INSTRUCTIONS 208-B00 e

Section	208
Effective	November 2010
Replaces	March 2008

Original instructions

RAL 485
EXHAUSTER

INSTALLATION

OPERATION

MAINTENANCE

TROUBLESHOOTING

PARTS LISTS

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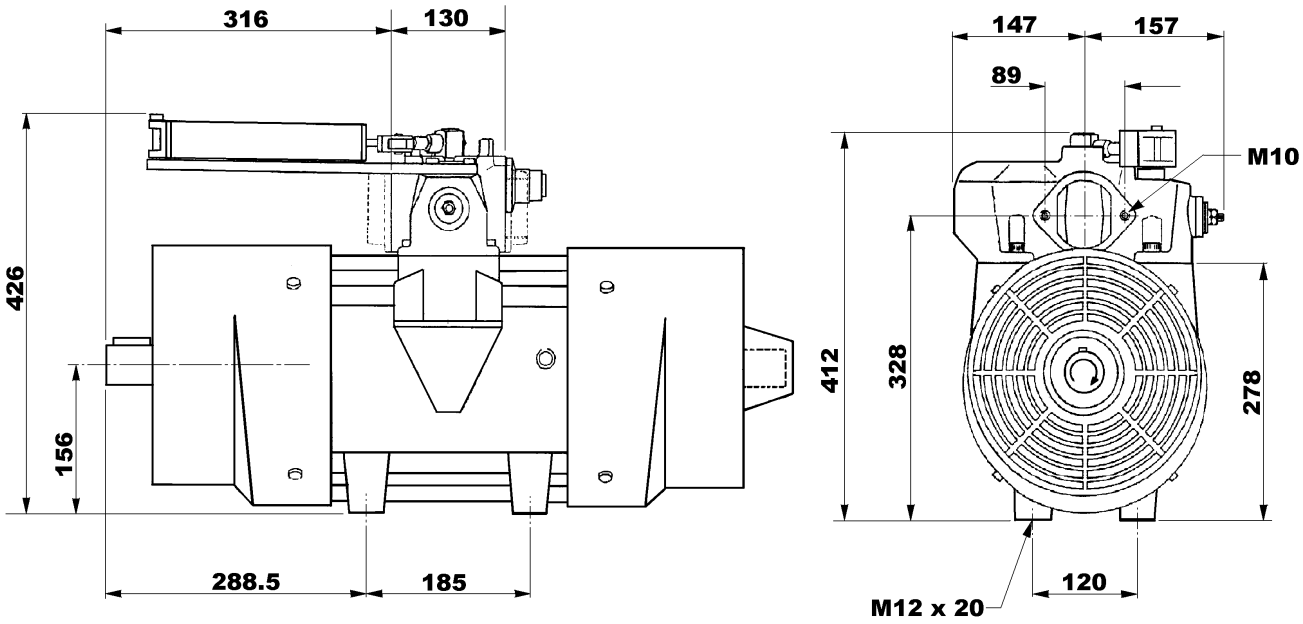
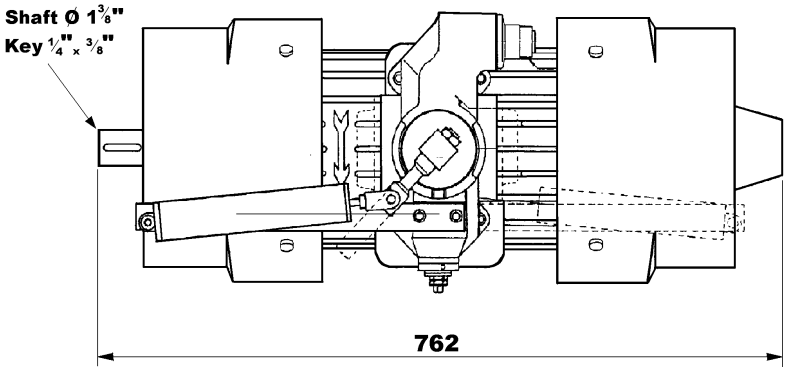
Your distributor :

DIMENSIONAL VIEW
Model: RAL 485





INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS
Model: RAL 485

NOTICE

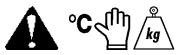
The warranty of this product is for the first twelve months. This is subject to our normal terms and conditions of sale.
Mouvex compressors are quality-engineered products, designed to give many years of trouble-free service.
Failure to comply with the advice given in these instructions may lead to serious malfunction of the compressor and / or associated equipment and invalidate our guarantee.
Mouvex will give no warranty on any failures if Mouvex spares and accessories are not used.

SAFETY

MOUVEX compressors / exhausters must be installed in systems which have been designed by qualified engineering personnel. The system must conform to all local and national regulations and safety standards.

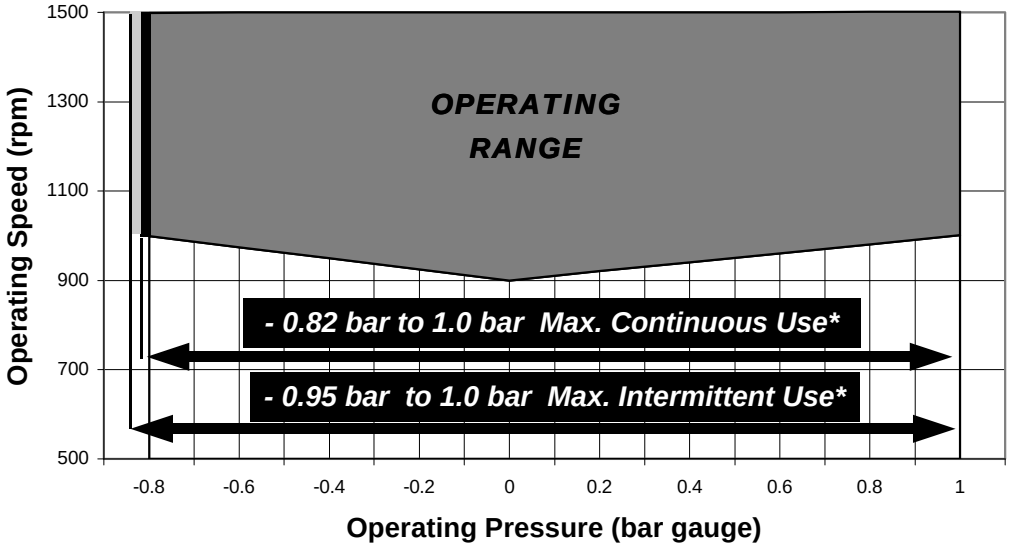
These instructions are intended to assist in the installation, operation and maintenance of the compressor / exhauster and MUST be kept with the compressor / exhauster. Read through the instructions before performing any work on these compressors / exhausters. It will warn you of all potential hazards that exist.

Symbols found throughout the manual will draw your attention to potential hazards, which could be a danger to personnel.

The following symbols can be found throughout this manual:	
Symbol	***Potential Danger***
	Danger of explosion which can cause death or injury or damage to property.
	Danger of death or personal Injury or damage to property.
	Danger of damage to compressor or to other property.

OPERATING PARAMETERS

Max. Air Flow (F.A.D) @1500r.p.m.	450 m3/hr.(265 c.f.m.)
Max. Pressure (Gauge)	1.0 bar (15 p.s.i.)
Max.Vac.(Intermittent*) (Gauge)	0.95 bar / 28 in.Hg.
Max.Vac.(Continuous*) (Gauge)	0.82 bar / 24 in.Hg.
Max. Rotation Speed	1500 r.p.m.
Shaft Power required @1500rpm@ 1.0 bar (Gauge)	18 kW / 24 h.p.
Power @ Max. Vacuum (absorbed @shaft)	12 kW / 16 h.p.
Weight (bare shaft machine)	110 Kg / 242 lb
Rotation - Standard **Option Please state when ordering	CW CCW



* Continuous Use Greater than 15 minutes

SAFETY FIRST!

Pressurised Gases

Before installing the vacuum pump, ensure the vessel to which the pump is connected is certified to withstand the pressure and / or vacuum produced.
Ensure that adequately sized relief valves have been fitted to protect the vessel. Ensure both vessel and valves conform to current legislation.
The vacuum pump should have separate vacuum and pressure relief valves fitted. MOUVEX supply pressure and vacuum relief valves for this purpose.

Heavy Components

There are components within the vacuum pump of sufficient weight to cause injury if mishandled.
The vacuum pump can be lifted with straps around the body.
Do not attempt to lift the vacuum pump without disconnecting it from the base frame.

Noise Levels

Prolonged exposure to excessive noise will cause serious hearing damage to any personnel within close proximity.
A notice should be clearly marked and in a readable position so that operators are warned of any hazard and should wear ear defenders - as specified by current legislation

Health Precautions

Contents of the tank, pipe work, vacuum pump and filters could be life threatening. Ensure there are adequate notices, warning of the dangers to health.

Static Electric

Care should be taken to ensure that, where necessary, this equipment is earthed in accordance with BS 5958 Part 1 (1980) and Part 2 (1983), - Control of Undesirable Static Electricity.

Engineer Correctly

The mounting of the vacuum pump must be correctly engineered and safely secured. The pipe work should not impart any strain on the vacuum pump flanges.

Volatile Gases

Gas/air mixtures which are potentially volatile/explosive must not be introduced or allowed to be introduced into the vacuum pump.
If volatile vapours are passed through the vacuum pump, adequate flame arresters and protective devices must be fitted.
MOUVEX will not take any responsibility for the recommendation, performance or the safety of the vacuum pump in these conditions.

