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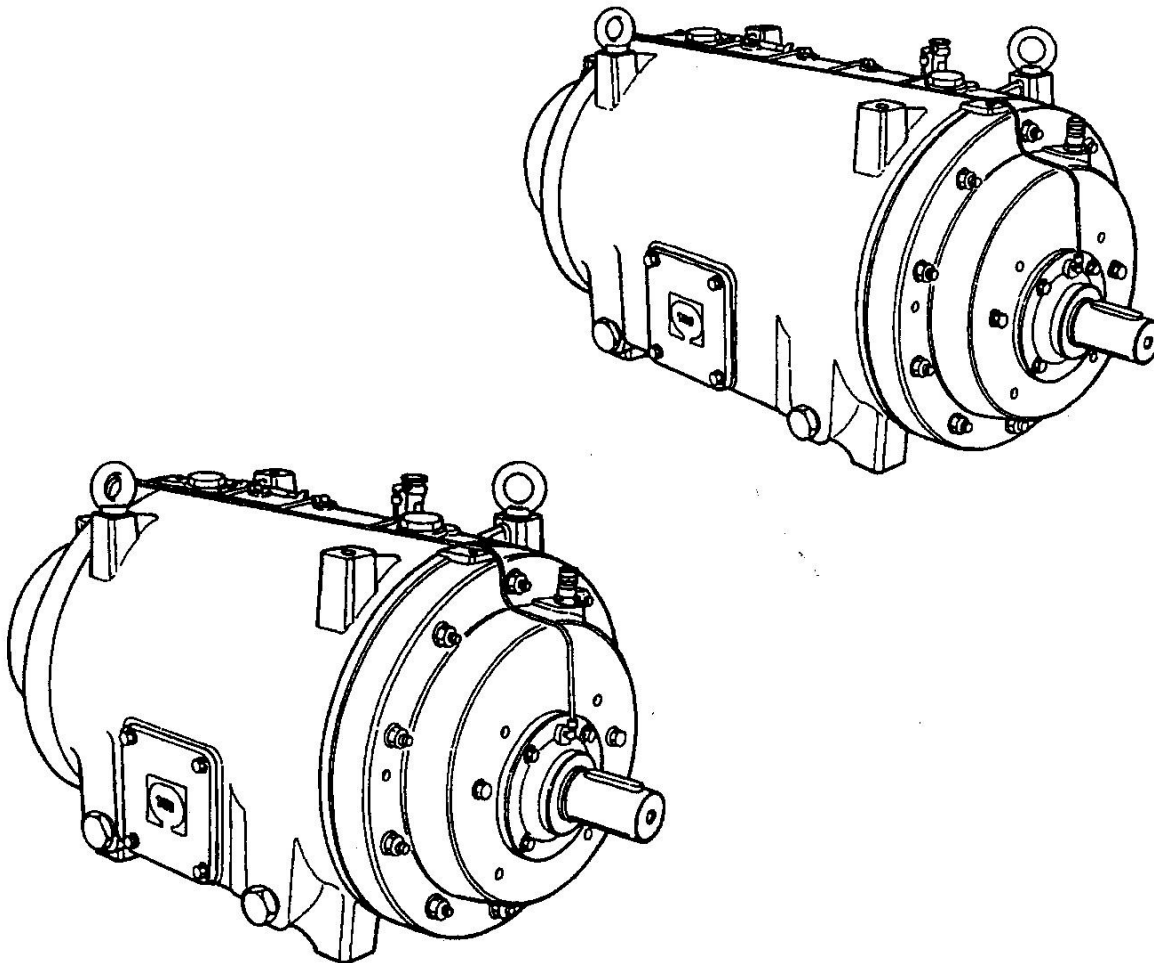
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# **MANUAL FOR VACUUM PUMP HM36 AND HM46**

## **PRESENTATION**

The vacuum pumps produced by **Allestimenti Pompe Moro S.p.a.** have a great tradition of reliability, long life and versatility. They are available with various flow rates, types of operation and cooling.

The principle of rotation volumetric operation with vanes ensures that high degrees of vacuum are reached and allows a vast field of application.

Industrial users of vacuum pumps require safe, constant running at a high vacuum for long periods.

To satisfy this need, **Allestimenti Pompe Moro S.p.a.** has developed a unique technology of liquid cooling even in the rotor, thus keeping lower temperatures inside the pump. This is to the advantage of the lubrication, the vanes and the seals, thus allowing use in harsher conditions.

