

Operating and  
maintenance manual  
vacuum pump

**PVT1000**

**Jurop**  
PORDENONE



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## 1. GENERAL INFORMATION

All the information needed for installing, starting, using and servicing the vacuum pump are included in this manual.

- It is essential that the contents of this manual are known to ensure the correct use of the pump. The manufacturer can not be considered liable for damages deriving from an improper, erroneous or unreasonable use.
- The guarantee for faulty parts can be approved only if the pump is installed/used/serviced according to the information included in this manual.
- Comply with the safety instructions given. Do not use the machine in different ways from those explained in the manual.

It is therefore necessary that:

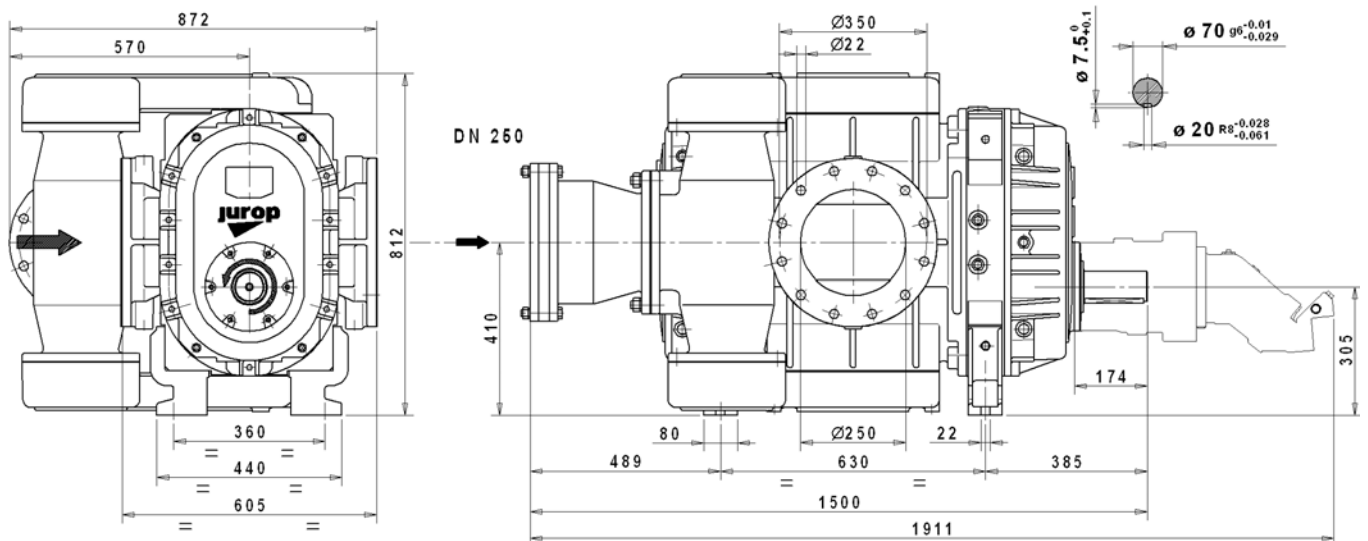
- the users and installer are aware of the instructions given in the manual.
- the manual has to be available to all the pump users.