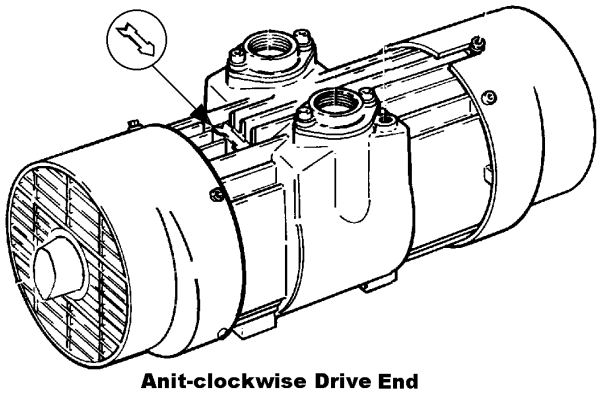
Hot Gases

The temperature of the air leaving the vacuum pump can reach in excess of 200 deg. C (measured at the discharge port). This will be subject to operating conditions and running time.
Ensure that the high temperatures do not adversely affect the product and any material used in the system. Where possible fit guards to prevent hot surfaces being touched.
Fit clearly marked signs in readable positions to warn of potentially hot surfaces on the vacuum pump, pipework and ancillaries, which will burn if touched.

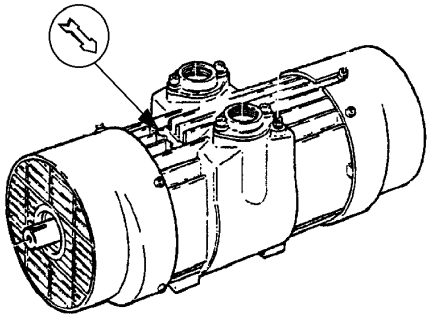
1) Rotation

The vacuum pump can be driven from either end .

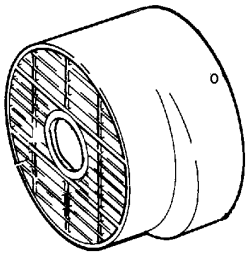
Ensure the vacuum pump runs in the same direction as the arrow cast on the top of the body



Anit-clockwise Drive End



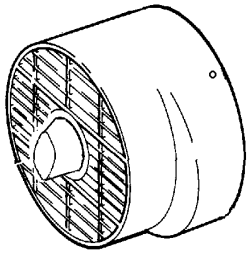
Clockwise Drive End



Drive End Cover and Key

To Change Direction of Rotation

Swap these parts ONLY.
Changes a clockwise drive into an anti-clockwise drive



Non-drive end cover.

2) Mounting Points

The vacuum pump should be mounted preferably standing on its feet.

3) Positioning

a) Ensure drive shaft is lying horizontal (+/- 5^{0})

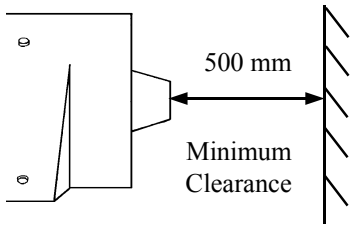
b) Ensure the vacuum pump is mounted in a position where it is protected from road spray and where dirt cannot quickly clog the fins and cooling outlets.

c) Ensure access for regular cleaning of the exterior surfaces. Keeping these surfaces clean will prevent the vacuum pump from overheating by allowing the cooling air to flow over the body unrestricted.

c) Access for maintenance.

i) One end of the vacuum pump should have good access to enable blade inspection / change. Ensure there is at least $^{1}/_{2}$ m clearance at one end of the vacuum pump to remove blades.

ii) Ensure the vacuum pump can be safely removed from its mountings when a complete overhaul is necessary.



4) Drive Options

Rotation - If the vacuum pump is run in the wrong direction, damage will occur.

Speed - Ensure the vacuum pump can only run within the speeds set out in this book. In all cases, the drive must keep the vacuum pump running at a constant speed. Speed governors or automatic speed controllers are recommended for all vehicle applications.

The RAL 485 is suitable for the following types of drive:

a) Propshaft - drive flange to suit 1100 or 1300 series
b) Direct Drive (electric motor, hydraulic motor, diesel engine etc.)
c) Vee Belt Drive

1) Safety!

Propshafts must be guarded. It is suggested that support hoops are fitted to prevent further damage if one end becomes detached.

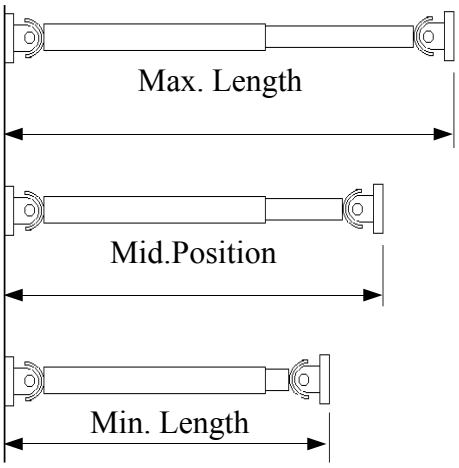
2) Starting Speeds

If the propshaft is fitted to a P.T.O., a torque- limiting device must be fitted to protect the P.T.O. from possible damage due to excessive start-up torque or seizure of the vacuum pump. Proper torque setting to protect shaft is 440 Nm. MOUVEX will not accept consequential damage to the P.T.O. or gearbox.
The P.T.O speed must be set to the correct compressor running speed before it is engaged.
To avoid excessive start-up torque, the clutch should then be engaged slowly.

Value A		Rating
0.017	1^0	**Very Good**
0.035	2	
0.052	3^0	
0.070	4^0	
0.087	5^0	
0.105	6^0	**Good**
0.125	7^0	
0.141	8^0	
0.158	9^0	
0.176	10^0	

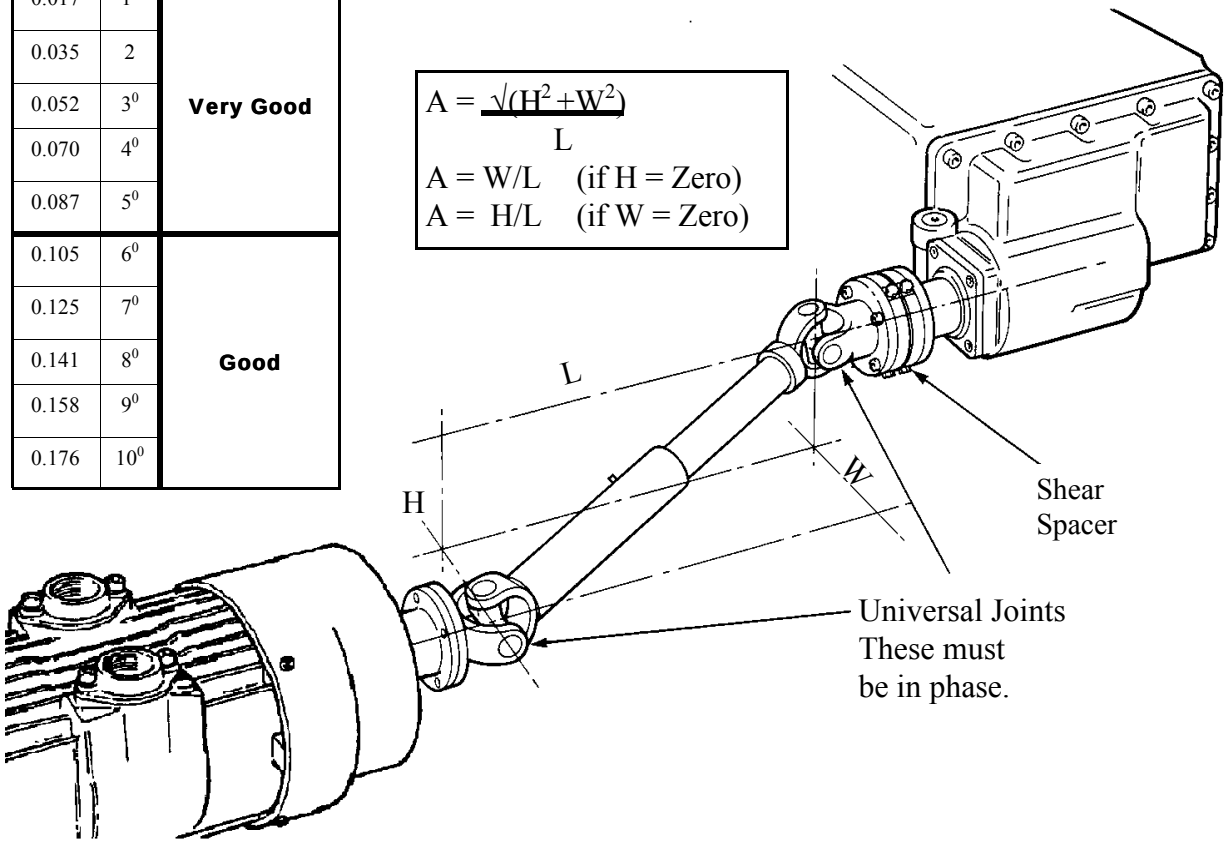
3) Alignment

The drive shaft and the vacuum pump shaft must be parallel to within one degree and have a maximum of 10º compound mis-alignment. Universal joints must be in phase and slip joint in mid position as shown below.