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In order to improve the product, the manufacturer reserves the right to modify and update this publication without notice.

## **INTRODUCTION**

For good operation of the vacuum pump, carefully read these instructions for use. This manual can help you solve all the problems that arise during assembly and use of the vacuum pump.

We recommend that you always keep the manual in the vicinity of the vacuum pump.

This manual is an integral part of the product. **Keep this manual with care for future consultation.**

Δ The user of the vacuum pump must be informed of the contents of this manual.

Δ The manufacturer cannot be held responsible for any damage due to incorrect, erroneous or unreasonable use.

## STORAGE

To keep the vacuum pump correctly, it must be stored as follows:

- indoors, sheltered from external atmospheric agents;
- in a horizontal position, standing on its four feet.

During inspection, the vacuum pumps are lubricated in our factory with a particular oil which guarantees preservation of the various internal components for about 6 months.

**In the event of prolonged storage, we advise flushing the inside of the pump with Diesel fuel and oil (see page 25), checking and , if necessary, changing the gaskets.**

### PERFORMANCE

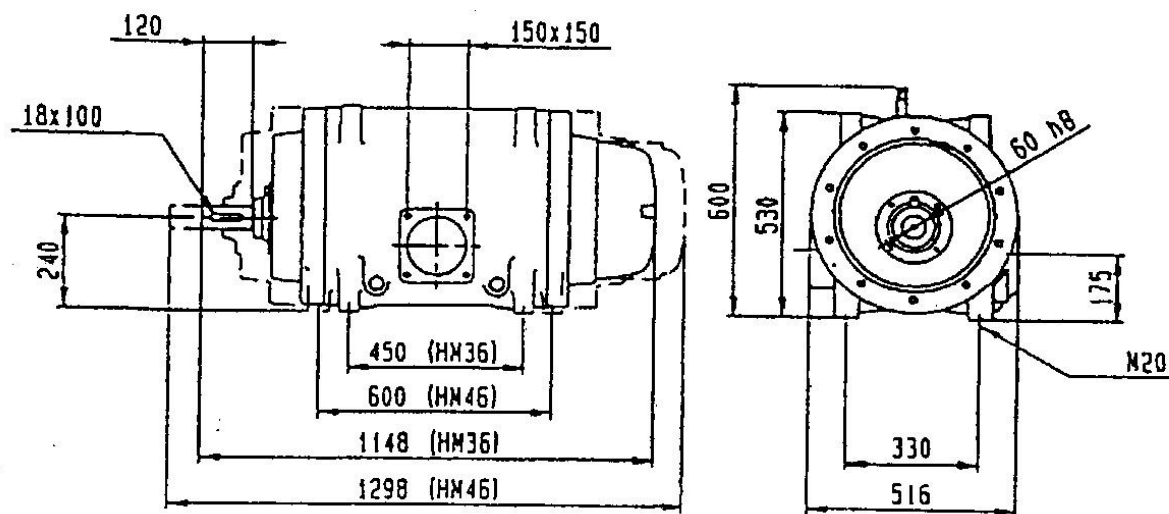
### HM36

### HM46

1- Flow rate with free suction	m3/h	2130	2790
2- Flow rate with suction in 50% vacuum	m3/h	1920	2400
3- Maximum vacuum	%	97	97
4- Maximum pressure	bar	1	1
5- Rated pressure	bar	0.5	0.5
6- Absorbed power at maximum vacuum	kW	49	56
7- Absorbed power at rated pressure	kW	52	63
8- Rotation speed (direct coupling)	r.p.m.	900/1000	900/1000
9- Rotation speed (with multiplier)	r.p.m.	900/1000	900/1000
10- Oil tank capacity	g/h	280	320
11- Oil consumption	h	35	31

**Fig. 1 - DIMENSIONS - DIMENSIONS - ABMESSUNGEN - DIMENSIONI**

Weight / Poids / Gewicht / Peso. HM 36: 600 kg. - HM 46: 720 Kg.



## PACKING

The vacuum pump is supplied without packing. Special packing may be supplied on request, such as:

- cardboard box;
- wooden base and shrink-wrap for single packages;
- wooden crates and shrink-wrap.

The packing components (bags, boxes, nails, etc.) must not be left within reach of children as they are potential source of danger.

## LIFTING

Lift the vacuum pump only by the eyebolts.

