

INSTALLATION, USE AND  
MAINTENANCE MANUAL



COMPANY WITH QUALITY MANAGEMENT  
SYSTEM CERTIFIED BY DNV  
= ISO 9001:2008 =

# LC Series Manual



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## 1. General warnings

### 1.1. Introduction

This booklet contains the necessary instructions for a correct installation, running, use and maintenance of the pump, as well as some practical suggestions for a safe operating.

The knowledge of the following pages will grant a long and trouble-free operation of the pump.

It is recommended to:

- Understand and apply carefully the instructions before running the pump.
- Keep the booklet at hand and have it known to all operators.

Below is a brief description of the symbols used in this manual.



If these safety rules are not respected, operators can be injured and the pump or oilers damaged remarkably.



If these safety rules are not respected, the pump or system can be damaged.



Suggestions for an environment friendly use of the pump.



Useful information for an easy usage and maintenance of the pump.

- Pump has to be fitted with its own tag reporting the following data: Model, Serial number, Year, Max speed, Max pressure.

jurop	
33082 AZZANO DECIMO, PORDENONE-ITALY	
MOD.	
SERIAL N.	
YEAR	
MAX PRESSURE	(bar)
MAX SPEED	(R.P.M.)
MADE IN ITALY	

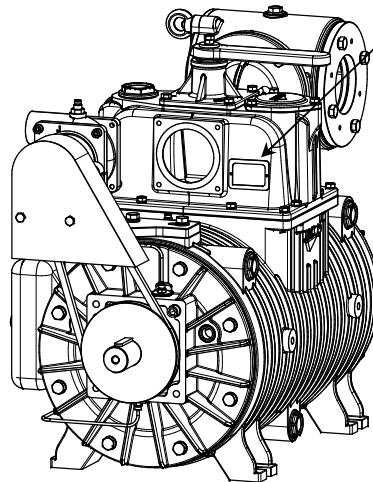


Fig. 1.1

### 1.2. Spare part request

- Use only **genuine spare parts** for maintenance and repairs. To order spare parts, provide the following details:

ESEMPIO:

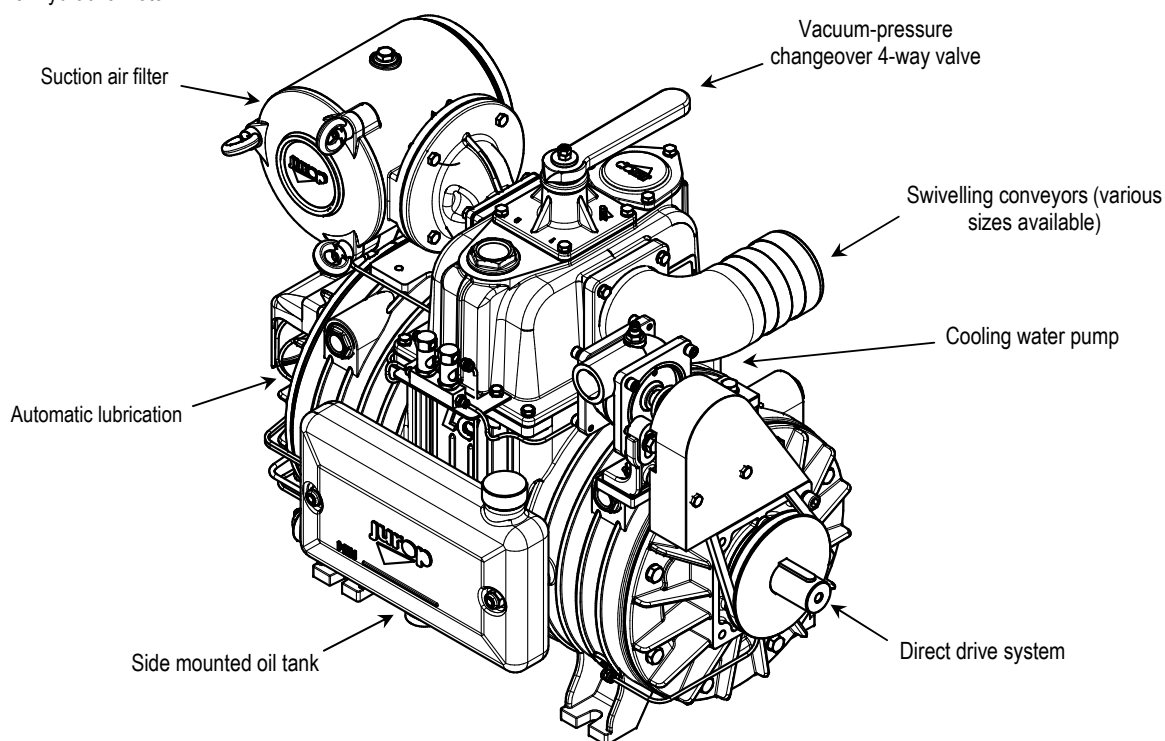
- |  |              |
|--|--------------|
| a) The model of the pump (see pump tag):         | LC420        |
| b) The serial number of the pump (see pump tag): | H80025       |
| c) A description of the parts (see parts list):  | VANE         |
| d) The quantity (see parts list):                | n°4 pz       |
| e) The code number of the part (see parts list): | 16016 063 00 |

### 1.3. Warranty terms and conditions

- Compliance with the installation, use and maintenance instructions provided by this manual **is crucial for the recognition of warranty** against defective parts.

