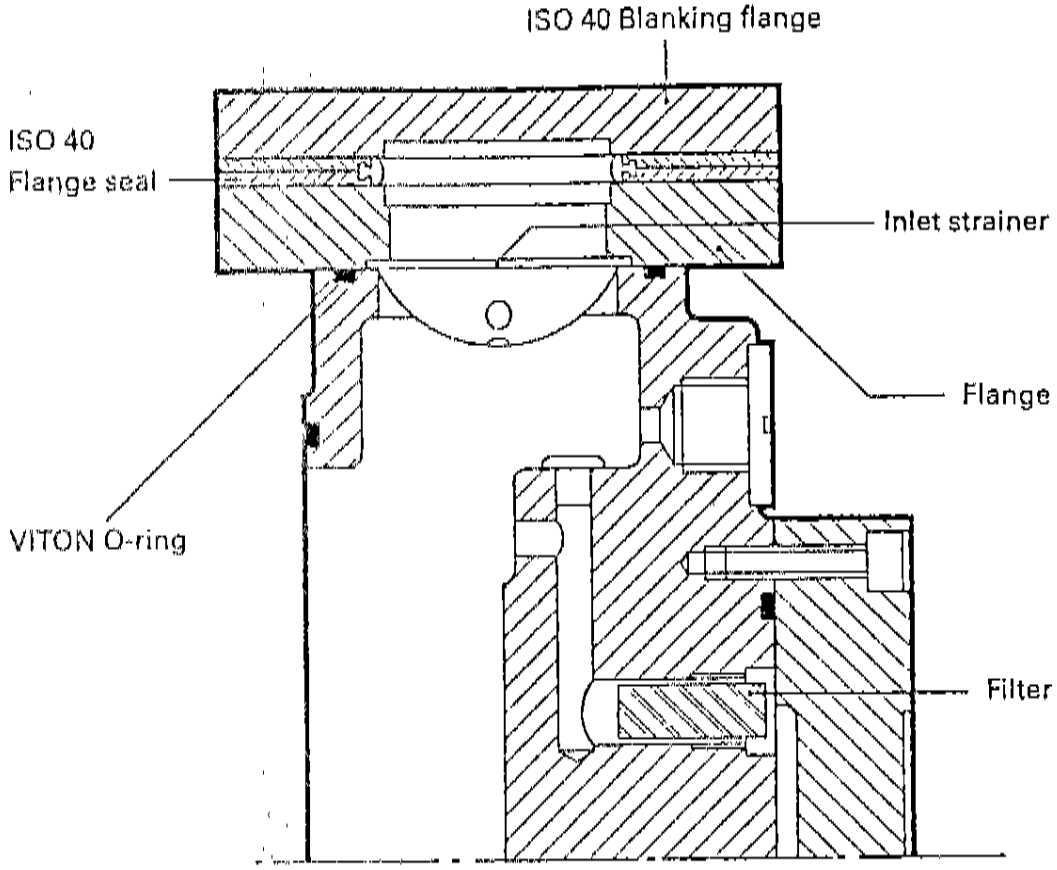


FIG.11 DUCT PLUG INSTALLATION

7. MAINTENANCE

To ensure trouble-free running of the pump it is recommended that a schedule of maintenance be implemented. The frequency will depend upon individual installation conditions.

Two maintenance kits are available:

Routine maintenance kit	A40102820
Full maintenance kit	A40102800

The main points to consider are:-

1. Check pump oil level in the gear cover (Fig. (9). This should be visible in the sight-glass between the MAX and MIN lines.

2.1 If an exhaust valve is used inspect, clean (and/or change) (56), Fig. 12, as necessary. To gain access to this valve, undo and remove the four securing screws securing the connexion to the low vacuum headplate (10). Remove the exhaust outlet connexion. Before assembly clean the mating faces of the outlet connexion (13) and headplate (10). Ensure the sealing O-ring is still in a serviceable condition. Otherwise renew. Lubricate the O-ring with Fomblin RT15 or Krytox 240AD grease.

2.2 Reassembly is the reverse sequence to dismantling.

3.1 It is recommended that the rotor bearings (30) are re-packed annually. Undo and remove the six screws securing the bearing end cover (12) Fig. 12 to the high vacuum headplate (6). Lift away bearing end cover (12). Check the sealing O-ring (113) and if it is either damaged or has deteriorated renew.