WEIGHT: See table on page 3.

**Δ Attention:** Do not damage the pipes and oilers when lifting.

## GENERAL PRECAUTIONS

**▲** The warnings marked with this symbol indicate danger to personal safety.

To guarantee maximum safety at work, we recommend taking the maximum care in the operations for which the description is marked with this symbol. This must be brought to the attention of all operators working with the vacuum pump. The vacuum pump must not be used by children, adolescents or persons who are not fully capable.

**⊘** The warnings marked with this symbol indicate danger to environmental safety.

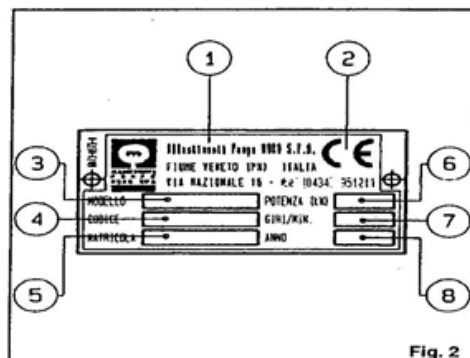
## DATA PLATE

The data plate showing the main technical characteristics is located on the vacuum pump and is always visible.

**▲** When purchasing the product, ensure that it has a plate. If not, immediately notify the manufacturer and /or the dealer.

Appliances without a plate must not be used, otherwise the manufacturer declines all responsibility. Products without a plate must be considered anonymous and potentially dangerous.

- 1-- Manufacturer
- 2—"CE" mark
- 3--Model
- 4--Model code number
- 5--Pump serial number
- 6--Max. absorbed power
- 7--Max. rotation speed (rpm)
- 8--Year of manufacture



## CORRECT USE

**▲** The vacuum pump has been designed especially for the suction and compression of filtered air. All other uses are to be considered improper.

## INSTALLATION

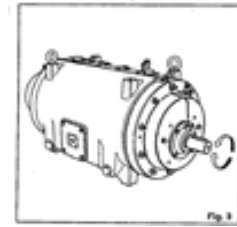
▲ **LIFTING**---Lift the vacuum pump only by the eyebolts!

Allistimenti Pompe Moro S.p.a. has a list of all the elements necessary for correct installation of the vacuum pump.

**Checking on delivery**- Fig. 3-All the accessories listed on the delivery note must be checked on arrival to ensure that they are in perfect working order.

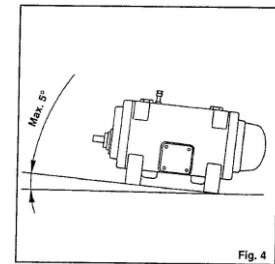
The vacuum pump must not have been damaged during transport.

Check the shaft by hand to ensure that it turns easily.



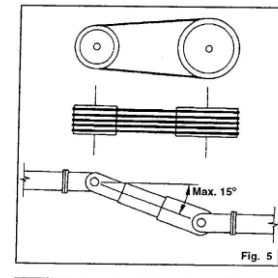
**Assembly of the vacuum pump**---The assembly position on the vehicle must be easily accessible and protected from stone chippings and all other objects that could damage the vacuum pump. Leave enough room for all the pipes of the suction and discharge system and to allow free circulation of the cooling air.

**Alignment of the vacuum pump**- Fig 4-The vacuum pump is usually secured to the chassis of the vehicle or on a special bracket. The transmission must rotate in the direction indicated with the arrow on the pump. Avoid violent blows to the pulley, the cardan shaft and the coupling. The couplings must be exactly aligned. The vacuum pump must be mounted horizontally, the maximum tolerance is an inclination of 5degree.



**Transmission elements**-Fig 5-The transmission may be made by means of a cardan shaft, pulley or coupling. The pulley must be directly connected to the shaft of the vacuum pump, taking great care in assembly:

- The axes must be parallel, to avoid a different load on the belts;
- The pulleys must be aligned, to avoid an excessive axial load on the shaft of the vacuum pump.



▲ The pump pulley cannot be used as a drive for other mechanisms.

For transmission with a cardan shaft, do not exceed the max. shaft inclination of 15 degrees.

- The transmission parts must not be coupled by hammering them.

**Suction pipes**—Avoid installing pipes subject to internal corrosion. When assembled, the pipe must be clean on the inside; accurately remove all welding slag, filings, rust or other foreign bodies.