## 2. TECHNICAL DATA

### 2.1 Dimensions

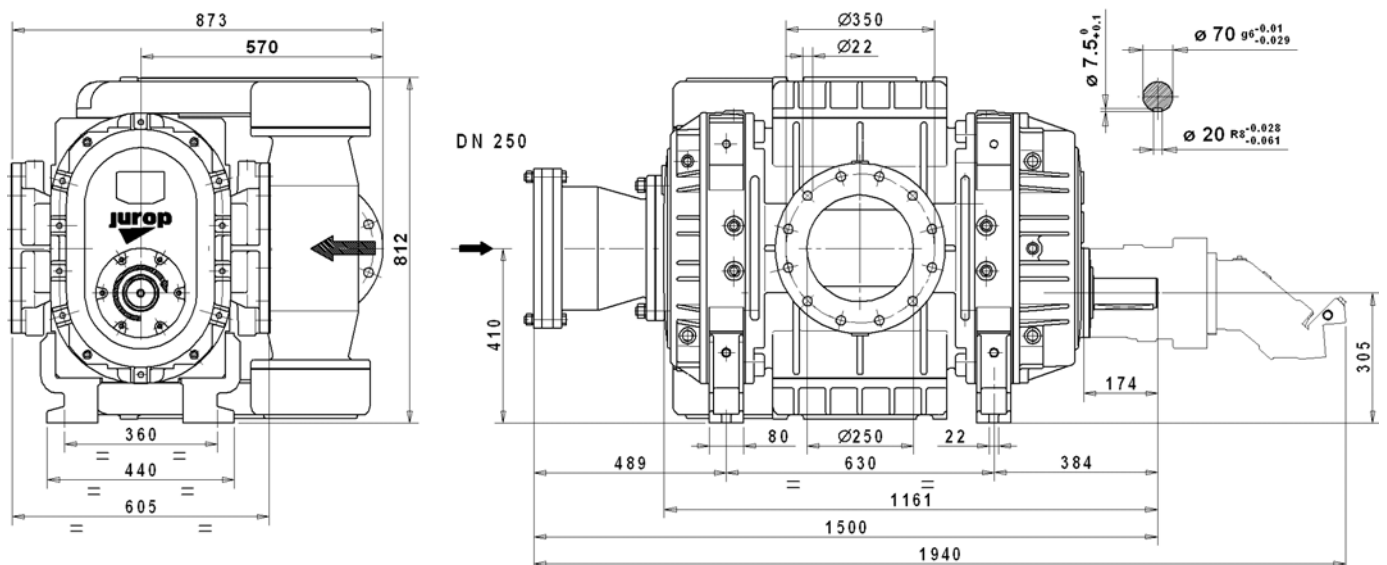
*PVT 1000 CCW rotation, Horizontal Ports lower shaft*