## 2. Technical data

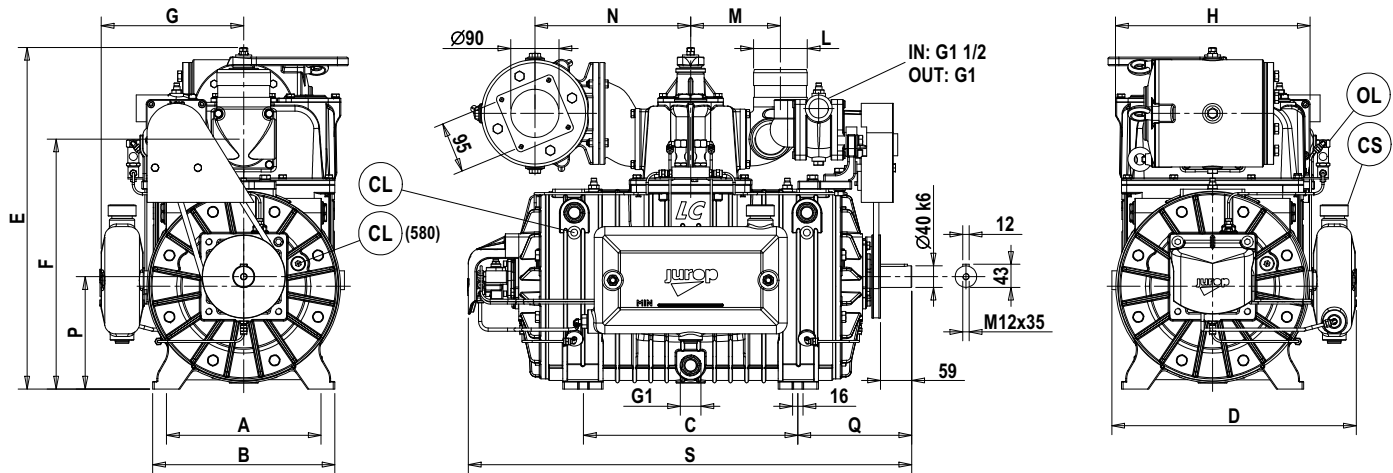
- Four-vane rotary pump with liquid cooled housing, suitable even for major duty operating conditions with high volumetric efficiency and low noise. It has two inlet liquid points on the lower part of its body and four outlet points on the upper part. They do not interfere with the side mounted oil tank.
- Automatic lubricating pump, accessible from the outside for an easy and quick adjusting. Copper oil piping, complete with sight glass drip oilers for a continuous check of the lubrication system.
- Side mounted oil tank with level spy hole. The oil tank can be mounted either on the right or left side of the pump to grant an easy oil checking and filling up. The outside mounting of the oil tank grants a better cooling of the oil itself.
- Heavy duty vanes (asbestos free), radially disposed on the rotor: reduced wear for a long-lasting lifetime. Vanes wear checking ports on the pump body: they do not interfere with the side mounted oil tank.
- Built-in vacuum-pressure changeover 4-way valve, manually operated: on request, hydraulic or pneumatic operated actuators available.
- Non return valve (rubber ball) integrated in the pump manifold.
- Swivelling conveyors, made of aluminium alloy: various sizes available.
- Cooling water temperature: a mechanic thermometer can be inserted into one of the outlet holes. A metal capillary operates the pointer that can be mounted on a visible point near the pump. Delivered on request.
- Exhaust air temperature: the manifold is equipped with a housing for the safety thermostat (intervention temperature: 150° C). Delivered on request.
- Built-in suction air filter. It can be mounted horizontally whereas the suction hole can be swivelled either towards the right or the left side, for an easy pump installation and the following cleaning operations and maintenances. The space required to remove the inner cartridge of the suction filter do not exceed the overall dimensions of the pump. Cleansing agents suction points for the internal wash-up of the pump (recommended in case sewage has been sucked).
- Drive system:
  - Direct with smooth shaft;
  - With gear box (ASAE 1 3/8) 540 rpm o 1000 rpm, left rotation;
  - With hydraulic motor.



Weight	LC 300	LC 420	LC 580
Direct with smooth shaft	195 kg	210 kg	232 kg
With gear box 540 rpm o 1000 rpm	200 kg	215 kg	252 kg
With hydraulic motor	205 kg	220 kg	247 kg

## 2.1. Dimensions LC300-420-580

### Versions with smooth shaft



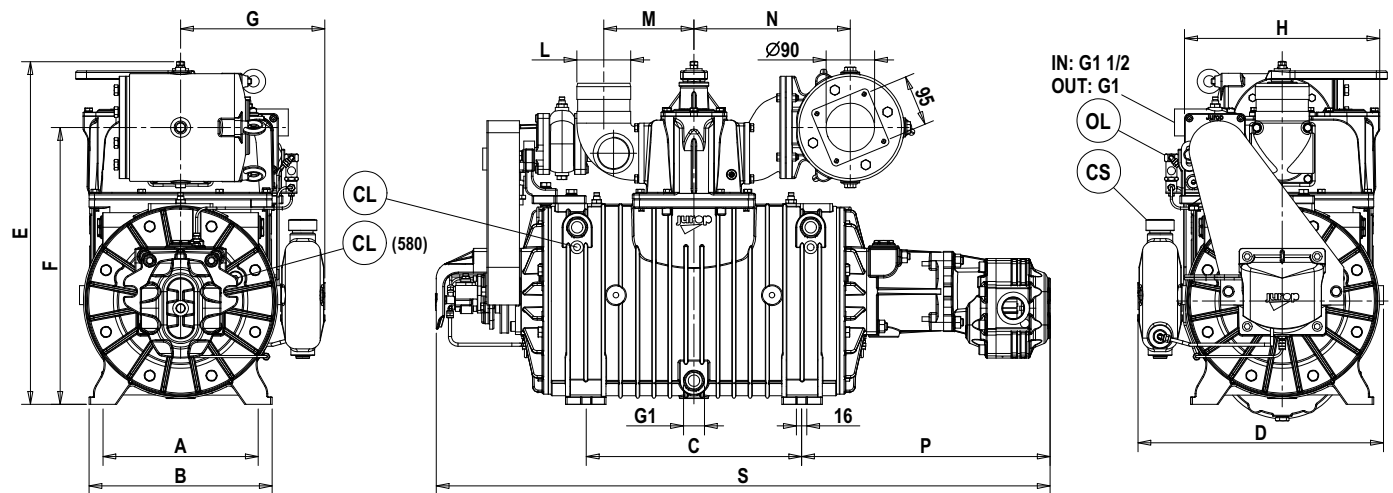
**PUMP LUBRICATION**  
**CS:** tank filling point      **OL:** oilers

**HOUSING**  
**CL:** vanes wear checking      **LM:** oil level

**GEARBOX**  
**SM:** outlet plug      **CM:** inlet plug

Mod.	A	B	C	D	E	F	G	H	L (IN)	L (OUT)	M	N	P	Q	S
LC 300 D	250	290	290	420	605	435	242	350	76-80	76	136	266	205	182	659
LC 420 D	250	290	290	420	625	455	242	350	80-100	80-100	166	290	205	249	794
LC 580 D	300	340	400	456	636	467	266	350	80-100	80-100	166	290	210	213	827

### Versions HDR



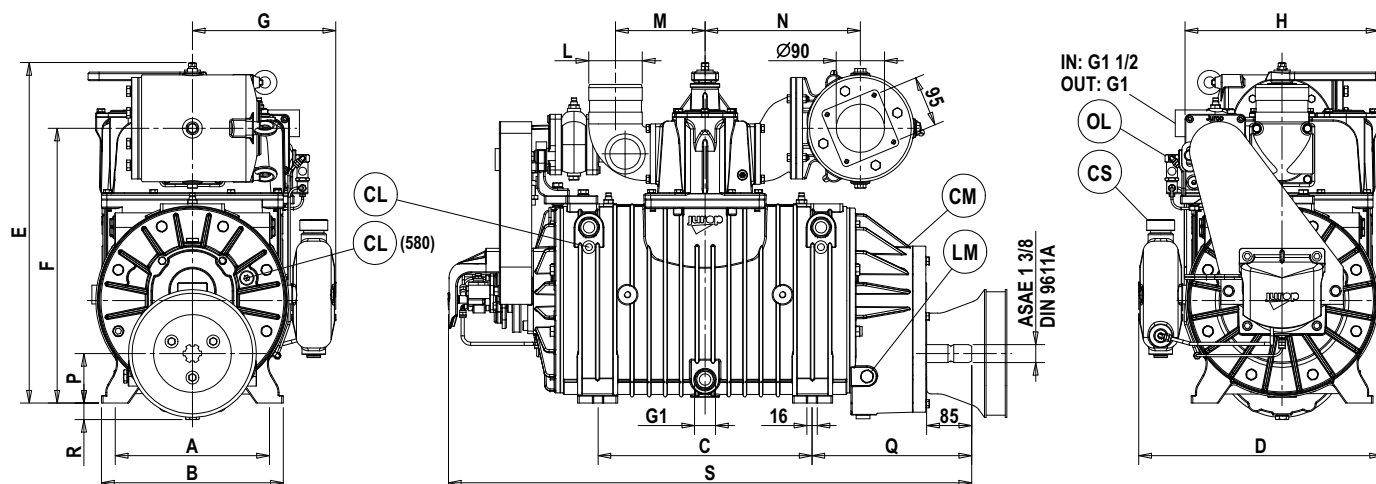
**PUMP LUBRICATION**  
**CS:** tank filling point      **OL:** oilers