3.2 Using a plastic or wood spatular, remove as much old grease as possible from the cover (12) and roller bearings (30). DO NOT use fingers for this.

WARNING If air pressure cleaning is carried out it is important that eyeshields and face mask be worn also any exposed skin areas be protected.

3.3 Force new grease (Fomblin RT15 or Krytox 240AD) into the bearings (30).

3.4 HALF FILL each cavity in the bearing end cover (12) with Fomblin RT15 or Krytox 240AD grease.

3.5 Reassembly is the reverse sequence to dismantling. Ensure both headplate (6) and bearing end cover faces (12) are clean and that the sealing O-ring (113) is lubricated with Fomblin RT15 or Krytox 240AD grease and correctly positioned in its groove in the headplate.

4.1 On dusty, or dirty (waxy, tarry, gummy) applications the inlet stage sump should be cleaned. This is located on the underside of the pump.

4.2 Undo and remove the two securing screws and lift away the KF25 clamp, blanking plug and sealing ring. Note which way round the clamp and blanking plug are fitted. Cleaning will be facilitated if a long flexible handled, large diameter bottle brush is used.

4.3 Reassembly is the reverse sequence to dismantling. Ensure all faces and the sealing O-ring are clean and that the O-ring is not damaged or deteriorated. Renew as necessary. Lubricate the O-ring with Fomblin RT15 or Krytox 240AD grease.

5.1 If the cooling water supply is dirty or after prolonged use it is advisable to flush the cooling jacket. This is achieved by using a fast flow of water in the reverse direction to normal flow.

5.2 Use the water outlet connexion item 130, Fig.2 for the inlet and the standard water inlet as the outlet. With a piece of wire probe the reverse flush outlet to remove any released but subsequently trapped sediment.

6. At regular intervals remove the exhaust connexion and valve and run the pump for several minutes to remove any contaminants retained in the exhaust system.