*PVT 1000 HDR CCW rotation, Horizontal Ports lower shaft*

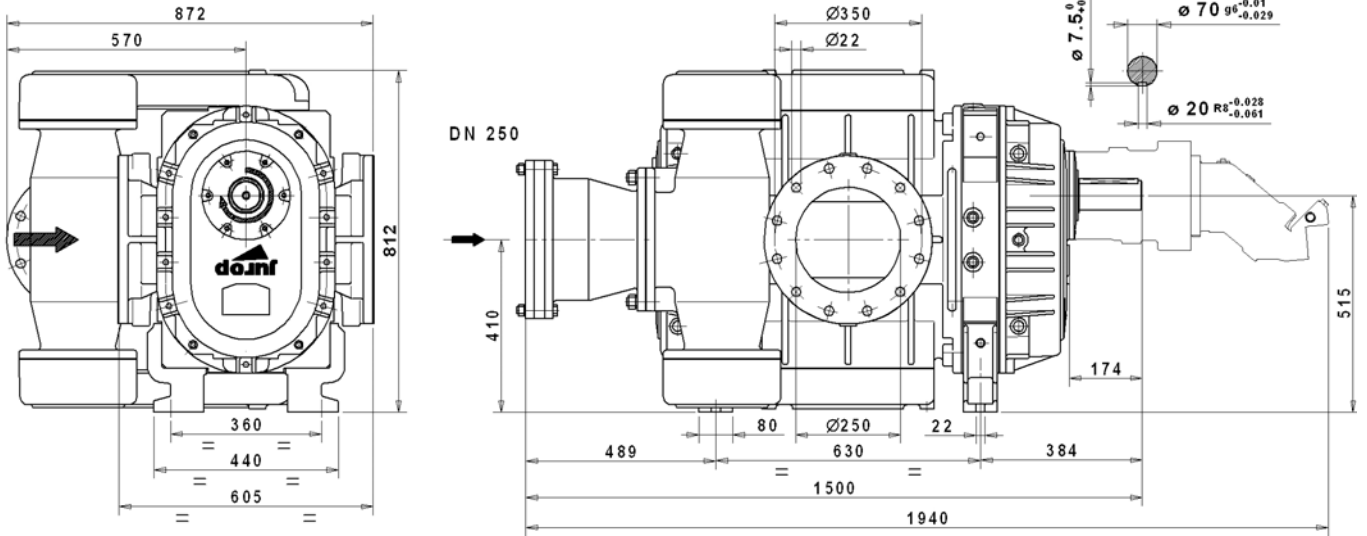


*PVT 1000 CW rotation, Horizontal Ports lower shaft*

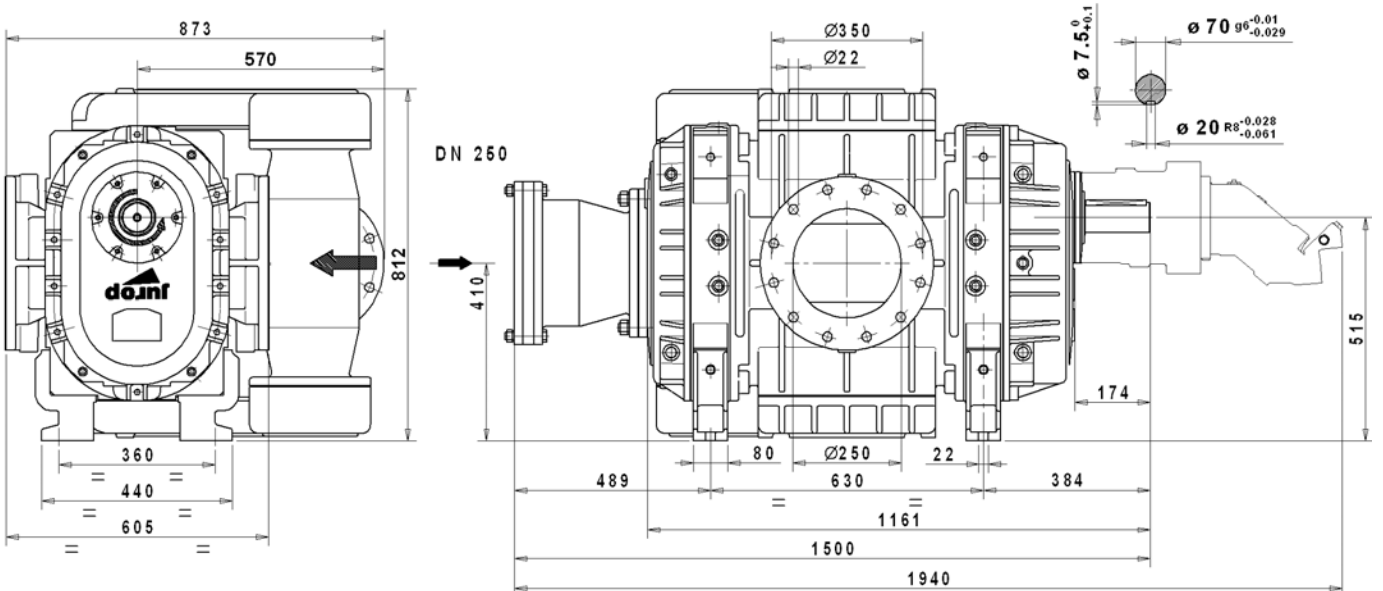
*PVT 1000 HDR CW rotation, Horizontal Ports lower shaft*