**HOUSING**  
**CL:** vanes wear checking      **LM:** oil level

**GEARBOX**  
**SM:** outlet plug      **CM:** inlet plug

Mod.	A	B	C	D	E	F	G	H	L (IN)	L (OUT)	M	N	P	S
LC 300 HDR	250	290	290	420	605	435	242	350	76-80	76	136	266	428	970
LC 420 HDR	250	290	290	420	625	455	242	350	80-100	80-100	166	290	496	1105
LC 580 HDR	300	340	400	456	636	467	266	350	80-100	80-100	166	290	462	1141

## Versions with gear box (540 -1000 rpm)



**PUMP LUBRICATION**  
**CS:** tank filling point      **OL:** oilers

**HOUSING**  
**CL:** vanes wear checking      **LM:** oil level

**GEARBOX**  
**SM:** outlet plug      **CM:** inlet plug

Mod.	A	B	C	D	E	F	G	H	L (in)	L (out)	M	N	P	Q	R	S
LC 300 M	250	290	290	420	605	435	242	350	76-80	76	136	266	83	262	37	805
LC 420 M	250	290	290	420	625	455	242	350	80-100	80-100	166	290	83	330	37	940
LC 580 M	300	340	400	456	636	467	266	350	80-100	80-100	166	290	93	299	31	979

## 2.2. Performances

Performances referred to vacuum pump operating at max. speed.

Performances	LC300	LC420	LC580
Air flow under free air condition	8500 l/min - 510 m³/h	12000 l/min - 720 m³/h	16330 / 18000[*] l/min - 980 / 1080[*] m³/h
Air flow 60% vacuum rate	6415 l/min - 385 m³/h	9000 l/min - 540 m³/h	14500 / 15950[*] l/min - 870 / 957[*] m³/h
Air flow 80% vacuum rate	3450 l/min - 207 m³/h	4833 l/min - 290 m³/h	12180 / 13220[*] l/min - 731 / 793[*] m³/h
Max. vacuum at continuous duty [**]	80%	80%	80%
Max. vacuum	92%	92%	95%
Power required at max. vacuum	14 kW	18 kW	17 - 19,5[*] kW
Power required at 0.5 relative bar (1.5 abs.)	12 kW	16 kW	29 - 33[*] kW
Power required at 1.0 relative bar (2.0 abs.)	17 kW	24 kW	35 - 39[*] kW
Max. relative pressure (abs.)	1,0 bar (2,0 bar abs)	1,0 bar (2,0 bar abs)	1,0 bar (2,0 bar abs)
Air flow at 0.5 relative bar (1.5 abs.)	7500 l/min - 454 m³/h	10830 l/min - 650 m³/h	15500 / 17040[*] l/min - 930 / 1022[*] m³/h
Air flow at 1.0 relative bar (2,0 abs.)	7000 l/min - 420 m³/h	9830 l/min - 590 m³/h	14400 / 16110[*] l/min - 864 / 967[*] m³/h
Oil consumption	200 g/h	220 g/h	240 g/h
Oil tank capacity	4 litri	4 litri	4 litri
Circulating pump speed	2700 rpm	2700 rpm	2700 rpm
Circulating flow rate	55 l/min	55 l/min	55 l/min
Heat exchange rate	6000 kcal/h	8000 kcal/h	9500 kcal/h
Mass moment of inertia	0,15 kgm²	0,21 kgm²	0,37 kgm²

[\*] : conditions not foreseen for continuous duty.

[\*\*] : at nominal speed.

### REFERENCE CONDITIONS

Conveyed gas: air  
Reference temperature: 20°C

Functioning in free air  
Vacuum functioning: free outlet

Reference abs. pressure: 1.013 mbar  
Pressure functioning: free inlet

Flow - power											
Model		Free port	Vacuum						Pressure (abs)		
			20%	40%	60%	70%	80%	90%	1,5 bar	1,8 bar	2,0 bar
LC 300	m³/h	510	480	444	385	285	207	10	454	435	420
	l/min	8500	8000	7400	6420	4760	3450	190	7500	7250	7000
	kW	8	9	10	11	12	13	14	12	15	17
LC 420	m³/h	720	670	620	540	400	290	16	650	610	590
	l/min	12000	11170	10330	9000	6670	4833	270	10830	10170	9830
	kW	11	12	14	15	16	16,5	17	16	21	24
LC 580	m³/h	980	956	921	870	828	731	350	930	888	864
	l/min	16330	15930	15350	14500	13800	12180	5830	15500	14800	14400
	kW	25	22,5	21	20	19	18	17,5	29	33	35

Note: data at nominal speed.

Sound pressure level	LC300	LC420	LC580
Max. speed, 60% vacuum rate*	70 dB(A)	73 dB(A)	72 dB(A)
Max. speed, 90% vacuum rate*	73 dB(A)	75 dB(A)	74 dB(A)

\* : noise of pump with exhaust silencer cod. 15470 D2C B0. Distance: 7m in open field.

### 2.3. Usage limitations

Pump	Max. Speed – Operating speed (RPM)			P <sub>2</sub> (bar ABS)	T <sub>2</sub> (°C)	T <sub>2</sub> - T <sub>1</sub> (°C)
	M - 540	M - 1000	D - HDR			
LC300-LC420	540 – 460 rpm	1000 – 850 rpm	1300 – 1100 rpm	2,0 bar	150°C	130°C
LC580	540 – 460 rpm 600[*] rpm	1000 – 850 rpm 1100[*] rpm	1200 – 1000 rpm 1325[*] rpm	2,0 bar*	150°C	130°C

P1: absolute pressure during suction  
P2: absolute pressure during delivery

T1: temperature during suction  
T2: temperature during delivery

[\*] : conditions not foreseen for continuous duty.

Note: \* for pump LC580 with belt drive: P<sub>2</sub> = 1,5 bar abs.

### 2.4. Lubrication

#### Recommended lubricants: SIDE MOUNTED OIL TANK LEVEL

Room. Temp.	Viscosity	Type	ENI	ESSO	SHELL	TOTAL	MOBIL	BP
Under 10°C	ISO VG 46	Mineral oil	Radula 46	Nuto 46	Morlina oil 46	Drosera MS 46	Nuto H 46	Bartran HV 46
Over 10°C	ISO VG 150	Mineral oil	Radula 150	Nuto 150	Morlina oil 150	Drosera MS 150	Nuto H 150	Bartran HV 150

Note: use SAE 15W-40 mineral oil as an alternative to the lubricants written above.

#### Recommended lubricants: GEAR BOX OIL

Viscosity	Type	ENI	ESSO	SHELL	TOTAL	MOBIL	BP
ISO VG 220	EP mineral oil	Blasia 220	Spartan EP 220	Omala oil 220	Carter EP 220	Mobilgear 630	Energol GR XP 220

Note: use SAE 80W-90 mineral oil as an alternative to the lubricants written above.



### 3. Safety and accident prevention



**Attention:**  
carefully apply  
these prescriptions.

#### 3.1. General recommendations

- Installation and maintenance must be carried out with the unit totally disengaged from its drive system and must be performed by qualified personnel.