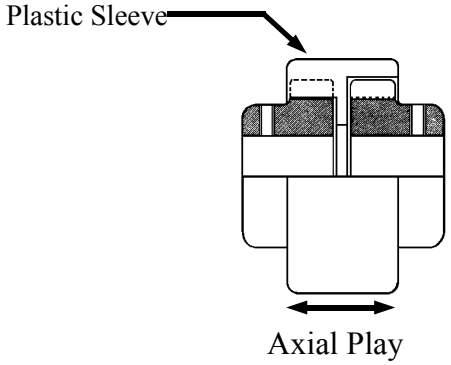
$$A = \frac{\sqrt{(H^2 + W^2)}}{L}$$

A = W/L (if H = Zero)
A = H/L (if W = Zero)



1) Mounting

MOUVEX supply a standard **drive kit** for direct mounting of the hydraulic motor or hydraulic pump.
MOUVEX can also supply the hydraulic motor. and 23 cc/rev pump .
For drive kits to suit other pumps and motors please specify fully, details of the motor / pump including the flange and shaft specification.



2) Hydraulic Oil Coolers

The HYDRIVE

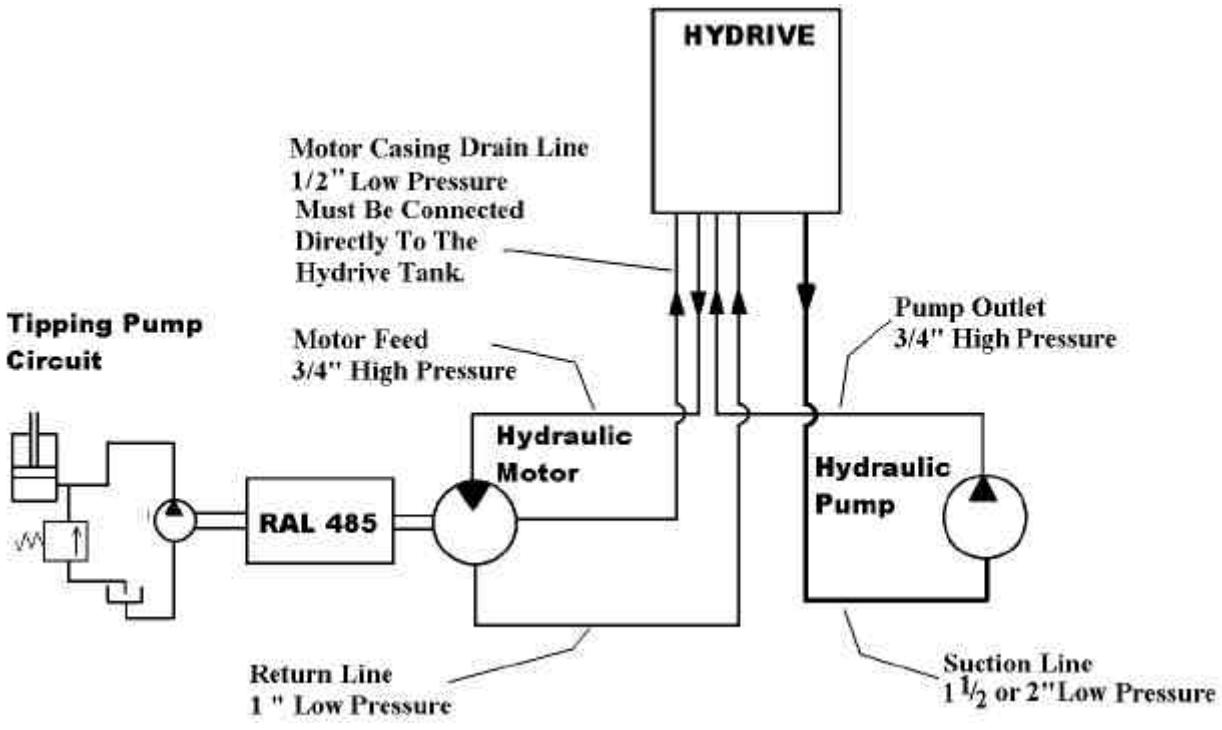
Heat Dissipation	up to 10 kW
Circuit Pressures	up to 300 bar
Flow	up to 100 l/min.
Integral tank	10 litres

Simply connects between the pump and the motor.

3) Coupling Alignment

Ensure correct coupling alignment and spacing. This should be checked before operation.
If the coupling hubs are aligned correctly, the outer plastic sleeve should have 3 to 5mm axial play through 360 °.
This can be checked by removing the inspection plate.

4) Hydraulic Circuit

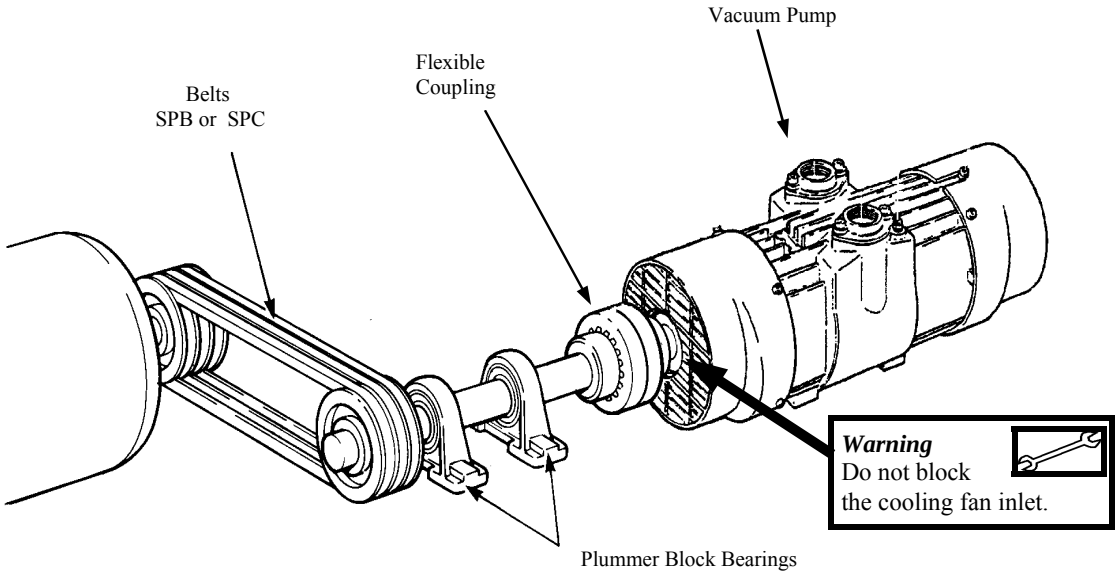


BELT DRIVE

1) Safety - Ensure all belts and pulleys are properly guarded in compliance with current legislation.
Ensure the guarding does not obstruct the cooling fan air flow.

2) Drive Arrangement

The driven pulley must be mounted on a jackshaft, supported by two plummer block bearings, and used in conjunction with a flexible coupling. To enable the belts to be tensioned the plummer blocks and the vacuum pump would have to be mounted on the same adjustable frame.
Alternatively, a jockey pulley could be used.



Note : Mounting the pulley directly onto the drive shaft is possible but not recommended without first consulting MOUVEX for technical advice.

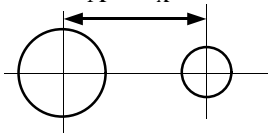
3) Fitting Belts and Pulleys

Do not prise belts onto the pulleys!

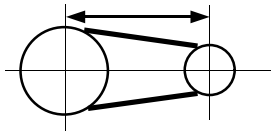
i) Check the grooves for any chips, bruising, scoring or excessive wear.
ii) Clean-up the shaft if necessary, and smear some copper slip on it.
iii) Assemble each pulley and tapered bush onto the shafts - ensuring the correct pulley size goes onto the correct shaft. Push them as far onto the shaft as possible, then tighten the grub screws lightly.
iv) Check the belts for cracks (due to slippage), swelling or softening (due to oil or cutting fluids contamination) or any other damage.
v) Set the drive shaft and vacuum pump to the correct centre distance, "A".
vi) Before fitting belts, move either the drive unit or the vacuum pump closer by "x" mm to reduce the centre distance.
vii) Fit belts onto pulleys then reset the centre distance to "A" + "y" mm.

Belt Pitch Length (mm)	"x" (mm)		"y" (mm)
	SPB	SPC	
1840 to 2170	30	50	30
2180 to 2830	30	50	40