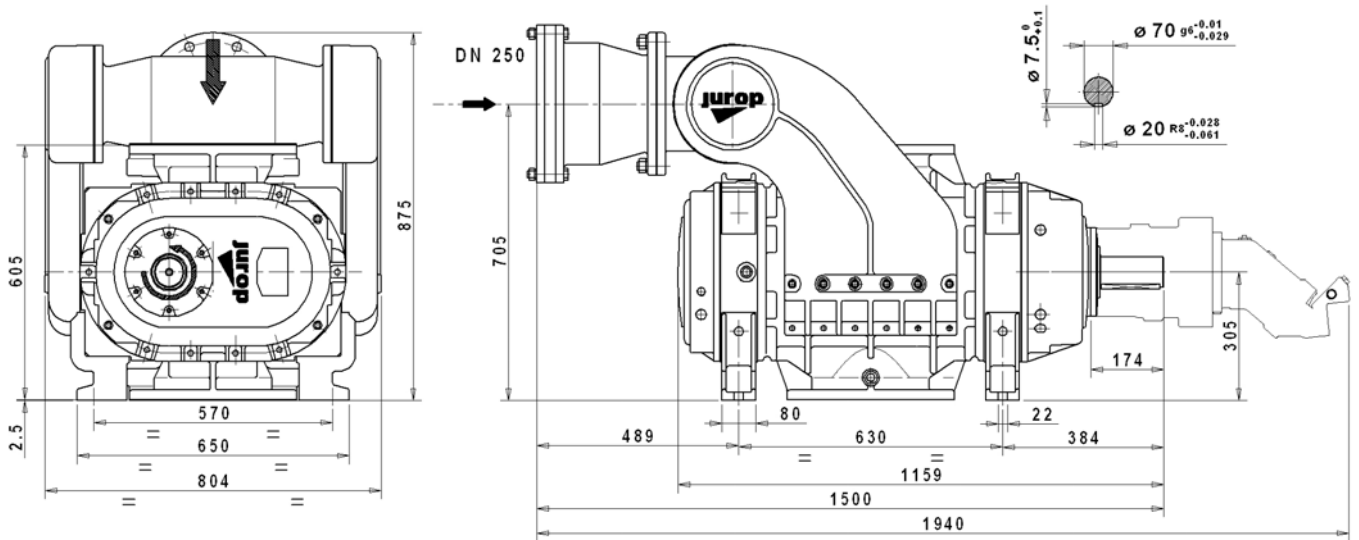
PVT 1000 CW rotation, Horizontal Ports upper shaft  
PVT 1000 HDR CW rotation, Horizontal Ports upper shaft



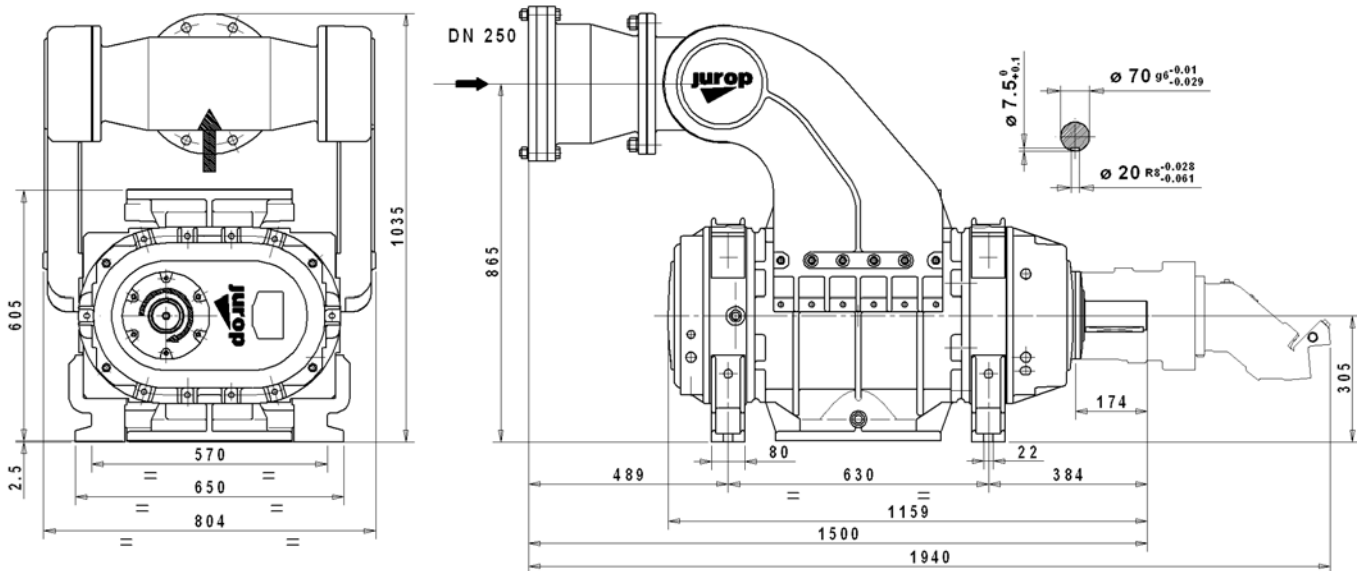
PVT1000 CCW rotation, Horizontal Ports upper shaft  
PVT1000 HDR CCW rotation, Horizontal Ports upper shaft