7. Regularly check the security of all water, inlet, outlet (and gas) connexions.

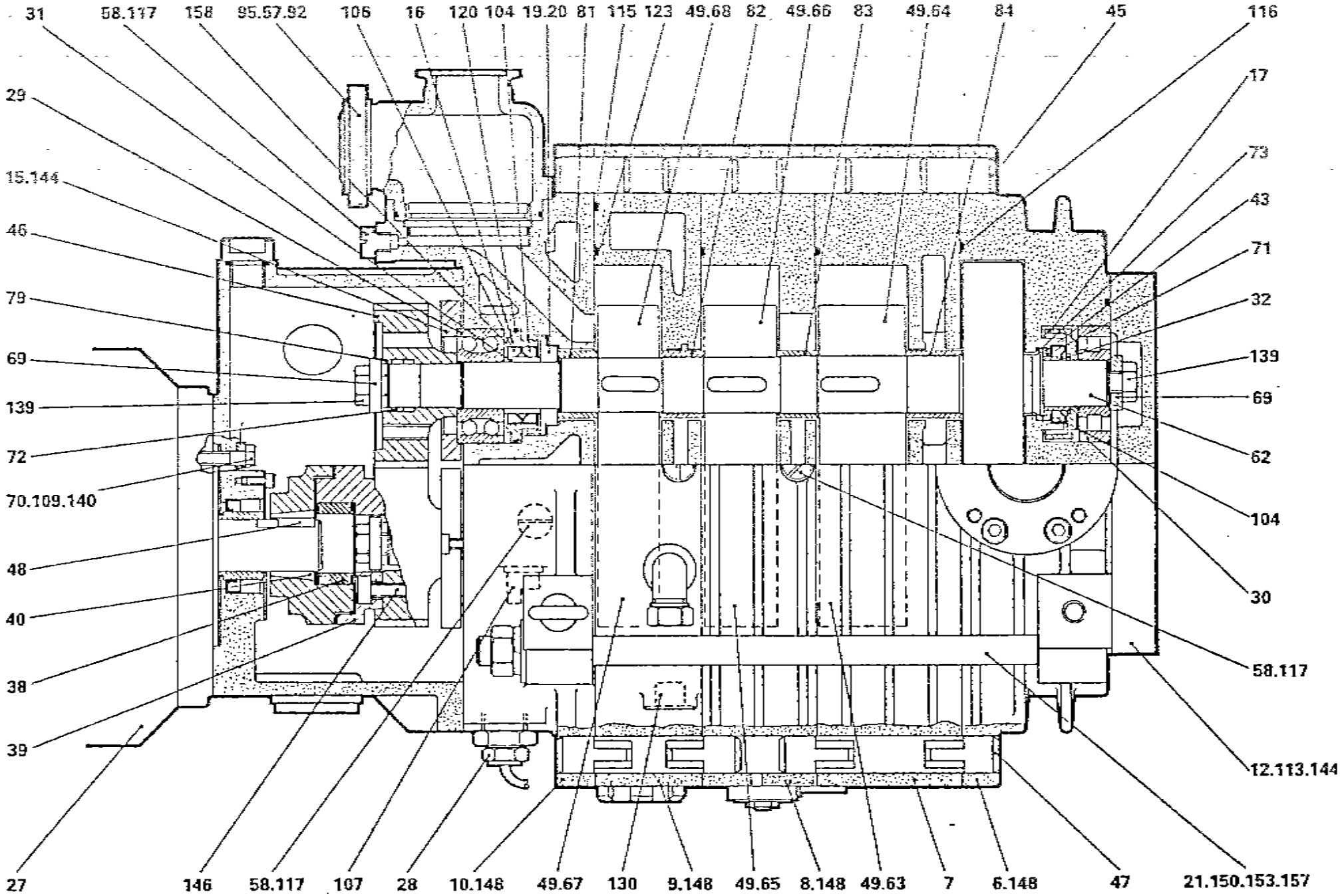


FIG. 12 CROSS SECTIONAL VIEW OF DP80 'DRY' PUMP (50Hz)