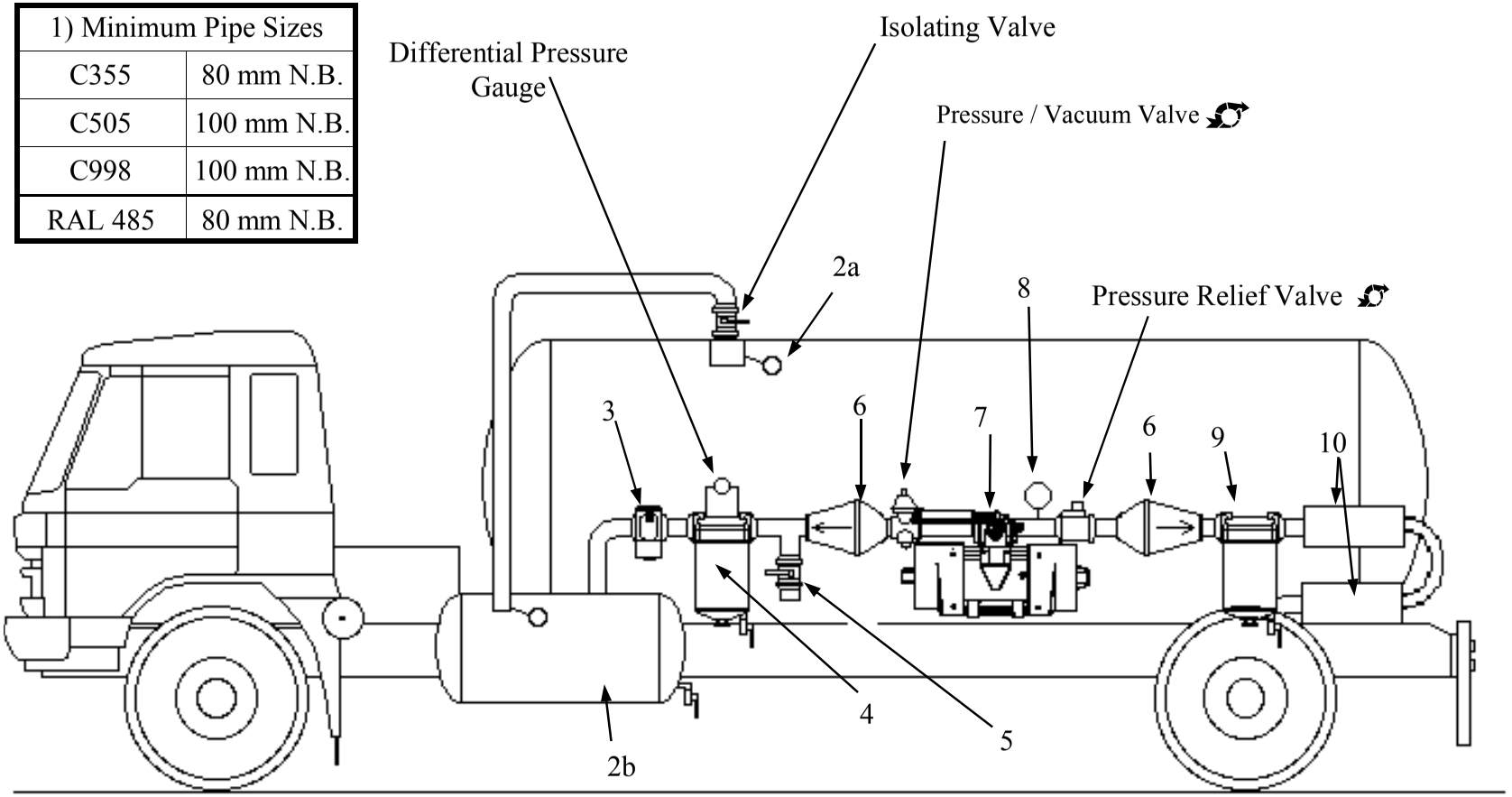
Before Fitting Belts



After Fitting Belts



1) Minimum Pipe Sizes	
C355	80 mm N.B.
C505	100 mm N.B.
C998	100 mm N.B.
RAL 485	80 mm N.B.



= MOUVEX can supply these items

1	Pipe Work	4	Suction Line Filter	8	Pressure Gauge
2a	Primary Cut-Out	5	Manual Vent Valve	9	Oil Separator
2b	Secondary Cut-Out	6	Flame Trap	10	Silencer
3	Strainer	7	Combination Valve and Air Kit		

1) Pipe Work

i) All pipe work to and from the vacuum pump must be fitted freely and not impart any strain on the rest of the installation, or on the vacuum pump ports.

ii) It is recommended that flexible pipes are fitted either side of the vacuum pump - this will take out pipe work strain as well as reduce noise and vibration.

iii) Ensure all pipe work is rated for pressure and vacuum and also the high temperature (up to 200ºC.)

2) Carry Over Protection

Liquids must not be allowed to be drawn into the vacuum pump, otherwise serious damage will occur

2a) Primary Cut-Out

This is a float valve fitted in the top of the vacuum tank to prevent the liquid in the vessel being sucked into the pipe work, between the vessel and the vacuum pump, when the vessel is full.

2b) Secondary Cut-Out

This is fitted after the primary cut-out and before the vacuum pump.

The device removes and collects any liquid that passes the primary cut-out. This can happen if the liquid starts to "foam" or when the tank is nearly full.

Clear signs should be fitted to tell operators that the secondary tank should be emptied and cleaned after every operation to prevent a build up of sludge at the bottom.

3) Strainer

The strainer is designed to catch air-borne particles, greater than 1 mm in diameter. Its design allows easy removal of the straining element for cleaning.

The strainer should be mounted between the S.L.F. and the secondary cut-out with the arrow pointing towards the vacuum pump and the removable cap towards the ground.

4) Suction Line Filter (S.L.F.)

i) The MOUVEX range of of suction line filters have been developed specially to filter air drawn into the vacuum pump. **Use of these filters will prolong its life.**

ii) When mounting the S.L.F. in the system, ensure there is good access for :

a) Draining the casing sleeve assy. through the ball valve at the bottom,

b) Removal of the sleeve assy. to clean / replace the element.

iii) Ensure the arrow cast on the aluminium filter body points towards the vacuum pump.

iv) MOUVEX recommend that a differential pressure gauge is fitted across the filter body to show the condition of the element.

5) Vent Valve To Atmosphere

Fitted on a tee, this should be located in the pipe work between the tank and the vacuum pump. It is necessary to vent the vacuum pump to atmosphere when starting. ***Ensure the air is vented away from the operator - preferably downwards.***

6) Flame Traps

Consult MOUVEX before allowing gasses other than air to enter the pump.

In applications where volatile gases could be drawn into the vacuum pump, flame traps must be fitted on both suction and discharge sides.

1) They should be fitted such that their arrows point away from the vacuum pump

2) A drain plug should also be fitted and this should point downwards when the flame trap is fitted.

3) If flame traps are fitted, a suction line filter must be fitted.

7) Combination Valve

For combined pressure and vacuum use. It fits directly onto the pump ports and includes the following:

Reverse Flow Valve

To alternate the direction of flow from the vacuum pump enabling quick changeover from evacuating the tank to pressurising it.

Vacuum Safety Valve

An adjustable vacuum valve to prevent the pump from drawing excessive vacuums which cause overheating.

Pressure Relief Valve

Non adjustable, set to 1.0 bar to protect the pump.

Non-Return Valve

To prevent the vacuum or pressure in the tank from running the vacuum pump backwards.

If the combination valve is not required i.e. for pressure only or vacuum only applications, non return valves and relief valves should be fitted in the pipe work as shown.

8) Pressure Gauge (-1 to 1 bar .g.)

MOUVEX recommend fitting a gauge to thedischarge port of the vacuum pump to indicate the total back pressure due to all the accessories fitted. If this reaches more than +/-0.25 bar when pump is running with the vent valve open, there will be a blockage in the coalecser or flame trap which must be cleared before continuing.

9) Oil Separators (Coalescer)

To prevent environmental pollution this catches 99% of the oil from the vacuum pump.

10) Silencers

For good attenuation it is better to fit two of these in series connected by a 180 deg. elbow .

OPERATION

Safety First!

Before carrying out any maintenance on the vac. pump, ensure it is safe to continue by checking the following:

Pressurised Vessels

i) Ensure that the vessel to which the exhauster / compressor is connected is certified to withstand the maximum pressure produced.
ii) On a regular basis, the pressure and vacuum relief valves should be checked for correct operation by artificially loading the compressor. Do this with a calibrated gauge connected to the exhauster / compressor.

Dangerous Gases

Gas / air mixtures which are potentially volatile or explosive must not be introduced into the exhauster / compressor. If gases other than air are involved, consult MOUVEX in order to approve the application.

Wear protective gloves

The exhauster / compressor and associated pipe work may still be hot to touch after the pump has stopped running.
When checking the pressure relief valve, beware of hot air from the valve and the hot temperature of the valve and pipe work.

Check the oil tank

Before running the exhauster / compressor:

- Check the oil level in the tank,
- Check the condition of the oil. If mixed with water and / or sludge this indicates that there is a carry-over from the vacuum tank. See trouble shooting page.

Check to see if drip feed lubricators are dripping. If these are dripping, it is possible there will be too much oil already in the exhauster / compressor.
Do not run the exhauster / compressor if it is full of oil. If the pump is run, it will fail. The pump must be stripped and cleaned of all excess oil.

With exhauster / compressor running:
Check drip feed lubricators. If the oil or drip feeders appear dirty, check inside for contamination of the oil. If this the case, check the system over for possible carry-over from the tank. Ensure no carry over does not block the suction filter, flame trap or strainer and that liquid cannot be drawn into the exhauster / compressor.

Know How To...

It is essential that those responsible for the maintenance are competent to install and operate this exhauster/ compressor. If this is not the case, contact MOUVEX for advice first.

Noise

Wear ear defenders when running the exhauster / compressor. The noise produced by these exhausters / compressors can lead to hearing injuries causing deafness if your ears are not adequately protected.

Environment

1) If working on a static vacuum pump installation, ensure the surrounding area is safe to work in. If in doubt, consult the person in charge of site
2) If working around a vehicle, ensure it is parked safely away from other moving vehicles and with brakes securely applied.
3) Beware of dangerous gases or liquids. Contents of the tank, pipe work, vacuum pump and filters could be life threatening. Be aware of the dangers and take all the necessary precautions before attempting any maintenance.

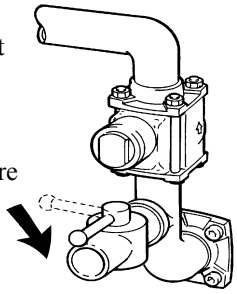
Check The Suction Line Filter

Before running the exhauster / compressor, open the drain valves on the S.L.F. and the secondary cut-out, to ensure all liquid is drained out. **Ensure there is no dirt blocking the drain valve.**
Be sure the contents are not dangerous to handle or inhale.
Run the exhauster / compressor with the vent valve open and check the condition of the S.L.F. element by reading off the differential gauge (if fitted). If gauge shows red, the element must be removed and steam cleaned.
Be sure the contents of the filter are not dangerous to handle / inhale.