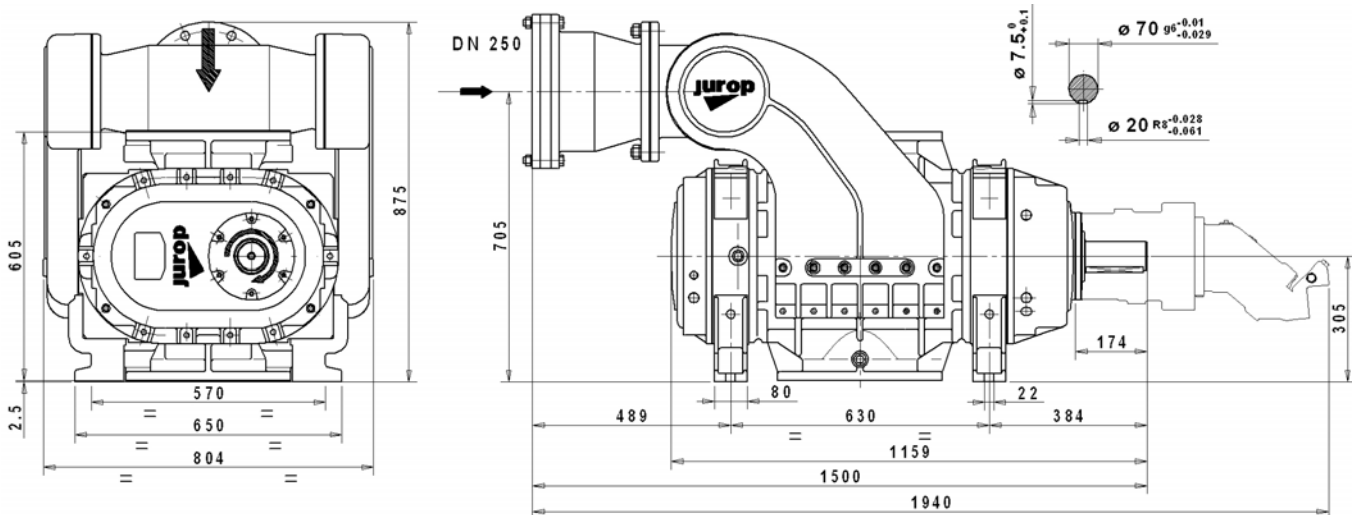
PVT1000 CCW rotation, Vertical Ports left hand shaft  
PVT1000 HDR CCW rotation, Vertical Ports left hand shaft