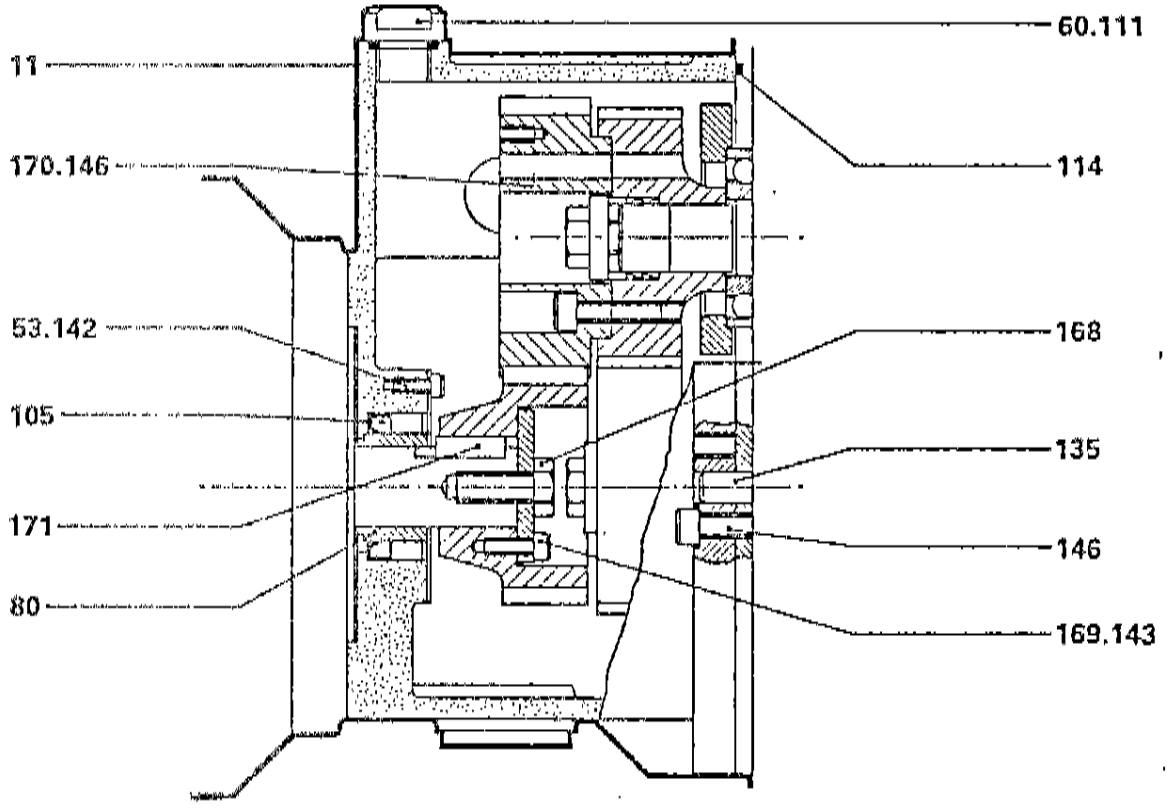


FIG.13 DP80 'DRY' PUMP DRIVE GEAR ASSEMBLY - 60Hz

ACCESSORIES

Inlet isolation valve PV40EK	220/240V 110/127V	C31107000
Inlet dust filter ITF100		A44302000
Vibration isolators (set of 4)		A24801416
Compressor valve (delivery)		A28706014
50Hz drive coupling		A50094000
50Hz drive gears		A50095000

MAINTENANCE KITS

Routine maintenance kit	A40102820
Full maintenance kit	A40102880

ORDERING SPARE PARTS

All Edwards products are readily available from Edwards High Vacuum International companies in Canada, Germany, Italy, Brazil, Japan, USA and a worldwide network of distributors, the majority of whom employ Service Engineers who have undergone a comprehensive training course at Crawley. Spare parts and service should be ordered through your nearest Edwards group company or distributor.

A separate publication (03-A401-03-880 - parts manual) is available for the DP 80.

When ordering spare parts please state for each part:

Model of pump
Serial number of pump
(The model and serial numbers are stamped on the red label located on the face of the bearing end cover (12)).
Code number of part
Description in words of part
Number required.

EXAMPLE

Model	DP80
Serial number	159
Code number	H02109053
Description	Lip seal - plain P.T.F.E. - 30 x 42 x 8
Number	2