Start-up Procedure

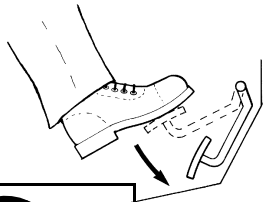
Step 1

Open all valves necessary to vent the vacuum tank to atmosphere. Be sure there is no possibility of operating the vacuum pump against a pressure / vacuum before it reaches the correct running speed.



Step 2

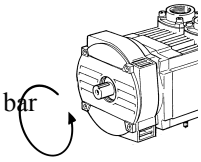
Start engine up and run at idle speed.
Depress the clutch pedal



Engage P.T.O.

Step 3 for PTO

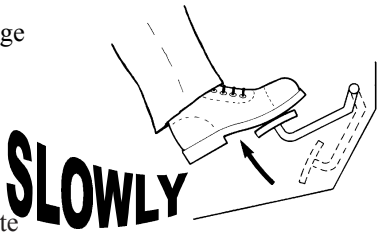
Set the engine speed to give the correct vacuum pump speed.
Maximum discharge pressure is 1.0 bar



MAX speed - 1500 rpm
MIN speed -1000 rpm full vacuum and pressure range (see graph page 2)
900 rpm restricted vacuum and pressure range (see graph page 2)

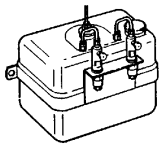
Step 4 for PTO

Release clutch to engage P.T.O. slowly.
For diesel, electric or hydraulic driver, monitor the speed increase so that its reaches the appropriate range in about 3S.



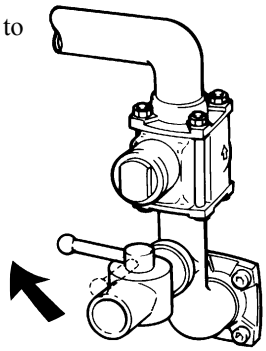
Step 5

Check the drip feed lubricators are working and delivering the correct amount of oil.



Step 6

Close all valves and proceed to evacuate / or discharge the tank.



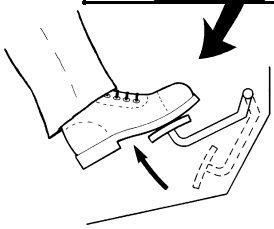
Shut-Down Procedure

1
P.T.O. Drives -
Hydraulic, Propshaft or Belts.
1) Depress the clutch pedal to dis-engage the P.T.O.

2) Reduce engine speed to idle.

3) Release clutch.

Caution
Always disengage the drive before slowing the engine down.



Diesel Driven Packs
Switch off engine at the control box. **Do not reduce engine speed.**

2) Caution
Do not restart the exhauster / compressor if:
a) there is pressure or vacuum in the system. If this is the case, open the vent valve first, then re-start the vacuum pump. Once the pump is up to speed , close the vent valve slowly.
b) input speed is too slow.

Maintenance

Safety First!

Before carrying out any maintenance on the vac. pump, ensure it is safe to continue by checking the following:

Pressurised Vessels

i) Ensure that the vessel to which the exhauster / compressor is connected is certified to withstand the maximum pressure produced.
ii) On a regular basis, the pressure and vacuum relief valves should be checked for correct operation by artificially loading the compressor. This should be done with a calibrated gauge connected to the compressor.

Dangerous Gases

Gas / air mixtures which are potentially volatile, explosive or harmful to health may be present in the tank. Maintenance personnel MUST be aware of the tank contents and all the relevant dangers BEFORE attempting any maintenance.

Wear protective gloves

The exhauster / compressor and associated pipe work may still be hot to touch after the pump has stopped running.
FKM seals can be hazardous to health if exposed to temperatures above 300ºC.
When checking the pressure relief valve, beware of hot air from the valve and the hot temperature of the valve and pipe work.

Know How To...

It is essential that those responsible for the maintenance are competent to install and operate this exhauster/ compressor. If this is not the case, contact MOUVEX for advice first.

Power Supply

The power supply to the vacuum pump must be isolated with a warning notice left at the point of isolation for other operators.

Noise

Wear ear defenders when running the exhauster / compressor. The noise produced by these exhausters / compressors can lead to hearing injuries causing deafness if your ears are not adequately protected.

Heavy Components

1) There are heavy components within the vacuum pump which will cause injury if mishandled.
2) An M12 lifting eye can be fitted between the inlet and discharge ports. This is a lifting point for the vacuum pump only. Ensure it is unbolted from pipe work and mountings before lifting.

Environment

1) If working on a static vacuum pump installation, ensure the surrounding area is safe to work in. If in doubt, consult the person in charge of site
2) If working on a vehicle, ensure it is parked safely away from other moving vehicles and with brakes securely applied.
3) Beware of dangerous gases or liquids. Contents of the tank, pipe work, vacuum pump and filters could be life threatening. Be aware of the dangers and
take all the necessary precautions before attempting any maintenance.

Maintenance - Check List

Daily

- Operate manual drain valves on Suction Line Filter, Oil Filter and Secondary cut-out tank. ***Ensure these are not blocked.***
- Visual check on oil level and drip feed rate.
- Inspect the strainer element and flame trap element. ***If contaminated with sludge, consult trouble shooting page***

Weekly

- Check pressure gages are working properly
- Check the operation of all relief valves and non-return valves both for pressure and vacuum on RAL and on truck.

To do the check, first open the vent valve then isolate the tank
Vacuum : close slowly the vent valve and check vacuum
criteria : between 0. and -0.95 bar for 1000 to 1500 rpm speed
Pressure : close slowly the vent valve and check max pressure on gage
criteria : between 0 and 1.0 bar for 1000 to 1500 rpm speed

- Top up oil tank.
- Clean external surfaces:
- Exhauster / compressor should be left for 1 hour after running before cleaning.
- Do not aim high pressure water jets at shaft seals.

1200 hours or 12 months

- Strip down each end and replace all seals.
- Clean out the bearings and apply fresh grease. Ensure remote grease pipes are fully primed.
- Check the blades and replace if worn.
- Check the distance sleeves and replace if worn.
- Check the condition of the suction line filter elements. Either clean the element or replace.

3600 hours or 3 years

- Strip down and replace all seals and bearings.
- Apply fresh grease. Ensure remote grease line are fully primed.
- Check the blades and replace if worn.
- Check the distance sleeves and replace if worn.
- Check the condition of the coupling and replace if worn.

DIS-ASSEMBLY

BEARING CAP REMOVAL

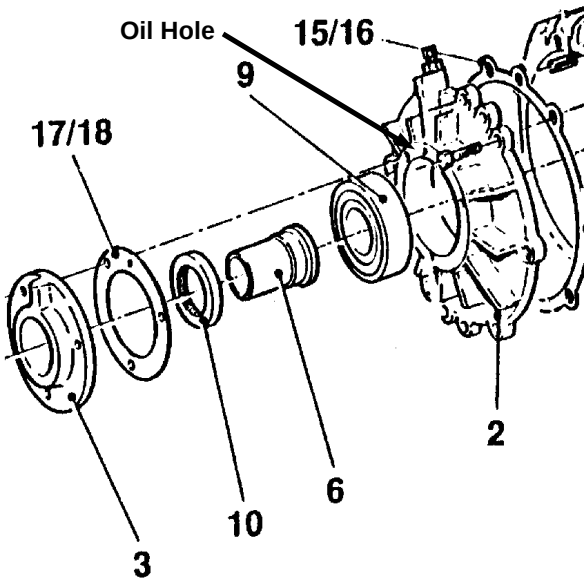
Take out the three M10 cap screws **[20],** and remove the bearing cap **[3]**. **Note -** liquid gasket is used to seal between the bearing cap and the sideplate. This seal will have to be broken to remove the bearing cap.

SIDEPLATE INSPECTION

1)
Draw out the bearing **[9]** from the sideplate **[2]** this should be a slide fit.Check the bearing for any wear or damage and replace if necessary.

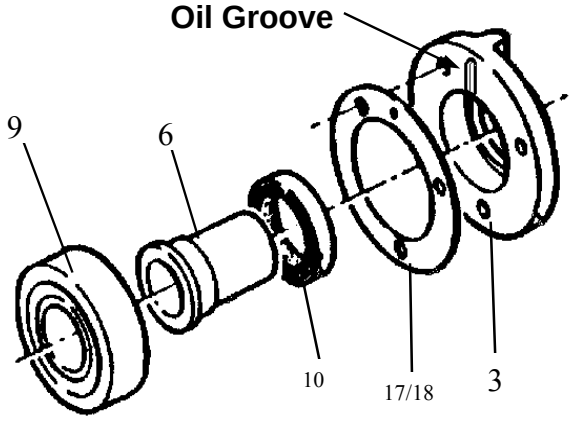
2)
Check the machined face of the sideplate for any damage or wear. The sideplate can be re-ground flat by as much as **5/1000" (125 µm)**. If damage is more severe, the sideplate must be replaced. When re-grinding, a bearing cap shim will have to be fitted to compensate for the amount of material removed. These shims are available in **2/1000"** and **5/1000" (50 and 125 µm)** sizes. The sideplate clearance must then be measured when the sideplate is rebuilt.

3)
Remove any old sealant from the machined face and clean sideplate thoroughly. Blow the oil way hole in the sideplate through from both ends to ensure there is no foreign matter blocking it.