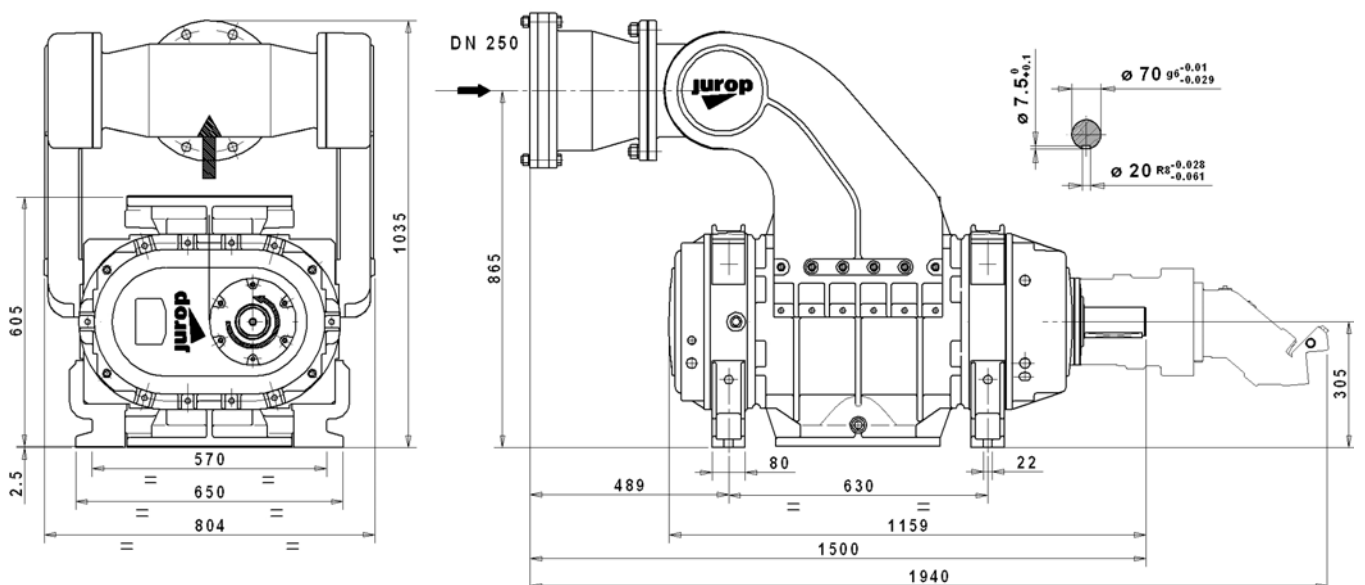
PVT1000 CW rotation, Vertical Ports left hand shaft  
PVT1000 HDR CW rotation, Vertical Ports left hand shaft



PVT1000 CW rotation, Vertical Ports right hand shaft  
PVT1000 HDR CW rotation, Vertical Ports right hand shaft