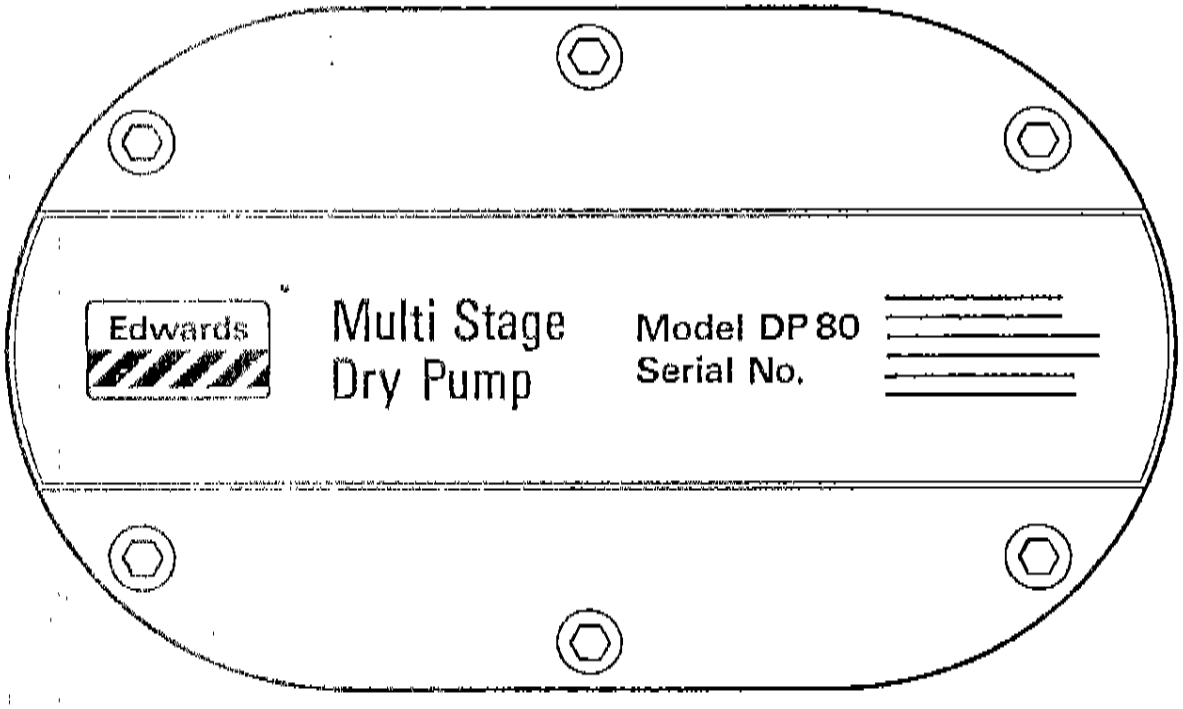


FIG.14 PUMP SERIAL NUMBER IS STAMPED ON LABEL ATTACHED TO END COVER

COMMUNICATION WITH EDWARDS

Any communication relating to the subject of this instruction should be addressed to Edwards High Vacuum International or to the supplier from whom it was purchased.

Please specify:

1) the model, serial number and code.

2) the date of purchase.

3) your order number and the suppliers sales reference.

Equipment MUST NOT be returned to the supplier without prior arrangement.

IMPORTANT Health and Safety

Under Section 3 of the Health and Safety at Work Etc Act 1974 every employer has a duty to conduct his business so as not to expose persons not in his employment to risks to their health and safety. When goods are returned to the supplier, therefore, warning must be given if their usage is likely to render the equipment hazardous in any way. Your attention is drawn to FORM HSC001 attached.

Edwards High Vacuum International and its distributors reserve the right to refuse acceptance of any equipment returned which they have reason to believe may be hazardous.

Damage in transit

If any damage has occurred in transit, it is important to inform both the carrier and the supplier within three days of delivery.

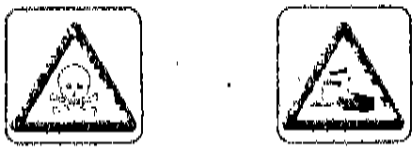
Edwards SERVICE

Edwards High Vacuum
(Part of The BOC Group plc)
W. Sussex RH10 2LW
Tel: 0293 28844
Telex: 87123 edivac g

PROCEDURE FOR RETURNING CONTAMINATED PUMPS TO EDWARDS HIGH VACUUM OR EDWARDS HIGH VACUUM DISTRIBUTOR

When returning a pump to EHV, the following procedure should be followed:

1. All fluid must be drained prior to despatching the pumps.
2. All pump outlets must be sealed with suitable blanking covers or PVC tape.
3. All accessories should be removed and if they require servicing, sealed in heavy-duty polythene bags and secured to the pallet with the pump.
4. Inlet and outer mist filters should be removed. All filter elements must be removed and disposed of as contaminated waste.
5. Any openings left by removing accessories must be sealed with suitable covers or PVC tape.
6. Pumps and accessories must be sealed in a heavy duty polythene bag and securely strapped to a suitable pallet *(the dimensions of which should not exceed 510mm by 915mm)*.
7. The pallet must be labelled in accordance with current Packaging and Labelling Dangerous Substances regulations 1978 (SI No. 209) and subsequent amendments. At the present time (1985) the following labels should be used:



MAY CONTAIN TOXIC
OR CORROSIVE CHEMICALS

8. The Service Department at EHV or EHV Distributor must be notified in writing of the nature of the hazard, the name of the carrier and anticipated delivery date, using Form HSC 001. This should be either Faxed *(Fax No. 0293 33453)* or sent by 1st class post to ensure that we have this information before we receive the equipment.
9. A copy of form HSC 001 should be handed to the carrier who must be informed that the cargo may be contaminated and who should present this copy of HSC 001 with the delivery note at EHV.
10. It is recommended that such pumps should only be transported in vehicles where the driver is in a separate cab, *eg open back lorry*.
11. Failure to comply with this procedure will lead to delays in servicing the equipment.

Edwards High Vacuum
(Part of The BOC Group plc)
W. Sussex RH10 2LW
Tel: 0293 28844
Telex: 87123 edivac g

HEALTH AND SAFETY CLEARANCE FORM HSC 001

1.0 This form must be used when returning pumps and equipment for service at EHV or EHV distributor as per EHV procedure.

2.0 A completed copy of this form should be Faxed *(Fax No. 0293 33453)* or sent by 1st class post to ensure that we have this information before we receive the equipment.

A further copy should be handed to the carrier with the equipment.