- Use adequate clothing (avoid ties, loose sleeves, necklaces and so on) and suitable protection equipments (gloves, protection glasses, boots...).

- When transporting the pump, use proper slinging. Store the pump in stable places.

- Make sure that all the parts of the unit are idle and cool, before performing any maintenance operation.

- Before each maintenance operation, stop the pump and restore the atmospheric pressure.

- When the pump is running, some parts may reach very high temperatures (above 100°C). Use all necessary precautions to avoid contact.

- Operators working nearby must avoid prolonged exposure to the noise emitted by the aspirator, if not equipped with the proper ear-protection devices.

- Avoid accidental suction of solids: solids may be projected at high speed through the exhaust manifold and cause injuries.

- Do not start the machine if the protection devices provided for transmissions are removed. Replace damaged parts.

- Pressure relief valve: point the air flux away from the operators.

- Do not use the aspirator over its designed limits: the machine may be damaged and the operator may be injured.



**Do not exceed the power supply parameters indicated in the technical tables (see par. 2.3).**

#### 3.2. Intended use

- The vacuum pumps LC are designed to convey filtered air into systems for the vacuum production or for the suction of powders or liquid wastes. Any other usage shall be considered improper.

- Do not sack toxic substances and inflammable or explosive gasses, since the internal components of the pump may reach high temperatures.

- Liquids or solids infiltrations can seriously damage the pump.

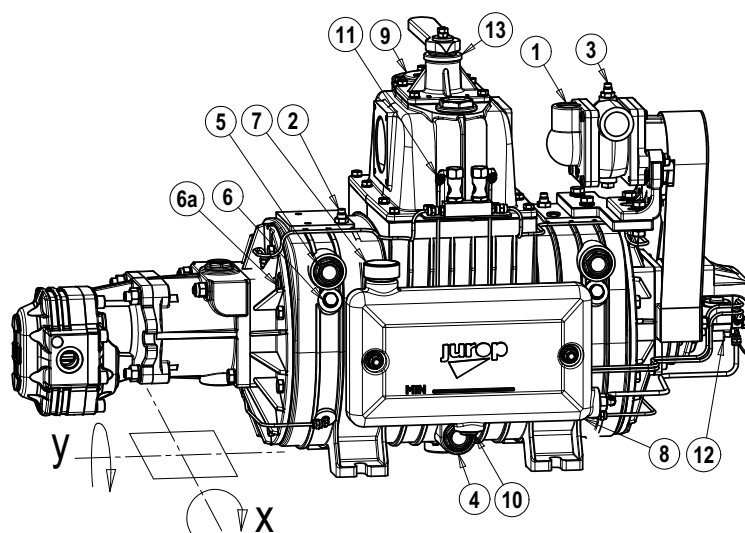
- Do not run the pump over its designed operating limits (see par. 2.3): it may break and transmission can be damaged.

### 4. Installation

Legend of main components

- |  |                            |                                    |
|--|----------------------------|------------------------------------|
| 1. Water recycle pump                  | 6. Vanes check-port        | 10. Oil tank emptying port         |
| 2. Venting valve on pump housing       | 6a. Vanes check-port LC580 | 11. Oilers                         |
| 3. Venting valve on water recycle pump | 7. Oil filling port        | 12. Self-lubricating pump          |
| 4. Cooling water inlet                 | 8. Lubricating oil tank    | 13. Vacuum – pressure change valve |
| 5. Cooling water outlet                | 9. Check valve             |                                    |

Fig. 4.1





#### 4.1. Checking upon receipt

- When the goods are delivered, make sure that all parts listed on the delivery note are in perfect condition and have suffered no damage during shipping.
- Make sure the vacuum pump has its identification plate affixed on the front cover. Pumps without such identification are to be considered anonymous and potentially dangerous: in such an event, they must not be used, otherwise the manufacturer will be deemed free from any liability whatsoever.

#### 4.2. Mounting

- The mounted aspirator must be accessible for maintenance and firmly fixed on a frame or angled base with a 3° max inclination on x and y axes (see Fig. 4.1). The structure must be fit to avoid flexions or vibrations.
- Make sure that there is enough free room around the pump for a correct air cooling circulation and protect the pump from the exposure to dirt and debris.
- Prepare the necessary space for an easy access to the lubrication check-points (tank level and gear box, oilers) and to the oil tank filling port, the four-way manifold handle, and the vane wear inspection ports.

#### 4.3. Vacuum - pressure line

- To avoid accidental suction of liquids inside the pump, install a primary (pos. 1) and a secondary flow shutoffs (pos. 2). If necessary, install also a suction filter (pos. 4) to protect from solids infiltration.
- The exhaust silencer (pos. 6) is designed to reduce the noise level and to separate the oil mist coming out from the pump outlet port. The separator must be periodically drained from oil and condensate accumulated in the separator during the normal pump functioning.
- The diameter of the vacuum/pressure line pipes must be properly dimensioned to the pump flow and, in any case, larger than the diameter of the ports.
- The pipes weight must not solicit the body of the pump. Use high temperature resistant rubber connections.
- Before mounting the vacuum line to the pump, remove the port protections. Pipes and all line components must be clean.
- Avoid restrictions and tight curves as much as possible if not strictly necessary.
- Exhaust pipes can reach high temperatures. Hence, they must be properly isolated.

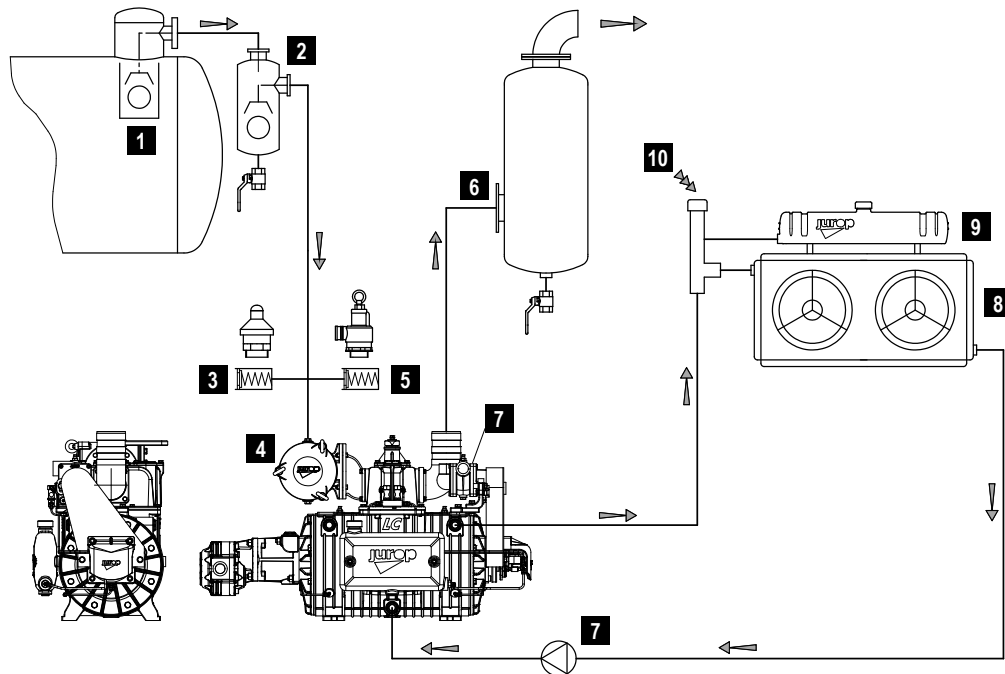


Fig. 4.2

#### Vacuum line components

1	Primary shutoff	6	Silencer – oil separator
2	Secondary shutoff	7	Circulating pump
3	Vacuum relief valve	8	Air-water heat exchanger
4	Suction filter	9	Expansion tank
5	Overpressure safety valve	10	Exchanger inlet port

- Safety valves:
  - Overpressure safety valve (pos. 5): mount it close to the pump. The valve flow must prevent the LC pump from exceeding the absolute

- pressure of 2.0 bars or the maximum pressure allowed by the system. Do not apply gate valves on the line;
- Vacuum control valve (pos. 6): install if necessary to limit the vacuum rate of the system.