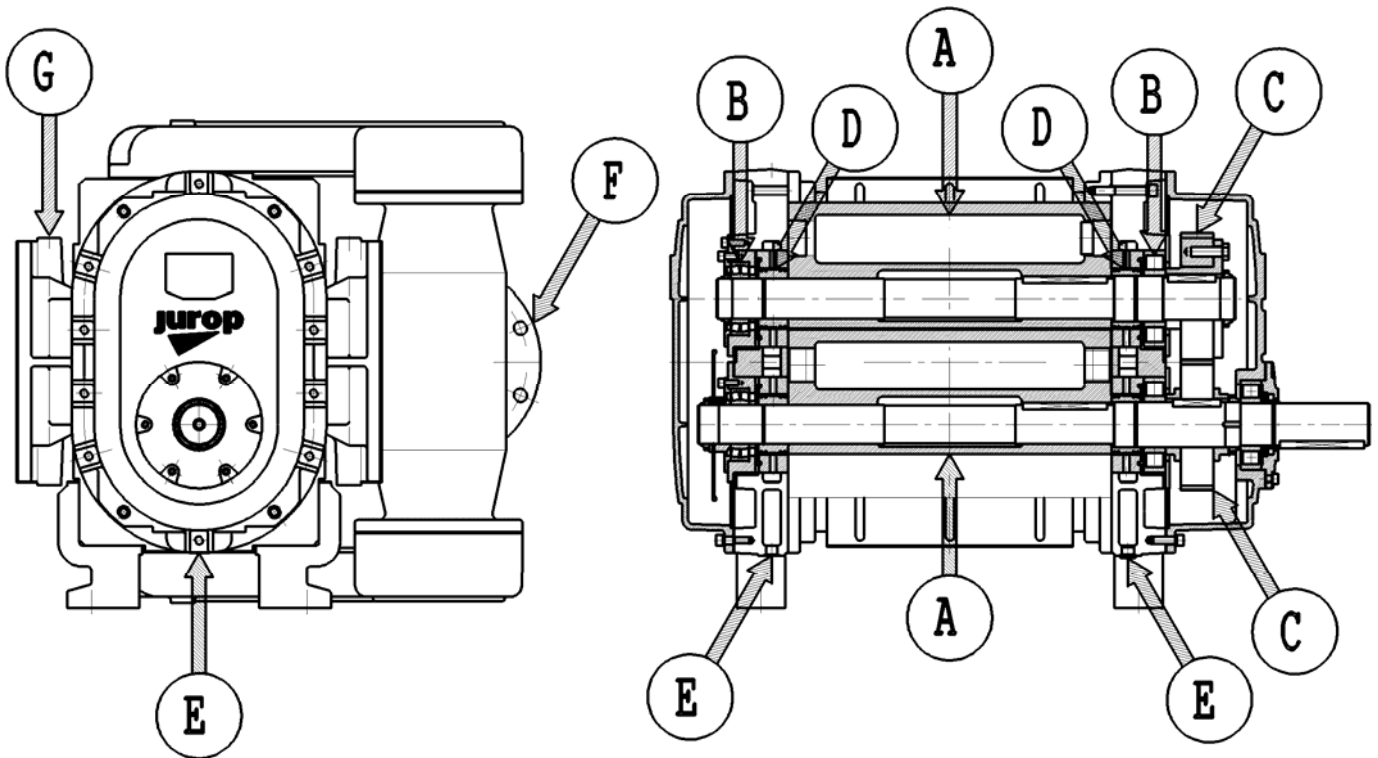


PVT1000 CCW rotation, Vertical Ports right hand shaft  
PVT1000 HDR CCW rotation, Vertical Ports right hand shaft

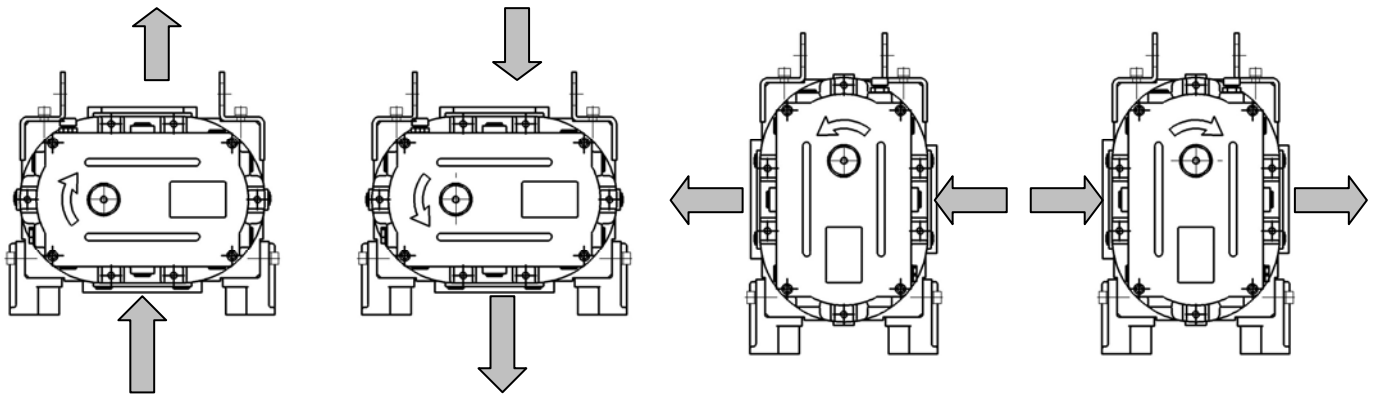


## 2.2. CONSTRUCTION CHARACTERISTICS

- Tri-lobe rotary volumetric pump with synchronised phase gears
- No oil emission into the atmosphere.
- Wear-proof operation, reduced maintenance.
- Clockwise or counter clockwise rotation on request.
- Dynamically balanced rotors to reduce vibrations (A).
- Splash lubricated bearings (B) and gears (C) in the front and rear boxes.
- Internal labyrinth seals (D) with cast iron rings with discharge into the atmosphere.
- Leak check ports of the labyrinth seal (E).
- Seals and gaskets for high temperatures.
- Air injection cooling system with clapper valve (F). This valve opens only in the vacuum functioning mode.
- Silencer for injection (compulsory accessory) and vacuum pump exhaust.
- Overheating thermostat on the exhaust port (G).
- Lifting points .