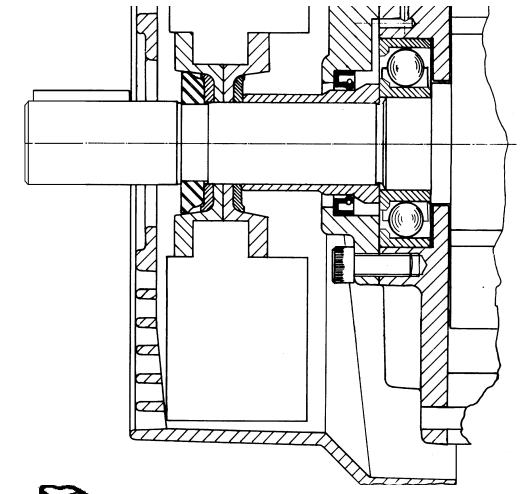
BEARING CAP INSPECTION

1) Check the oil seal **[10]** for any wear or damage. Generally it should last 1500 hours running time or approx. 6 months.
2) Clean up the machined face to remove the old sealant, and make sure the oil way groove is clear.
3) To replace the oil seal, tap out the old one from the bearing cap using a drift.
4) Check the oil sleeve [6] for any wear or damage and replace if necessary.



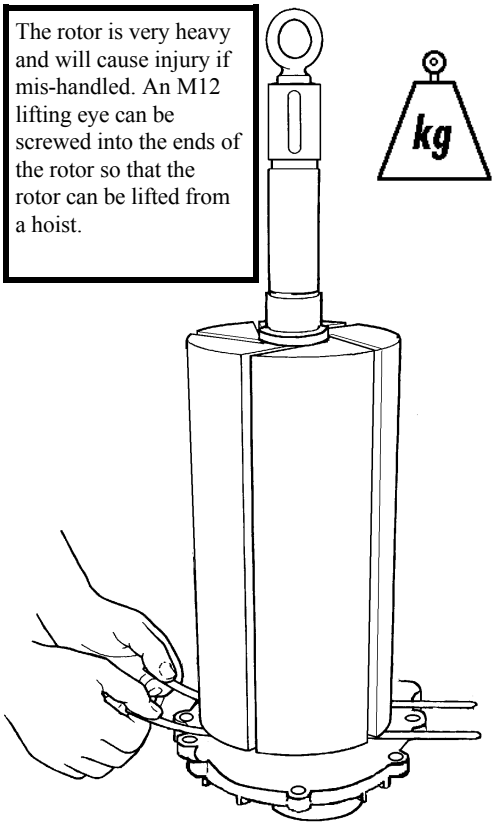
REBUILDING THE SIDEPLATE

- Blow the oil way hole in the sideplate through from both ends to ensure there is no foreign matter blocking it.
- Remove any old sealant from the machined face and clean sideplate thoroughly.
- Before re-fitting the bearing clean thoroughly then oil it.
- Slide bearing into the sideplate so that the thrust side - which has the writing on - faces away from the sideplate
- Lay the bearing cap on a clean and flat surface.
- Fit the new oil seal with the lip and spring facing up - i. e. facing the rotor.
- Locate the oil sleeve through the rotor side of the oil seal.
- Apply loctite around the machined face of the sideplate bearing aperture - ensure this does not contaminate the bearing.
- Fit the bearing cap [3] to the sideplate with the oil groove in the bearing cap lined up with the oil hole in the sideplate.
- ***Note*** - If a bearing cap shim is used, the hole in the shim must be aligned with the oil groove in the bearing cap.
- Fit the three M10 cap screws [20] and tighten to the correct torque.



SIDEPLATE CLEARANCE SETTING

The rotor is very heavy and will cause injury if mis-handled. An M12 lifting eye can be screwed into the ends of the rotor so that the rotor can be lifted from a hoist.



SETTING PROCEDURE

1) The sideplate clearance is measured with the correct ends of the rotor located in their corresponding sideplates as shown.
Ensure the rotor is fully home in the sideplate by tapping the free end with a hide mallet,then remove the lifting hook from the lifting eye.

2) With two feeler gauges, one each side of the rotor shaft as shown, check the clearance. ***Do not check the clearance with only one feeler gauge.***

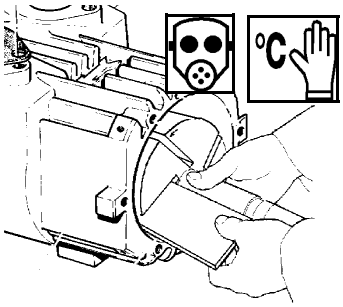
Allowable Clearance is
Min. = 5/1000" (125 µm)
Max. = 7/1000" (175 µm)

3) To increase the clearance, add shaft shims **[13 or 14]** to the rotor shaft - care will have to be taken when lowering the rotor back into the sideplate, to prevent the shim catching.
To decrease the clearance add a bearing cap shim **[17 or 18]** between the sideplate and the bearing cap.

4) Mark each sideplate "***CW***" or "***AC***" to identify which end of the rotor the clearances were set to.

BLADE INSPECTION

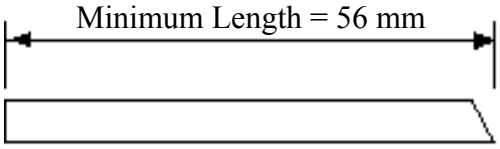
1) Safe Blade Removal



- Remove sideplate assembly and draw out blades. ***Blades may still be hot after use.***
- **New blades are now manufactured with asbestos-free material.** However some machines may still have blades which contain asbestos materials. Such blades must not be cut, machined or re-shaped on an abrasive surface in any way. Inhalation of dust fibres from any machining of these blades, can cause serious damage to health. If in doubt, please contact MOUVEX.

2) Blade Wear

Check the length of each blade, if worn below the minimum length a new set of blades should be fitted.



3) Defects

When checking blades, look for the following symptoms

- Chipped blade tips
- Cracks in the blade tips due to burning.
- Dry patches
- Heavy wear on the ends (this is more visible on on the sideplates).
- Bent or twisted blades.
- if these symptoms are present, refer to the faults and remedies.

4) Blade Breakage

Whenever there has been a failure involving blades breaking, always

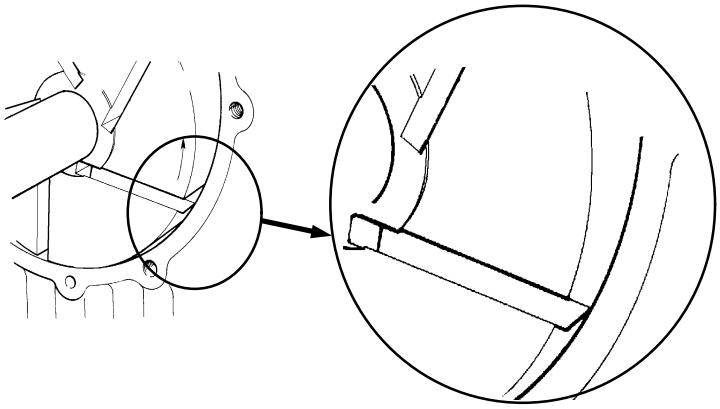
- ensure blade debris is completely removed before putting a new set of blades in.
- ensure reason for blade failure has been established.
- ensure valves are set correctly and pipe work is drained and cleaned.
- check the body and rotor for any damage.

5) Disposal

All asbestos waste must be disposed of at an authorised site.It must be suitably packed, sealed polythene in bags and labelled in accordance with the latest asbestos regulations.

6) Storage

Blades should be kept covered up and coated with a film of oil at all times.
Store on a clean flat surface in a dry atmosphere.



7) Blade Renewal

When replacing blades take care that the blades are put in the correct orientation. The knife edge should be in contact with the bore.

ROTOR INSPECTION

1) Rotor Removal

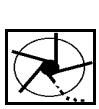
Remove rotor from the body carefully. The rotor is very heavy and will cause injury if mis-handled.

2) Rotor Care

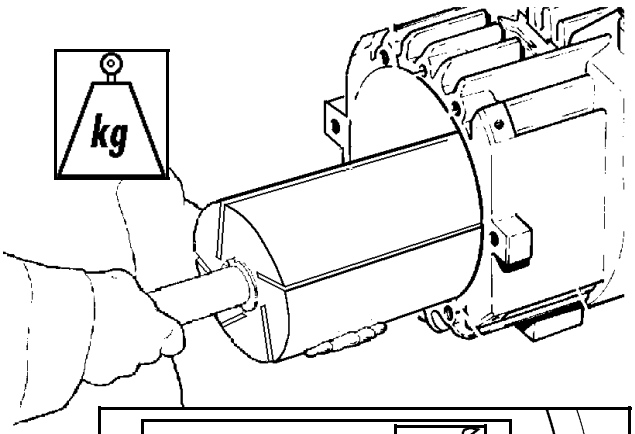
Once the rotor has been removed, rest it in safe place where it cannot roll away and cause damage. Protect the rotor from being damaged and clean thoroughly. Check rotor slots for damage or bruising. Blades should slide freely in the slots. Damage or bruising to the slots should be filed off.

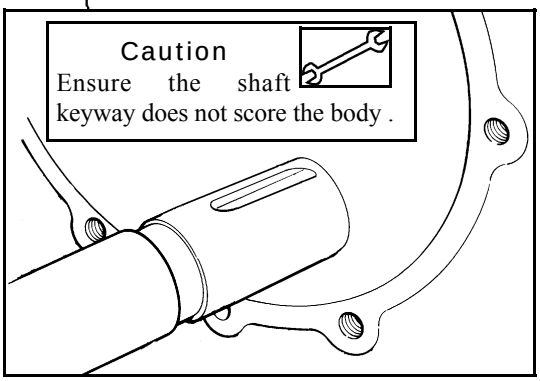
3) Blade Breakage

If the vacuum pump has failed due to broken blades and or a carry-over , the rotor may have bent. We recommend that the rotor is mounted on vee blocks and checked for run-out - if in doubt consult MOUVEX.