#### 4.4. Cooling system

- It is composed of:
  - Centrifugal recycle pump;
  - Heat exchanger with electric fans operated by a thermostat;
  - Expansion tank.

• The heat exchanger must dissipate the heat power indicated in par. 2.2. The Fig. 4.3 shows the characteristic curve "Flow – Head" of the recycle pump.

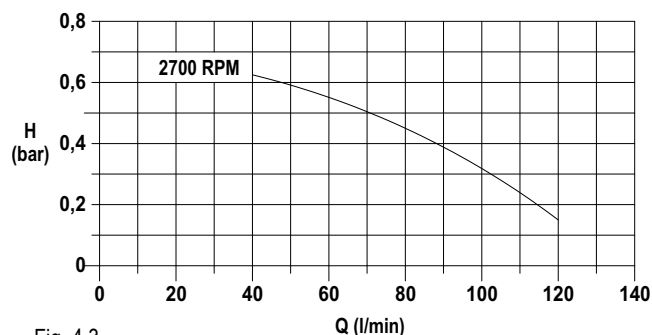


Fig. 4.3

- The cooling liquid temperature must not exceed 60° C. The air flow generated by the exchanger fans must be kept free of obstacles.

#### 4.5. Pump mounting - Drive connection

##### A) Cardan shaft drive

- Use telescopic cardan shafts.

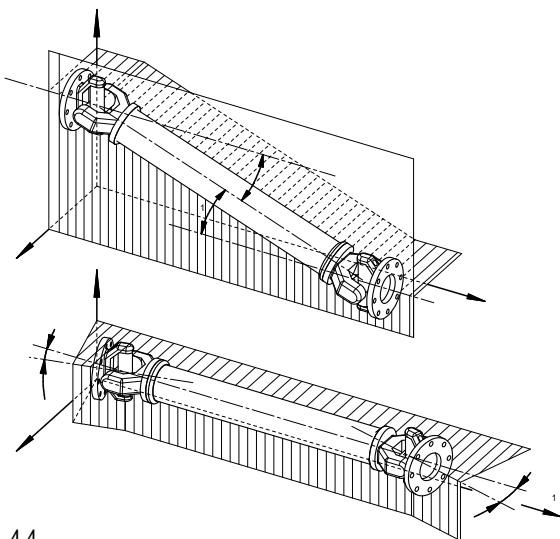


Fig. 4.4

- In order to achieve a uniform motion of the driven shaft, the following requirements must be met (see Fig. 4.4):
  - Equal working angle  $\alpha$  and  $\alpha_1$  of both couplings.
  - The internal fork joints must be coplanar.
  - Both driven and driving shafts must be coplanar.

- It is also recommended working with limited articulated joint angles (max 15° at 1000 rpm and max 11° at 1300 rpm) and disengaging the transmission for those operations requiring great angles (steering or lifting).



**Follow the rotation direction as indicated on the front flange. Follow the instructions of the cardan shaft's manufacturer.**

- Use the protection that comes with the pump shaft.



**Use the cardan protection supplied with the pump. The pump installation must fulfil the current EC injury prevention specifications.**

##### B) Belt drive

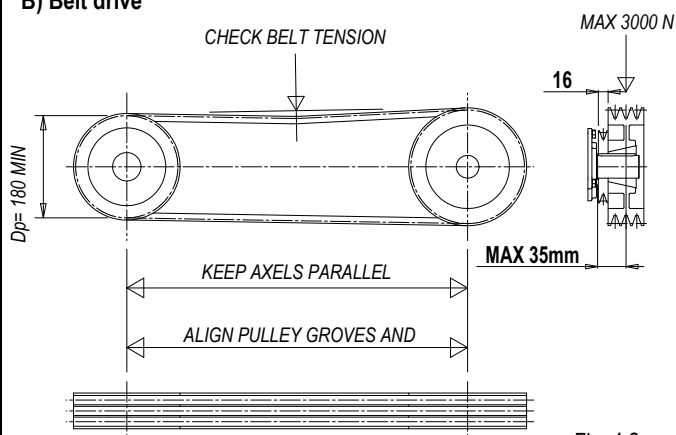


Fig. 4.2

- Install a suitable pulley on the smooth shaft as close as possible to the pump: max 35 mm.
- Apply an adequate belt tension (see manufacturer's data). Max 3000N.
- Do not use driven or driving pulleys with a pitch diameter inferior to 180 mm. Small pulleys require a high belt tension which may cause premature wear to the bearing or transmission troubleshooting.

Pump	Drive min. pulley p. diam.	T. max	Belts	Max. Speed	Max. Pressure	Max. Vacuum.
LC300	180 mm	3000 N	SPB x 3	1300 rpm	2 bar abs	92%
LC420	180 mm	3000 N	SPB x 3	1300 rpm	2 bar abs	92%
LC580	180 mm	3500 N	XPB x 3	1200 rpm	1,5 bar abs	95%

- A limited speed ratio allows a longer belts life while reducing stress on the shafts. When possible, prefer:
  - pulleys with a pitch diameter bigger than the one indicated;

- motors or power take-offs with a speed similar to the one of the pump.

## C) Hydraulic drive

Model	Displacement	Operating pressure (max. vac.)	Operating pressure (1 rel. bar)	Flow	Max pressure draining line	Max. pressure motor exhaust	Max pressure
LC300	61 cc/rev	125 bar	150 bar	83 l/min (1300rpm)	5 bar	5 bar	200 bar
LC420	72 cc/rev	135 bar	175 bar	98 l/min (1300rpm)	5 bar	5 bar	200 bar
LC580	108 cc/rev	140 bar	190 bar	136 l/min (1200rpm)	5 bar	5 bar	220 bar

- **Fluid:** mineral oil for hydraulic systems in compliance with ISO/DIN.

Temperature	Optimum viscosity ale	Max. viscosity allowed
-20 / +80 °C	12 – 100 cSt	750 cSt

- **Filtration:** class 19/16 contamination according to ISO 4406 to be obtained with a  $\beta_x = 75$  filter.

- **Check circuit connections:** they must be applied in the same rotation direction as that indicated by the arrow on the pump front flange.

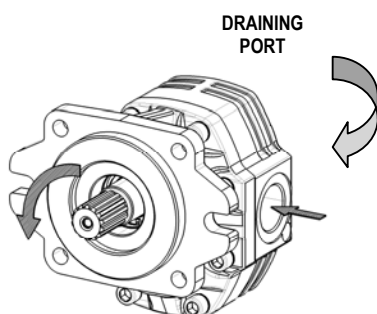


Fig. 4.3

- **Draining:** connect directly to the tank above the maximum oil level. Operating without draining line may damage the motor.