**Preventing the suction of liquids and foreign bodies**—The vacuum pump must be protected against the suction of liquids or foreign bodies by means of a safety valve with an automatically closing float and a suitable safety filter. Any intake of liquids or foreign bodies could cause breaking of the vanes, the shaft or the pump body. For this reason **Allistimenti Pompe Moro S.p.a.** has prepared a double protection.

**No return valve (optional)**—A no return valve must be fitted on the vacuum pump's discharge outlet. A special **Allistimenti Pompe Moro S.p.a** valve has been designed for the HM-type decompressors: this valve works by closing automatically when the pump is stopped, thus preventing liquid from returning. The **Allistimenti Pompe Moro S.p.a** no return valve must be fitted between the vacuum pump's forcing outlet and the delivery pipe.

**Four-way valve (optional)**—switch valve, fig 7—In circuits where both vacuum and pressure must be created, a four-way valve must be fitted which, with a simple movement, enables the tank to communicate either with the suction inlet, or with the forcing outlet of the vacuum pump.

**Allistimenti Pompe Moro S.p.a's** list of products features a four-way valve which is particularly suitable for HM-series vacuums.

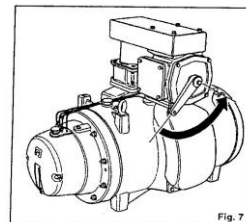
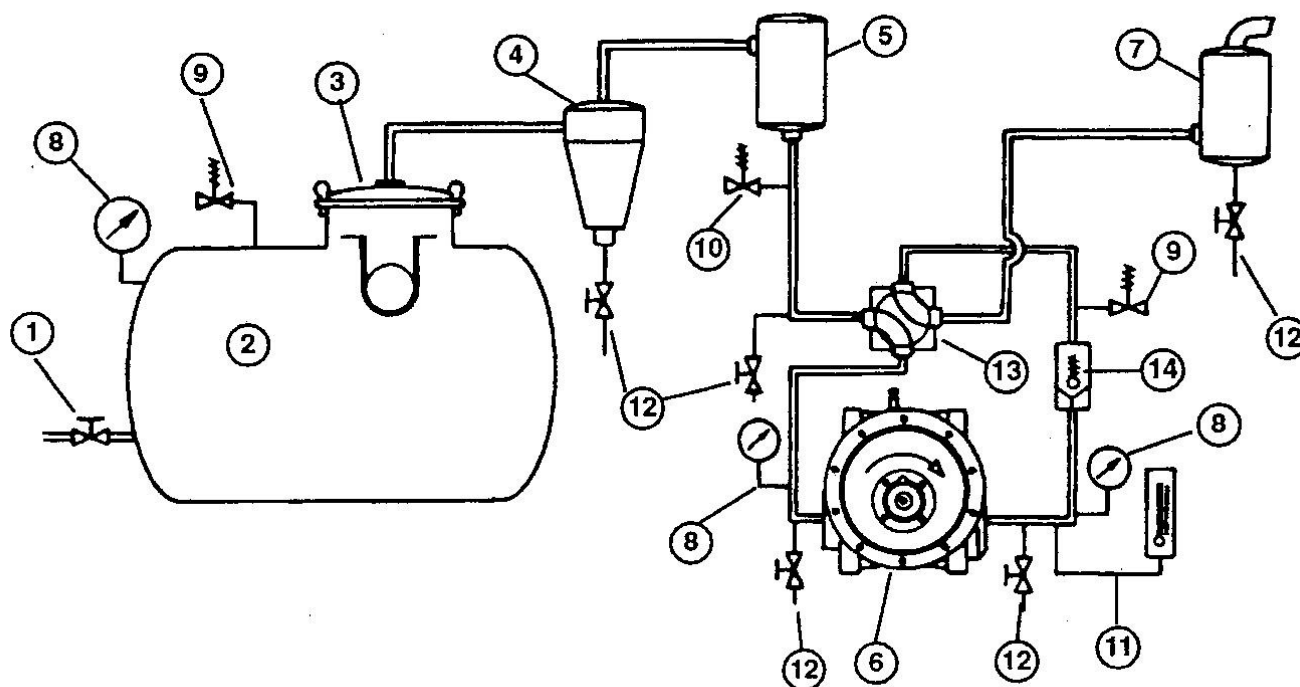


Fig. 7

- ▲ Operate the four-way valve by means of an oleodynamic or pneumatic actuator. If operating it by hand, wear gloves.
- ▲ During installation, leave sufficient space for air to circulate around the vacuum pump so as to allow cooling.