Rotor Run Out (measured on Vee Blocks)	
Max.	4/1000" (0.100 mm)





BODY INSPECTION

1) Inspection

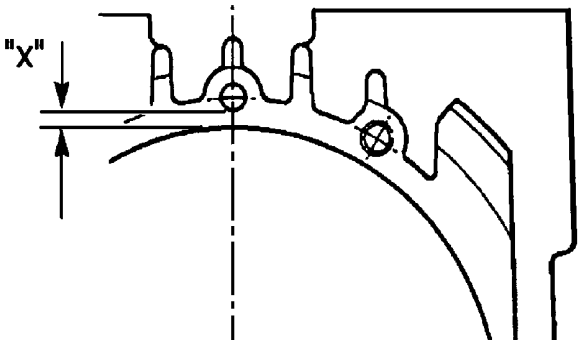
Clean body thoroughly. The bore of the body should be checked for:

a) Cracks

b) Corrugation - This will appear as a series parallel lines either partially or completely around the bore These will have to be honed out even if this corrugation light and cannot be felt.

2) Re-honing

The honing allowance is approximately 1mm on the diameter. However, to measure how much material can be honed it is best to measure "x"- this is the amount of material between the dowel pin hole at the nip and the actual bore of the body.



Nip Measurement "X"		
Max. Size	***Min. Size***	
	High Pressure Use (up to 1.0 Bar g. pressure or 0.82 bar vac.)	Low Duty Use (less than 0.8 Bar g. pressure or 0.7 bar vac.)
9.57 mm	9.37 mm	9.17 mm
Actual Nip Gap Size Between Rotor and Body		
Max.		Min.
0.150 mm		0.250 mm

STEP 1

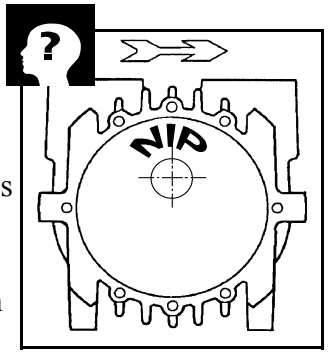
- Stand the body **[1]** onto its port flanges on a clean bench
- Tap the four dowel pins **[19]** into the body - two each end. ***The dowels pins must not be left in the sideplates.***
- Fit a new body shim **[15 or 16]** only if one is required. Body shims are required if the float is too low. If in doubt, measure the length of the rotor, the length of the body and the sideplate clearance for both sideplates.

Float Calculation

Body Length = ***a***
Rotor Length = ***b***
Total sideplate clearance (both ends added) = ***c***
Float = ***d*** =***a*** -(***b***+***c***)
Max.***d*** = 400 µm
Min ***d*** = 200 µm

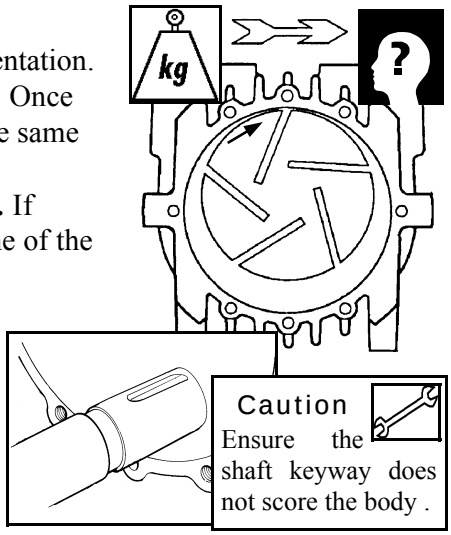
STEP 2

- Fit one sideplate assembly to the correct end of the body. ***These should already have been marked "cw" or "ac" when the clearances were set with the rotor.***
- Ensure the sideplate orientation is the right way up - the rotor axis will be towards the nip.
- Smear a small amount of copper slip into the bores of the distance sleeves and the bearing inner races to prevent any possible corrosion which may occur and to aid future dismantling,



STEP 3

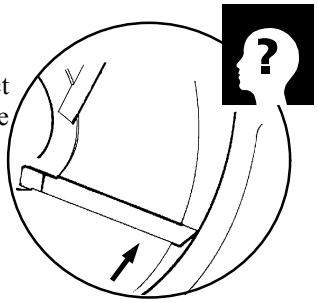
- It is important to place the rotor in the body in the correct orientation. Before picking the rotor up, check which rotation each end is. Once fitted, the arrow stamped on the rotor ends, should point in the same direction as the arrows cast on the body.
- ***The rotor is very heavy and will cause injury if mis-handled.*** If necessary use lifting equipment or another person to take some of the weight.
- ***Ensure the correct end of the rotor goes in first. The clockwise end of the rotor should be placed into the body from the anti-clockwise end*** (and vice versa). From the opposite end of body, lay the rotor in the bore. ***Avoid damaging the bore*** by keeping the shaft key way facing upwards.Once the rotor is fully onto the bore, slide it through the sideplate.



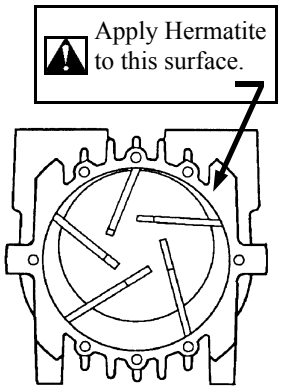
STEP 4

1) Lightly oil the blades then slide them into the slots.

2) When replacing blades take care that the blades are put in the correct orientation. The knife edge should be in contact with the bore and point the same direction as the arrows on the body and on the ends of the rotor.



STEP 5



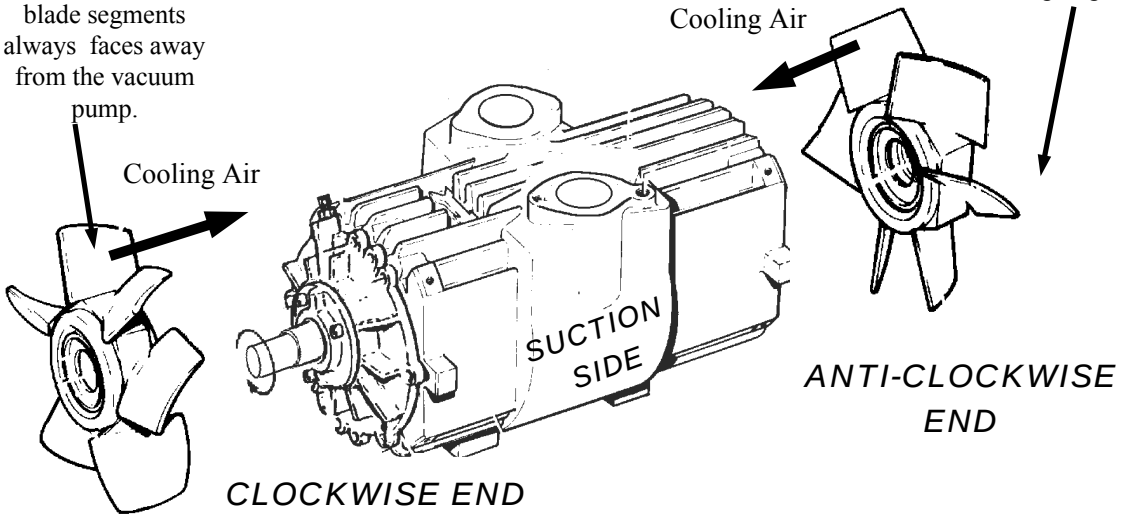
- Apply Hermatite to the sealing face of the body. This should be applied to
- form a continuos seal around the body, circling the six bolt holes and two dowels.
- **Avoid getting Hermatite inside the vacuum pump.**
- Apply copper-slip to the oil seal sleeve and bearing bores of the second sideplate.
- Slide the sideplate over the rotor shaft and lift the rotor shaft slightly to locate the sideplate onto the dowel pins. Insert the six M10 cap screws [20] and tighten to a torque of 35 Nm.
- Turn the vacuum pump over onto its feet.
- ***The assembly is very heavy and will cause injury if mis-handled.***

STEP 6

- Now fit the cooling fans onto the rotor shaft.

If the blade segments fell apart whilst the fan was removed, they must be put back together and held in place by the thrust sleeves **[7].** Notice that there is a clockwise and an anti-clockwise fan. The blade segments are not interchangeable, therefore care must be taken to build the fans correctly and to put them on the right end of the vacuum pump and facing the same direction.

Convex side of the blade segments always faces away from the vacuum pump.



- Refit the split sleeves **[8]**. **Ensure these are fully in the recess in the rotor shaft.**

Ensure the M8 cap screws **[22]** are located in the thrust sleeve recess and then tighten the to a torque of **15 Nm**.

Step 7

- Replace the drive and non-drive end covers, and secure with the M8 cap screws **[22]** tightened to a torque of **20 Nm**.
- ***Ensure the cowls are fitted to the correct ends to suit the direction of the drive.***
- Running the vacuum pump in the wrong direction will cause damage and will not be covered by warranty.