- **Distributor:** open-centre distributor in central idle position (vacuum pump off). It must be equipped with an adjustable overpressure safety valve.

- **Motor pipeline:** outlet pipe must not be of a smaller diameter than that of the inlet port. Inlet pipes always have a diameter smaller than outlet pipes. Choose preferably flexible pipes to avoid vibration transmission.

- **Tank:** with suction pipe and return separated by baffles. If necessary, use a heat exchanger to avoid oil heating above 70-80°C

and protect it from extreme pressure with a pressure relief valve. Minimum approximate capacity: as twice as the circulation flow.

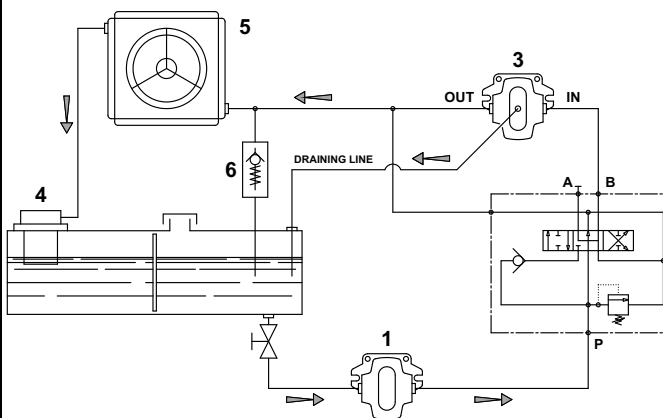


Fig. 4.4

1	Hdr pump	4	Oil filter
2	Distributor	5 *	Heat exchanger
3	Hdr motor	6 *	Safety valve

\* optional components

- **Starting-up:** be sure that the system is well cleaned and pour oil into the tank and into the motor housing (necessary to lubricate the internal bearings).

- Vent the circuit and adjust the overpressure safety valve to the lowest possible value.

- Check the oil tank level.

- Increase pressure and rotation speed until operating values are reached.

## 5. Start up

### 5.1. Starting-up of the pump

#### Lubrication

- Check oil levels in gearbox and side mounted tank.
- Check the oil level in the gear box (if the pump is provided with it).
- In order to choose the most suitable oil, see paragraph 2.4.

#### Cooling

- Unscrew the vent valves on the housing and recycling pump, pour the cooling fluid through the port near the exchanger.

- Screw the vent valves and start running the cooling system in order to expel the air bubbles inside it. Then, adjust the level by filling up the expansion tank on the exchanger: it must be half filled (approximately).

- The cooling system we designed has a capacity of 25-30 litres. Use a mixture of demineralised water and antifreeze liquid at a concentration suitable to room temperature (usually between 25 and 50%).



**Carefully vent the cooling circuit with the recycling pump stopped.**

#### Vacuum line

- Open all valves of the vacuum-pressure system.
- Open all gate valves and remove any possible obstacle from the line.

## 5.2. Precautions when starting the system

- Check oil levels in gearbox and side mounted tank.
- Check that all protection devices are correctly installed.
- Check that there are no obstacles in the vacuum line.
- Check rotation direction: open all system valves and start running slowly.



**Do not rotate in the wrong direction: this may damage the vacuum pump. Follow the arrow indicated on the front flange.**

- Check which position of the four-way integrated valve lever allows vacuum or pressure functioning.
- Close the valve and increase vacuum rate (or operating pressure).
- Check that the lubricating pump works properly. Oil must regularly drip into the oilers. Typically (with degree of vacuum > 50%), **35-40 drops/min** (at maximum speed).
- Check loading and operating speed for vibrations or unusual noises.



**This vacuum pump is designed to work at maximum speed, but for longer operating we recommend the pump be run at working speed (see par. 2.3).**

- Prepare adequately transmission.

## 5.3. Operating precautions

- Do not make the vacuum pump overheat: maximum air temperature on exhaust (or delivery) side: 150°C.
- Do not operate the pump without lubrication: it may cause quick wear and possible breakdown of vanes.
- Do not start running the pump under load: this may damage the drive system or the hydraulic motor.
- Check the rotation speed: it must never exceed the operating limits indicated on the identification plate of the vacuum pump.

- Do not accidentally operate the pump in the wrong direction: it may break the vanes.
- Do not convey the exceeding delivery outlet towards the suction port, otherwise it will suck warm gas.
- Do not convey the exceeding delivery outlet towards the suction port, otherwise it will suck warm gas.
- Control the air flow by adjusting the rotation speed: do not use the pressure relief valve to discharge the exceeding flow.
- Internal wash-up is necessary after prolonged inactivity, after working in dusty environments or in case of accidental suction of liquids.

Such operation must be carried out only on cooled pumps.

1. Disconnect the exhaust silencer, if possible;
2. Start running the pump at low speed;
3. Suck some water (about 1-2 litres) through the inlet port;
4. Then suck oil (about 1 litre) to complete the wash-up and lubricate internal components.



**In case the exhaust line cannot be disconnected, drain the liquids accumulated in the separator of the exhaust silencer.**

- Once the needed vacuum rate has been reached, we recommend reducing the vacuum pump speed to its working speed (see par. 2.3): this allows keeping the achieved vacuum/pressure rate constant. The pump speed can also be reduced to values lower than the working speed during the tank discharging phase (with the 4-way valve in pressure mode) without increasing the draining time.

- Thus, exhaust temperature is reduced, vane durability is increased and both oil consumption and power absorption are reduced.



**Once the needed vacuum rate has been reached, we recommend reducing the vacuum pump speed to its working speed.**

## 6. Maintenance

### 6.1. Ordinary maintenance

- Installation and maintenance must be operated only by qualified personnel wearing the proper clothes and the necessary tools as well as protection devices.
- In the following table summarizes the main controls to be performed and the frequency of intervention.

Pump Operating Condition	Checking	Frequency
	Lubrication: dripping into oilers	D
<b>OPERATING</b>	Rotating speed	D
	Working pressure	D

#### STANDSTILL

Side mounted tank oil level	D
Clean filter and vacuum line shutoff. Drain the oil gathered in the exhaust separator.	D
Check vanes wear	W
Clean filter and vacuum line shutoff	S
Check pressure relief valve condition	M
Gear box oil level	M
Sfiato impianto dell'acqua di raffreddamento	M
Gear box oil change	1500 h

**Frequency**

**W:** weekly

**D:** daily

**M:** monthly

### Checking the drip oilers

- Check dripping into the oilers.
- Be sure it is regular (about **40 drops/min** at max. speed, with degree of vacuum > 50%) to grant a correct lubrication of the pump. At lower speeds, the number of drops must be directly proportional.



**If the pump is run without lubrication, the internal components may quickly damaged due to overheating. Stop the vacuum pump and check the oil level and the lubricating pump.**

### Checking the side mounted oil tank level

- Do not run the pump with oil level under the minimum level: that may lead to dry functioning and cause serious damages.
- Tank capacity: **4l**.
- Use pure fresh oil.