### INSTALLATION DIAGRAM



- 1-Suction pipe with shutter
- 3-Manhole with float valve
- 5-Safety filter
- 7-Discharge filter
- 9-Maximum pressure valve
- 11-Thermometer
- 13-Switch valve

- 2-Tank
- 4-Cyclone filter
- 6-Vacuum pump
- 8-Pressure gauge
- 10-Safety valve
- 12-Drainage cocks
- 14-Non-return valve

Principal pipes (in a double line) min. 6"

- ▲ The thermometer (pos.11) must be installed immediately after the pump. (Max. distance 50mm.)

## LUBRICANTS

▲ The vacuum pump is supplied without oil. Fill it before use. (See table of technical characteristics on page 3.)

Check the level of the disposable oil in the vacuum pump from time to time by means of the level gauge (fig.9)

**Pre-lubrication** –fig. 10-The vacuum pump must be manually pre-lubricated before it is started up for the first time in the day, and every time it is washed internally.

In order to carry out the pre-lubrication, proceed as follows:

- Insert the crank provided in the oil tank opening and engage it on the shaft of the lubricating pump, pushing until the drive key clicks into place. Pre-lubricate normally until at least 40 drops have fallen from the oiler (or 40 turns of the crank).
- When finished, remove the crank and screw the tank cap back on.

**Additional lubrication**-fig. 11

- Vacuum pump
- Air flow
- Tap
- Extra oil tank

To allow correct lubrication of the vacuum pump even in the first minutes of cold operation, it is advisable to install an extra external oil container and to connect it to the pump intake by means of a pipe with a tap.

When starting, turn on the tap and let about 0.2-0.3 kg of oil flow freely into the pump, then turn off the tap.

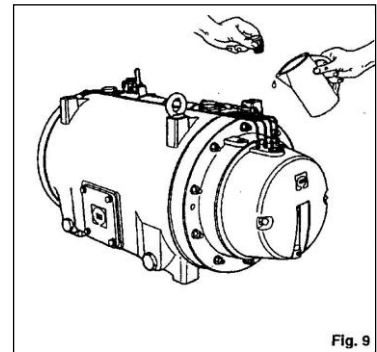


Fig. 9

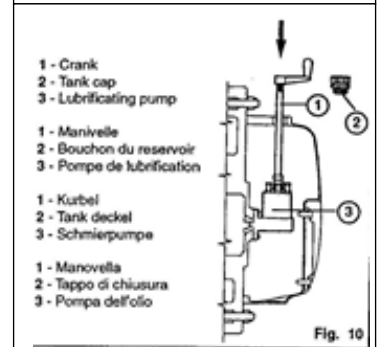


Fig. 10

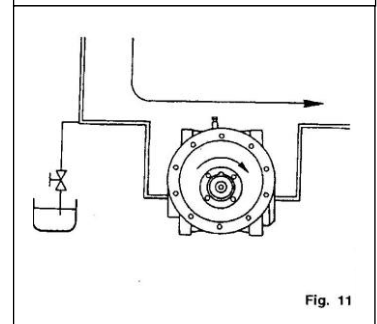


Fig. 11

## RECOMMENDED OILS

**Summer-- SAE 40**

**Winter ---SAE 30**

Use SAE 50 for temperatures above 40 degrees C and SAE 20?W40 for temperatures below 5 degree C.

Pay great attention to extremely low temperatures; in this event, contact an authorized dealer of **Allistimenti Pompe Moro S.p.a's**.

### **Minimum Specifications Allowed**

API	CD
CCMC	D4
MIL	L-2104 E (level)
MB	227.0 (monograde)
MB	227.1 (mutigrade)

▲ Use only HD oil.

## COOLING the VACUUM PUMP

Fig 12

The vacuum pump is liquid-cooled.

▲ We advise using a non-pressurized closed circuit with forced circulation as in fig. 12.

### Vacuum pump cooling system

The cooling system consists of a tank (250 lt.), a heat exchanger (50000 kcal/h with a temperature change of 30°C and a flow of 60 lt. /min) and 1/4" pipes and couplings, as shown in figure 12.