REVERSE FLOW VALVE OVERHAUL

1) Seal Renewal

- Take out four M10 cap screws and remove the valve assembly from the vacuum pump.
  Note - The vacuum pump may still be hot after use.
- Unscrew the M16 nut **[30]** and remove th **[32].**
- Using circlip pliers, and remove circlip **[28].**
- Draw out the plug valve **[21].**
- Clean out the bore inside the body **[18]** and also the plug valve.
- Remove the 'o' ring seal **[24],** and replace with new.
- Lightly grease the 'o' ring seal before locating the plug valve into the valve body aperture. Slide it in and ensure the 'o'ring seal does not pinch on the casting.
- Locate the handle in the top of the plug valve and secure with the M16 nut.

2) Air Kit Maintenance

Check regularly that the air cylinder is operating i.e. pushing / pulling the plug valve handle to the extreme positions.

3) Check Valve Maintenance

- Turn reverse flow valve over and prise out the check valve seat **[22]**.
- Remove check valve **[23]** from body **[18]**, this should be a loose fit inside the casting. Examine the check valve for any damage, wear or coating of burnt oil. Ensure it is free to slide in the body casting. ***Note*** - the check valve may be made from material which contains asbestos. It must not be cut, machined or re-shaped on an abrasive surface in any way. Inhalation of dust fibres from any machining of these blades, can cause serious damage to health. If in doubt consult MOUVEX.
- Clean out the casting and replace check valve into the hole ***open end first.***
- Replace check valve seat into the recess in the in the body.
- Turn valve body over.
- With new gaskets **[27]** placed on the ports of the vacuum pump, locate the reverse flow valve over each port - check valve goes over discharge port - then secure with the four cap M10 screws.

COMMISSIONING

1) Re-install Vacuum Pump

Check for:

- Correct Rotation of vacuum pump with respect to the drive.
- Correct orientation of vacuum pump with respect to the pipe work.
- Correct coupling alignment.
- Ensure the vacuum pump is isolated from the vacuum tank.
- Check for any noise due to rubbing fans or guards etc.

2) Gauges

Fit a pressure gauge to the "discharge" port of the vacuum pump and a vacuum gauge to the "suction" port.

3) Start-Up Vacuum Pump

- Run vacuum pump following the "Start-Up Procedure" in the Operation Instructions. ***Do not shut the vent valve off yet.***
- Select the vacuum position on the combination reverse flow valve if one is fitted.

4) Check List

- Check the speed
- Re-check the rotation is correct.
- Check the vacuum gauge if this is reading greater than 500 mbar a blockage exists and must be rectified.

5) Vacuum Test

- Isolate the pipe work from the tank by closing off the travel valve.
- Slowly shut the vent valve off and observe the reading on the vacuum gauge fitted to the vacuum pump, ensure the vacuum does not exceed 0.82 mbar .
- Adjust the vacuum snifter valve so that the max. vacuum does not exceed 0.82 bar (gauge).
- (This fitted to the combination valve or the on the bottom of the pressure / vacuum valve assembly).
- After 40 mins open the vent valve. In case of operation, in intermitent operaton only, set the snifter to 0,95 bar and open the vent valve after 15 minutes.

6) Shut-Down

Shut system down following "Shut-Dow" in the Operation Instructions.

1) Lubricating Accessories

MOUVEX can supply the following types of oil lubricating systems :

1) ***Drip-Feed Standard Oil Tank*** -This is a self-contained pressurising system, taking pressure and vacuum from the machine.

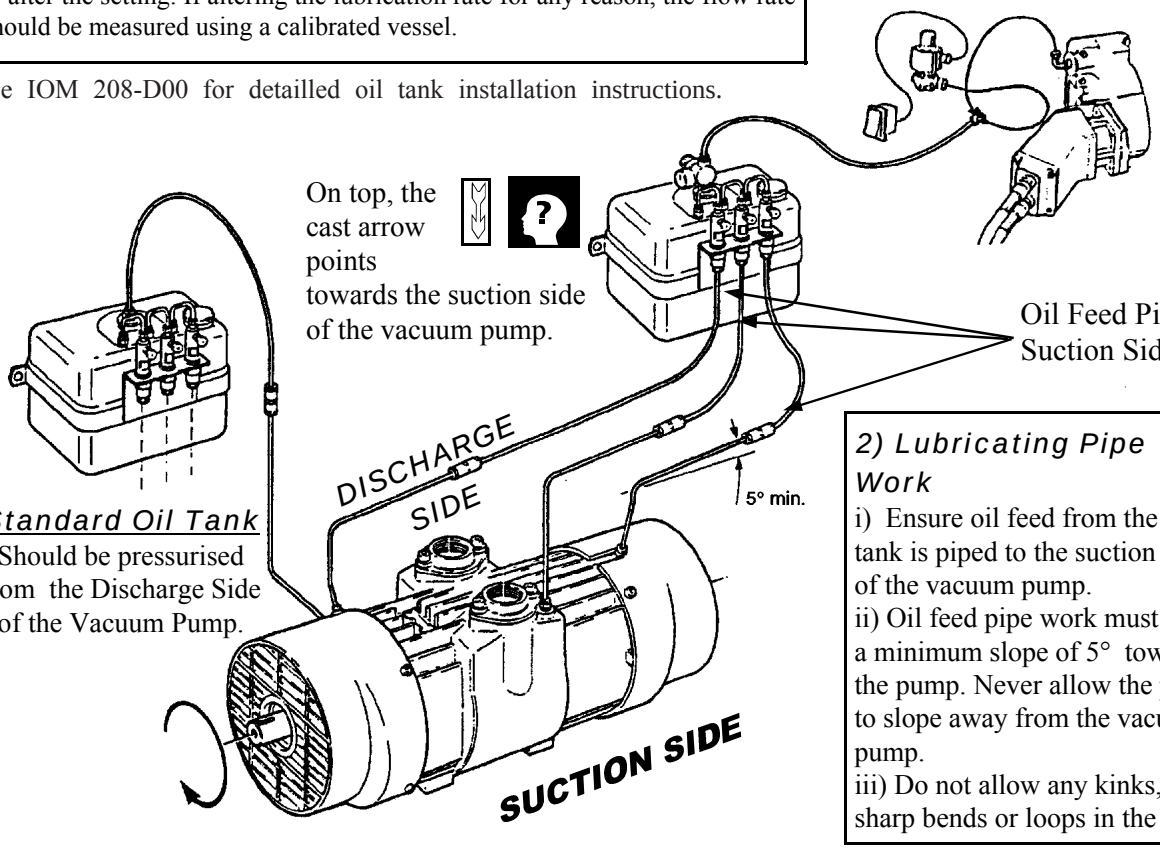
2) ***Drip-Feed Pressure Regulated Oil Tank***-This system requires air from the ***P.T.O. supply only.***

3) ***Positive Displacement Oil Pump***-This is a mechanical pumping system mounted directly onto the vacuum pump.Oil pumps are supplied set to the max. flow rate required for this vacuum pump. Normally it is not necessary to alter the setting. If altering the lubrication rate for any reason, the flow rate should be measured using a calibrated vessel.

Pressure Regulated Oil Tank

Should Be Pressurised from P.T.O. Air Line **Only.**

See IOM 208-D00 for detailled oil tank installation instructions.



<u>*Standard Oil Tank*</u>

Should be pressurised from the Discharge Side of the Vacuum Pump.

2) Lubricating Pipe Work

i) Ensure oil feed from the oil tank is piped to the suction side of the vacuum pump.

ii) Oil feed pipe work must have a minimum slope of 5° towards the pump. Never allow the pipes to slope away from the vacuum pump.

iii) Do not allow any kinks, sharp bends or loops in the pipe.

3) Lubrication Rates

Note: The lubricating of these vacuum pumps is a total loss system, the oil gets expelled by the pump. This relies on the air flow to carry the oil out. The following points should be noted:

1) Do not allow the expelled oil to drain back into the vacuum pump.

2) If running for more than an hour a high on vacuum, ensure the pump is regularly run, (every 30 mins mins.), for 5 mins. with the vent valve open to carry the oil away. and cool the vacuum pump.

	Adjustment	Flow Calibration	Max Rates	
			1500 rpm	1000 rpm
Lubricating Oil Pump	Factory set.	cc/min.	3	2
5 Litre Oil Tanks Standard or Pressure Regulated	Turn needle valve anti - clockwise to increase flow	Drops per min. per lubricator	30	20

Use SAE 20 / ISO 68 Mineral Oil	
Shell	Corena S68
BP	Energol RC 68
ESSO	Exxcolube 68
TOTAL	Cortusa 68
MOBIL	Rarus 426

Machinery Directive

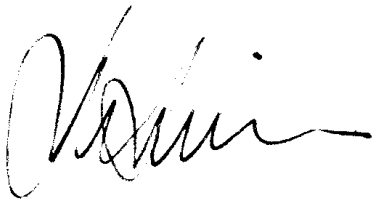
(89/392/EEC amended by 91/368/EEC, 93/44/EEC and 93/68/EEC)
Declaration of Incorporation
(In accordance with Article 4.2 and Annex IIb of the above EEC directive)

We declare that the RAL 485 oil-lubricated rotary vane vacuum pump / exhauster, is capable of working within the following parameters.

MAX. FLOW (M^3/HR F.A.D.)	MAX. PRESSURE (BAR GAUGE)	MAX. VACUUM (BAR GAUGE)	MAX. SHAFT POWER (KW) @ 1500RPM @ MAX PRESSURE	MAX. SPEED (RPM)
450	1.0	0.82	18	1500

Installation of this machine must be in accordance with the instructions which are included in our **Customer Service Manual,** and must not be put into service until the machinery into which it is incorporated has been declared to conform with the **Machinery Directive.**

Signed on behalf by :-



Mr. Jonathan Simms
Production Manager