**Do not re-use the exhausted oil gathered on the bottom of the exhaust silencer.**

### Checking the vanes wear LC300 - LC420

- Unscrew the vanes wear check-plug on the housing (pos. CL).
- Turn the shaft until you see the vane.
- The vanes should slide to the bottom of the seat due to gravity: check they really do.
- Insert a rod of 6 mm Ø with its conic end towards the pump (rod supplied with pump).
- Turn the shift manually and touch the outside diameter of the rotor with the checking rod, mark it a first time. Keep turning the shift till the rod falls inside a vane groove. Mark it again and measure the gap between the two marks.
- If this gap exceeds 10 mm, then the vanes must be replaced.
- At the end of this procedure, do not forget to replace the plug.
- Replace all vanes at the same time.

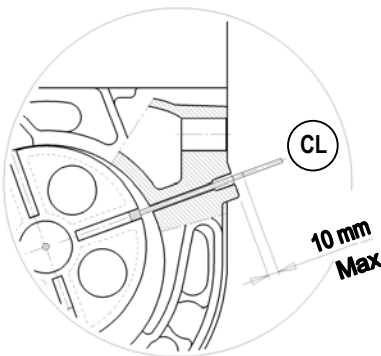


Fig. 6.1



**Replace the vanes when their wear exceeds 10 mm (L - L min): they may break. Replace all vanes at the same time.**

### Checking the vanes wear LC580

- Unscrew the vanes wear check-plug on the front flange (pos. CL).
- Turn the shaft until you see the vane.
- The vanes should slide to the bottom of the seat due to gravity: check they really do.

- Replace the vanes when their wear exceeds 10 mm (L - L min): they may break.
- At the end of this procedure, do not forget to replace the plug.
- Replace all vanes at the same time.

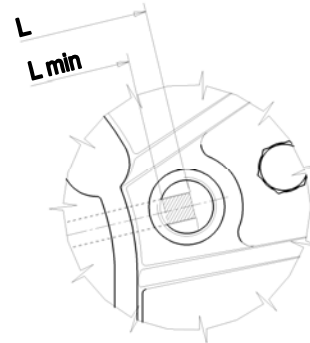
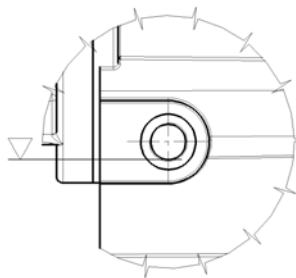


Fig. 6.2



**Replace the vanes when their wear exceeds 10 mm (L - L min): they may break. Replace all vanes at the same time.**

### Checking the gear box oil level



- When changing the oil, also replace the outlet plug washer.

- Check the level when the pump is cooled: it must almost reach the threaded port. Refill if necessary.
- For a complete replacement, **0.7 litres** are required. Use mineral oil with EP additives for gears and transmissions.



**Dispose of exhausted oil as provided by current specification.**

## 6.2. Extraordinary maintenance

- Before starting any extraordinary maintenance operation, be sure the pump stands still and follow the safety prescriptions as described in Cap. 3.

### Adjusting the 4-way valve

- For pumps equipped with handle for manual operation or hydraulic actuator.
- Adjust the screws to avoid the valve blocking in its seat (see Fig. 6.3).



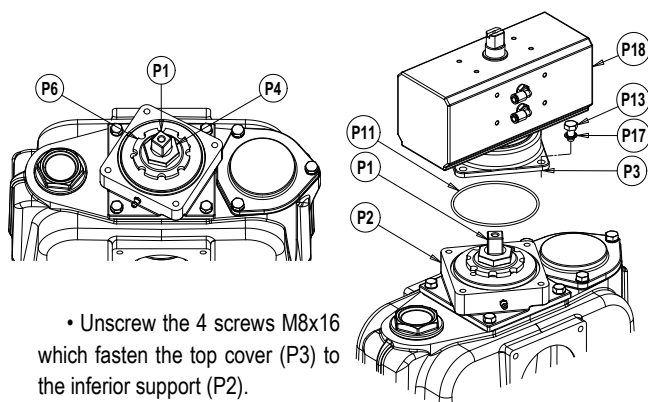
**Attention: do not exceed with the adjustment: possible vacuum loss.**



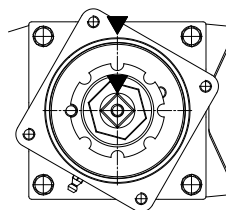
Fig. 6.3

### Adjusting the pneumatically operated 4-way valve

• In case of reduced performance or difficult rotation of the valve in its seat, it is necessary to adjust the operating play.



- Unscrew the 4 screws M8x16 which fasten the top cover (P3) to the inferior support (P2).
- Clean the inner part from the lubricant.
- "Mark" the initial position of the cock (P1). When mounting the cock back in place, it must be in the same position.



- Turn the valve until one of the cock regulation ferrules (P6) coincides with one of the threaded holes on the inferior flange (P2). Block temporarily the nut ferrule with a screw.

- Hold the valve in place with a 17 mm spanner and loosen the nut (P4) over the ferrule by  $\frac{1}{2}$  -  $\frac{3}{4}$  turn with a 36 mm spanner.

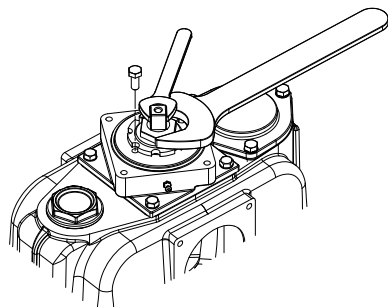


Fig. 6.4

- Valve adjustment: turn the valve clockwise by  $\frac{1}{8}$  turn ( $45^\circ$ ) in order to lower it (in case of excessive play between the valve and its seat and of reduced performance) or anticlockwise by  $\frac{1}{8}$  turn ( $45^\circ$ ) to raise it (in case of difficult rotation of the valve in its seat).
- Hold the valve in place with the spanner and fasten the nut (P4) above the ferrule.

- Remove the screw which temporarily blocks the ferrule and check for the correct rotation of the valve by adjusting the shaft frame. Repeat the valve adjustment, if necessary.

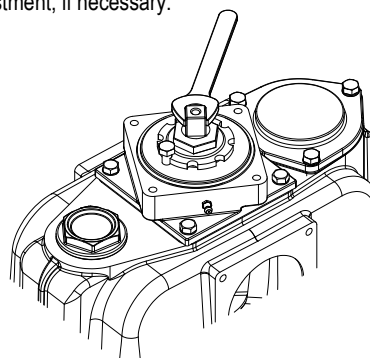
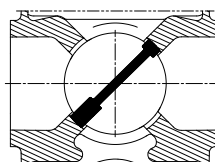


Fig. 6.5

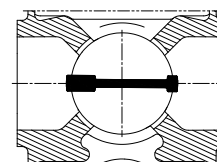


**Attenzione: get the valve back into the previously "marked" position. Otherwise, the valve may work improperly.**

- The valve - in both its end stroke positions - must separate the air flow sucked from the pump outlet air. The pump may be started in order to check for the proper functioning.



CORRECT POSITION



POSITION INCORRECT

- Lubricate the areas near the ferrule in order to guarantee the lubrication of parts undergoing wear.
- Set the top cover back into place. Do not forget the OR-Ring (P11). Fasten the 4 screws.

### Replacing the vanes

- Remove the vacuum pump from its bearing frame and wash it before disassembling.
- Drain the cooling liquid from the pump housing (pos. A).
- Remove the water pump cover (pos. B) and the carter (pos. C).
- Disconnect lubricating pipes (pos. D).
- Remove the lubricating pump (pos. E).