In order to ensure the cooling system is used properly, the following recommendations must be observed:

- Place the tank (with loading cap) in a position which is higher than the heat exchanger and the water pump.
- Position the heat exchanger so that the decompressor's water outlet pipe and the heat exchanger's inlet are always at an uphill slant, avoiding elbows pointing downwards.

▲ The temperature of the cooling fluid must never exceed 70°C. In the event of overheating of the cooling fluid, it is advisable to run the vacuum pump with free suction until the temperature of the fluid falls, then stop the vacuum pump and leave for about 1 hour.

If necessary, contact an authorized dealer.

▲ If the vacuum pump is used in harsh conditions or for continuous duty, use an extra powerful cooling system:  
Contact a **Allistimenti Pompe Moro S.p.a.** authorized dealer.

**Allistimenti Pompe Moro S.p.a.** has all the elements needed to make a system corresponding to the one shown in the figure and declines all responsibility for overheating or damage due to systems not complying with the above indications.

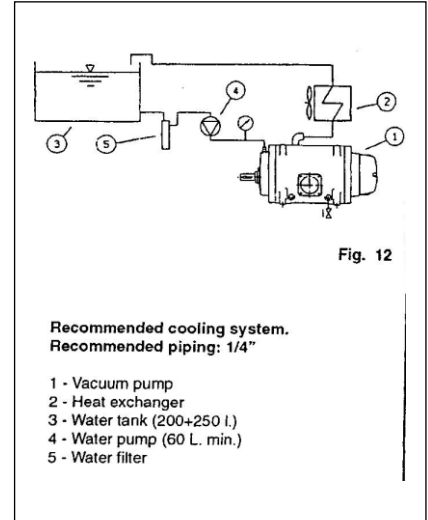
▲ The pressure in the system must not rise above 0.7-0.8 bar.

If a higher pressure is found, proceed as follows:

- Ensure that the system is not under pressure.
- Use pipes with a larger diameter, shorter pipes, or with less curves.
- Ensure that the system elements are not clogged.

### COOLING LIQUID

Water has to be mixed with 5%-10% of transparent soluble fluid oil (e.g./SHELL LUTEM OIL MULTIMENTAL or equivalent).





## ANTIFREEZE FLUID

As cooling fluid the vacuum pump uses a mixture of water and antifreeze as shown in the following table:

Outside temperature °C	Antifreeze %
Down to -10°	5
Down to -20°	35
Down to -30°	45
Down to -40°	55
Lower than -40°	Apply to an Authorized Dealer

▲ Never use mixtures of water and less than 5% antifreeze as coolant and certainly not water alone.

▲ If the vacuum pump is to remain unused for long periods, remove the cooling fluid by means of the drainage cocks provided.

## STARTING THE VACUUM CIRCUIT

- Ensure that the level of the disposable oil in the tank for the vacuum pump is never lower than the minimum shown; fill up if necessary.
- Check the cooling fluid level.
- Open all the shutters and valves.
- Pre-lubricate as indicated
- Start the vacuum pump slowly for a brief period (at about 300rpm) to check the direction of rotation.

▲ Check that rotation is in the same direction indicated by the arrow on the pump. If not, contact an authorized dealer or **Allestimenti Pompe Moro S.p.a.**

- Read the pressure gauges to see whether the switch valve is producing vacuum or pressure;
- Drain the steam bubbles through the vents. Fig 13-3

After all this has been checked, the pump is ready to start work.

**ATTENTION:** Never work with a rotation speed slower than 900 rpm, to avoid hammering and over wear of the pump body.

- 1- Coolant inlet
- 2- Coolant outlet
- 3- Steam bubble drainage.
- 4- Water drainage
- 5- Oiler
- 6- Oil tank cap
- 7- Oil level (to the rear)
- 8- Blade wear inspection hole