3.0 Failure to complete the form or comply with the procedure will lead to delays in servicing the equipment.

4.0 Please complete the following sections:

4.1 Pump/Equipment Type .....

4.2 Serial No. .....

4.3.0 Details of all substances pumped.

4.3.1 Chemical names:

(a) .....

(b) .....

(c) .....

(d) .....

4.3.2 Precautions to be taken in handling of these substances:

(a) .....

(b) .....

(c) .....

(d) .....

4.3.3 Action to be taken in the event of human contact or spillage:

(a) .....

(b) .....

(c) .....

(d) .....

4.4 Any further information which you consider relevant:

4.5 Please complete section 4.5.1 if substances are not toxic or hazardous or 4.5.2 if they are.

4.5.1 I hereby confirm that the equipment specified above has **not** pumped or come into contact with any toxic or hazardous substances and that the equipment has been drained of lubricant.

Signed: .....

Name: .....

Position .....

For and on behalf of: .....

Date .....

4.5.2 I hereby confirm that the only toxic or hazardous substances that the equipment specified above has pumped or been in contact with are named above, that the information given is correct and that the following actions have been taken:

1. The equipment has been drained of lubricant.
2. The inlet/outlet ports have been sealed and the equipment has been securely packed and labelled in accordance with EHV procedure.
3. The carrier has been informed of the hazardous nature of the consignment.

Signed: .....

Name: .....

Position: .....

For and on behalf of: .....

Date: .....

4.6 Carrier to be used: .....

Delivery date to EHV: .....

IMPORTANT

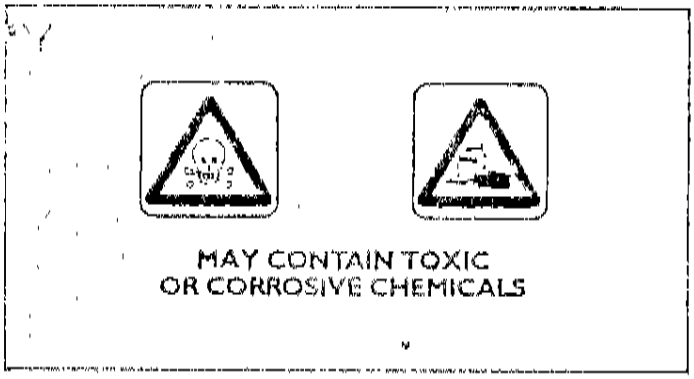
Edwards SERVICE

Edwards High Vacuum
(Part of The BOC Group plc)
W. Sussex RH10 2LW
Tel: 0293 28844
Telex: 87123 edivac g

PROCEDURE FOR RETURNING CONTAMINATED PUMPS TO EDWARDS HIGH VACUUM OR EDWARDS HIGH VACUUM DISTRIBUTOR

When returning a pump to EHV, the following procedure should be followed:

1. All fluid must be drained prior to despatching the pumps.
2. All pump outlets must be sealed with suitable blanking covers or PVC tape.
3. All accessories should be removed and if they require servicing, sealed in heavy-duty polythene bags and secured to the pallet with the pump.
4. Inlet and outer mist filters should be removed. All filter elements must be removed and disposed of as contaminated waste.
5. Any openings left by removing accessories must be sealed with suitable covers or PVC tape.
6. Pumps and accessories must be sealed in a heavy duty polythene bag and securely strapped to a suitable pallet *(the dimensions of which should not exceed 510mm by 915mm).*
7. The pallet must be labelled in accordance with current Packaging and Labelling Dangerous Substances regulations 1978 (SI No. 209) and subsequent amendments. At the present time (1985) the following labels should be used:



8. The Service Department at EHV or EHV Distributor must be notified in writing of the nature of the hazard, the name of the carrier and anticipated delivery date, using Form HSC 001. This should be either Faxed *(Fax No. 0293 33453)* or sent by 1st class post to ensure that we have this information before we receive the equipment.
9. A copy of form HSC 001 should be handed to the carrier who must be informed that the cargo may be contaminated and who should present this copy of HSC 001 with the delivery note at EHV.
10. It is recommended that such pumps should only be transported in vehicles where the driver is in a separate cab, *eg open back lorry.*
11. Failure to comply with this procedure will lead to delays in servicing the equipment.