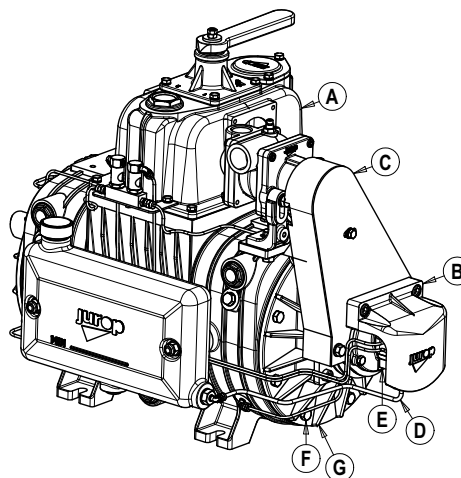


Fig. 6.6



- Remove the screws (pos. F) fixing the rear flange (pos. G) and use the two threaded holes to remove the flange – bearing – seal housing. If necessary, hold the rotor by inserting a wooden block, protecting the internal bearings from damage.

- Remove the bearing from the rear flange and replace the seal if broken.

- Lubricate with oil the new vanes before inserting those inside each groove of the rotor.

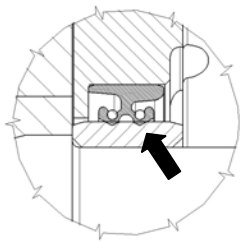
- Reinstall all the components in the following order: rear flange, seal ring (non), bearing, compensation ring, gasket and flange with lubricating pump (we recommend to fit correctly the pivot-key on the shaft groove).

- Tighten the nuts (pos. F) by means of a dynamometric wrench adjusted at 88 Nm.

- Refill the cooling system and re-install the pipeline.



**Do not damage components during assembly by forcing them exceedingly.**



- Do not flip the seal ring during rotation of the shaft. Do not leave foreign objects inside the pump.

#### Adjusting the self-lubricating pump

- The automatic lubricating pump is adjusted by the manufacturer before the shipping.

- If consumption noticeably differs from the indicated value, adjust it as follows:

- Remove the upper protection cover;
- Using a screwdriver and a 10 mm wrench, adjust the adjusting screw (K). Close the nut and remount the upper protection cover;
- It is advisable to turn the screw of  $\frac{1}{4}$  of turn and verify the actual consumption.

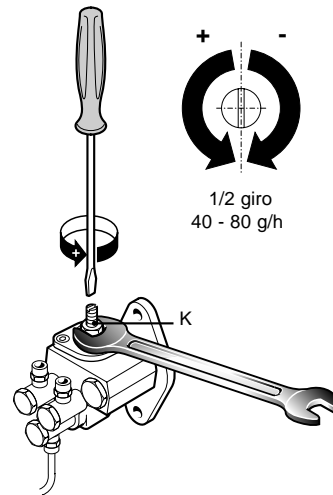


Fig. 6.7



**Do not reduce oil consumption below the value indicated in par. 2.2 (for functioning at speeds different from the maximum, flow is proportionate to rotating speed).**

- $\frac{1}{2}$  turn of the adjusting screw causes a variation in the flow of approximately **40 - 80 g/h**, depending on using conditions.

#### Replacing gear box components

- The pump with a 540 rpm gear box can be transformed into a pump with a 1000 rpm gear box (and vice versa):

- Take down the gear box as illustrated. Remove also the drive shaft's pinion;
- Install the new pinion closing the nut;
- Mount the gear wheel including bearings and seals on the front cover, properly aligning components. This housing may now be installed in the gear box: fit the bearing in the internal housing on the flange;
- Properly engage gears, replace the cover's gaskets to complete gear replacement. Insert the parallel pin, which maintains the correct alignment;

See Fig. 6.8.

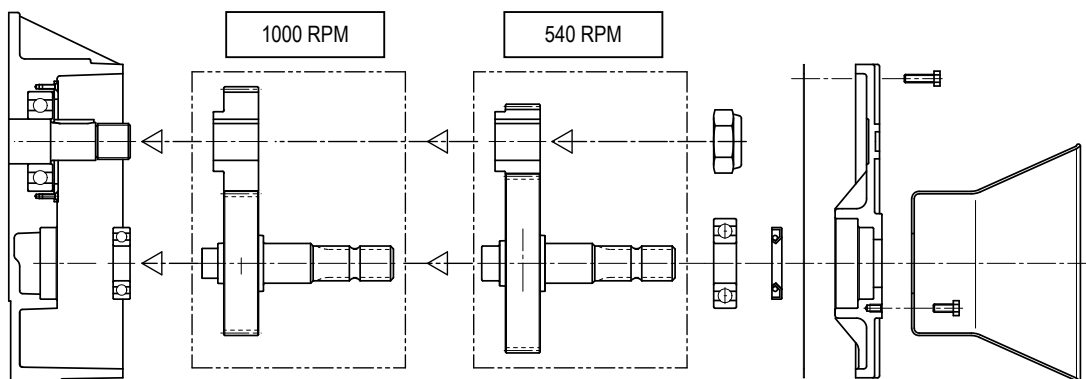


Fig. 6.8



## 7. Malfunctions: troubleshooting

### PROBLEMS

#### The vacuum pump overheats

Cause	Solution
• Insufficient or absent lubrication	• Verify oil and rings. Check oil pump efficiency
• Low tank oil level	• Fill tank with oil
• Excessive rotation speed	• Reduce rpm to the prescribed working speed
• Prolonged functioning at max vacuum rate	• Reduce vacuum rate
• Insufficient cooling	• Check oil pump efficiency. Bleed the system with care. Check heat exchanger efficiency
• Vacuum and/or exhaust line of insufficient diameter	• Check dimensioning

#### The vacuum pump does not rotate

Cause	Solution
• Broken vanes:	• Clean inner chambers, replace vanes
- due to infiltrated solids	• Check the secondary shutoff and filters of the suction line
- due to insufficient lubrication	• Check the oil pump
• Power transmission breakdown	• Check and replace the damaged parts
• Ice inside the pump (during the cold season)	• Remove ice and slowly start running it. Avoid suction of water

#### Reduced performances

Cause	Solution
• Four way changeover valve in idle position	• Move the lever to vacuum or pressure mode end stroke
• Four way changeover valve not correctly registered	• Adjust the functioning play and lubricate
• Worn vanes	• Replace vanes
• The non-return valve leaks	• Clean or replace if necessary
• Worn seal rings	• Replace
• Tank gate valves or gaskets leak	• Replace damaged or worn parts
• Tank connection pipes leak or are obstructed	• Replace damaged pipes
• Obstructed primary shutoff or suction filter	• Remove and clean
• Encrusted exhaust port	• Remove and clean
• Vacuum line components are too small dimensioned	• Verify dimensions for pump maximum performances
• Obstructed rubber couplings	• Replace

#### Unusual oil consumption

Cause	Solution
• Insufficient or absent lubrication	• Check and adjust the lubricating pump

## 8. Scrapping

• Before scrapping the machine, the following materials need to be separated and suitably disposed of:

- hydraulic oil.
- rubber and plastic parts, such as hoses.
- steel and aluminium parts.

• Recycling materials allow reducing the environmental impact and respecting the environment.



**Do not dispose of in the environment. Dispose of in compliance with the standards in force.**