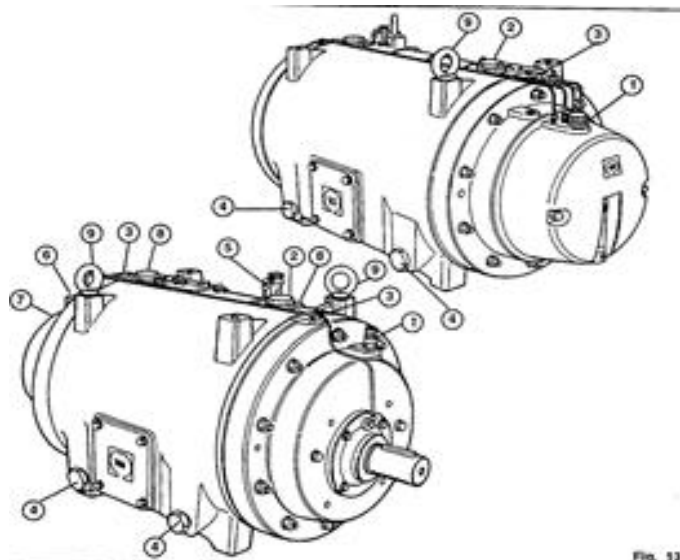


Fig. 13

## **PRECAUTIONS DURING USE OF THE PUMP**

- ▲ During use, **never touch** the pump with your hands: **danger of being burnt.**
- ▲ **The Manufacturer declines all responsibility for damage caused by the failure to respect the instructions for installation, use and maintenance given in this manual.**
- ▲ Do not exceed the maximum rotating speed indicated on the plate see page 3.
- ▲ Keep the rotating speed within the range indicated.

### **PRESSURE**

The working pressure must be kept within the range 0.5 to 1 bar, to prevent overheating of the vacuum pump. The pressure of 1 bar must never be exceeded, to avoid breaking of the vanes.

### **TEMPERATURE**

- ▲ The temperature at discharge of the vacuum pump must never be more than 150°C.  
If the temperature is too high, stop the vacuum pump and let it cool down.

### **MAINTENANCE**

**Only the maintenance jobs authorized in this instruction manual may be carried out by the user.**  
**All other operations are forbidden.**

### **RUNNING IN**

The first 50 hours of actual operation of the pump are the running-in period. During this period, regularly check the consumption of disposable oil, the discharge temperature and the wear of the vanes. Vane wear should be minimum or negligible. If it is excessive, wear must be checked at regular frequent intervals and the phenomenon should be notified to an authorized dealer. In any case, replace the vanes when wear is 15 mm or more. See page 11.

- ▲ It is forbidden to use a pump with more than 15mm vane wear. **Failure to follow this warning relieves the manufacture of all responsibility.**

### **PERIODIC CHECKS**

Periodic checks and maintenance of the machinery are recommended:

**Several times a day:** Check the dripping of oil from the oiler.

**Several times a day:** Check the maximum temperature at discharge.

**Several times a day:** Check the maximum temperature of the cooling fluid.

**Several times a day:** Check the pressure in the cooling circuit.

**Daily:** Check the vacuum and pressure during operation.

**Daily:** Check the level of the disposable oil.

**Weekly:** Clean the filtering elements of all the filters.

**Weekly:** Check the safety valve.

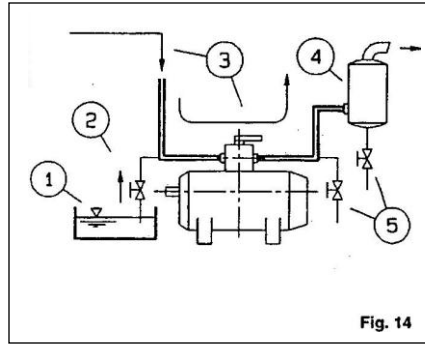
**Weekly:** Clean the heat exchanger in the cooling circuit.

**Monthly (or every 100 working hours):** Check vane wear.

- ▲ **IMPORTANT:** The times indicated refer to normal working conditions. For harsh conditions, decrease the intervals for each operation. Keep the pump clean in order to allow better cooling.

## FLUSHING THE INSIDE OF THE PUMP BODY

- 1 Diesel Oil
- 2 Input pipe
- 3 Free air flow
- 4 Discharge filter
- 5 Drainage cocks

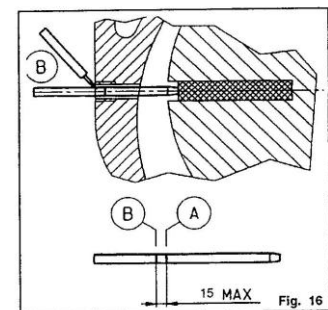
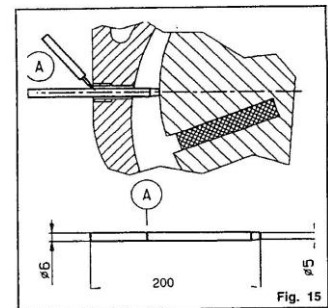


- 1) Switch off the drive system and release the vacuum or pressure from the tank and the suction and discharge system.
- 2) Open the tank shutters. Prepare the system so as to allow the passage of free air through the vacuum pump in the direction going from the tank to the discharge.
- 3) Fill a container with about 2 kg. of diesel fuel.
- 4) With a clamp, connect a rubber hose to the drainage tap upstream from the vacuum pump.
- 5) Immerse the free end of the hose in the container of diesel fuel.
- 6) Start the vacuum pump and check suction of the diesel fuel (about 3-4 min.), repeating the operation if necessary.
- 7) Stop the vacuum pump.
- 8) Remove the rubber hose; drain and clean the pipes and the discharge filter.
- 9) Collect the residue diesel oil and any sludge and dispose of it accordingly.
- 10) When starting up next time, follow the same procedure as for the initial start-up (see page 8), with pre-lubrication and additional lubrication (see page 7).

## CHECKING VANE WEAR

It is possible to check the wear of the rotor vanes without dismantling the pump:

- Remove the hexagonal socket cap, fig 13, page 9
- Insert a rod (diameter 6mm, length 200mm) in the hole as in figure 15.
- Turn the rotor shaft by hand until the rod touches the external diameter of the rotor, figure 15.
- Turn the rotor again until the rod enters one of the slots in the vanes, figure 16.
- Mark the rod with the awl again and measure the difference between the two measurements, figure 16.
- The maximum allowed difference is 15mm. If it is bigger, **all** the vanes must be replaced immediately.



▲ If all the vanes have to be replaced, contact authorized service center.  
Working with a worn vane may cause serious damage to the vacuum pump.  
Failure to follow this warning relieves the manufacturer of all responsibility.  
After measuring, screw the cap on again with sealing paste or Teflon.

**ATTENTION:** When the cap is not fitted, the flow rate and vacuum are reduced.

**IMPORTANT:** For maintenance and/or repairs, use only original spare parts which offer greater quality, reliability and safety. **Failure to use original spare parts relieves the manufacturer of all responsibility.**

## TROUBLESHOOTING

PROBLEM	CAUSES	REMEDIES
Reduced vacuum.	Leakage or partial obstruction in the system components.	Check the valves and elements in the systems.
	The vanes are stuck in their slots.	Flush the vacuum pump with diesel fuel.
	No lubrication.	Check the level of the disposable oil and dripping of the oiler.
Inverse rotation of the vacuum pump, with vacuum in the tank	Non-return valve not hermetically sealed.	Contact an authorized service center.
Excessive continuous knocking noise.	Excessive vane wear.	Change the vanes. Contact an authorized service center.
	No lubrication.	Check the level of the disposable oil and dripping of the oiler.
	The vanes are stuck in their slots.	Flush the vacuum pump with diesel fuel.
	Rotation speed too low.	Increase the number of revs to above 900 rpm.
Overheating of the vacuum pump.	Operation conditions too heavy or continuous.	Let the pump cool. Contact an authorized service center.
Excessive overheating of the cooling fluid.	Shortage of fluid in the cooling circuit.	Add fluid and top off the level.
	Faulty circulation pump.	Contact an authorized dealer.
	Components of the cooling system are clogged.	Check the elements in the cooling system.
	Dirty heat exchanger.	Clean it.
	Faulty heat exchanger.	Change it. Contact an authorized dealer.
	Unsuitable heat exchanger.	Change it. Contact an authorized dealer.
Presence of cooling fluid at discharge.	Leaks in the gaskets.	Contact an authorized dealer.
Cooling fluid has been used up.	Leaks in the gaskets.	Contact an authorized dealer.
The pump does not reach rated pressure, or gets stuck.	Suction of liquids, mud or foreign objects.	Flush the vacuum pump with diesel fuel.
Excessive consumption of disposable oil.	Leaks in the gaskets.	Contact an authorized service center.

 **If the problem persists, contact an authorized service center.**



### **REMOVING FROM SERVICE AND SCRAPPING**

Before demolition of the vacuum pump, the following materials must be separated:

- lubricating oil;
- rubber and plastic parts;
- cast iron, steel and aluminium parts;

these must be disposed of appropriately.

- Do not dump the vacuum pump in the environment.
- To dispose of lubricating oil, apply to the special treatment services.

**Do not use parts dismantled as scrap for spare parts.**

**Failure to follow this warning relieves the manufacturer of all responsibility and constitutes negligent use of the product.**