Relation between rotation and air flow



**2.3. PERFORMANCE**

**2.3.1. GAS CONVEYED**



The PVT1000 pump is suitable for conveying filtered air. Before conveying other kind of gases, verify compatibility with vacuum pump's characteristics. Please contact Jurop's Technical dept. if necessary. The vacuum pump can be seriously damaged by the accidental suction inside of solid bodies or liquids.

**2.3.2. OPERATING LIMITS**

RPM		P <sub>2</sub> (mbar)		P <sub>2</sub> -P <sub>1</sub> (mbar)	T <sub>2</sub> (°C)	T <sub>2</sub> -T <sub>1</sub> (°C)
Min	Max	Max continuous	Max intermittent	Max	Max	Max
800	2500	1800	2000	1000	160	130

P<sub>1</sub> : inlet absolute pressure

T<sub>1</sub> : inlet air temperature

P<sub>2</sub> : outlet absolute pressure

T<sub>2</sub> : outlet air temperature

max continuous P2: pressure limit for continuous du

max intermittent P2: pressure limit for intermittent duty

### 2.3.3. VACUUM MODE OPERATION

RPM	VAC. 0% Air flow free air		VAC. 30% 9"Hg		VAC. 40% 12"Hg		VAC. 50% 15"Hg		VAC. 60% 18"Hg	
	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW
1000	2400	3	2000	24	1800	31	1550	38	1300	46
	40000		33300		30000		25800		21700	
	1410		1170		1060		910		770	
1200	3000	4,5	2500	30	2300	40	2100	48	1700	57
	50000		41700		38300		35000		28300	
	1760		1470		1350		1240		1000	
1400	3450	8	3000	38	2800	48	2550	58	2250	67
	57500		50000		46700		42500		37500	
	2030		1770		1650		1500		1325	
1600	4000	12	3600	43	3400	55	3100	67	2800	78
	66700		60000		56700		51700		46700	
	2350		2120		2000		1830		1650	
1800	4600	16	4100	52	3950	65	3650	77	3350	87
	76700		68300		65800		60800		55800	
	2710		2410		2325		2150		1970	
2000	5050	22	4700	60	4400	74	4200	87	3700	102
	84200		78300		73300		70000		61700	
	2975		2770		2590		2470		2180	
2200	5750	29	5150	68	4900	83	4600	95	4200	112
	95800		85800		81700		76700		70000	
	3385		3030		2900		2700		2470	
2400	6100	37	5650	80	5500	92	5100	111	4700	124
	101700		94200		91700		85000		78300	
	3600		3330		3240		3000		2770	
2500	6400	42	5900	83	5600	96	5400	115	4900	127
	106700		98300		93300		90000		81700	
	3770		3470		3300		3180		2890	

RPM	VAC. 70% 21"Hg		VAC. 80% 24"Hg		VAC. 90% 27"Hg		VAC. Max 93% 28"Hg	
	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW
1000	800	52	110	60				
	13300		1800					
	470		65					
1200	1200	66	450	74				
	20000		7500					
	700		265					
1400	1750	78	900	87				
	29200		15000					
	1030		530					
1600	2300	89	1200	100	200	111		
	38300		20000		3300			
	1350		700		115			
1800	2600	105	1600	115	400	127		
	43300		26700		6700			
	1530		950		240			
2000	3100	115	1900	130	600	142		
	51700		31700		10000			
	1820		1120		350			
2200	3500	124	2300	141	800	152		165
	58300		38300		13300			
	2060		1350		470			
2400	4000	140	2600	158	1000	164		171
	66700		43300		16700			
	2350		1530		590			
2500	4200	145	2900	163	1200	169		175
	70000		48300		20000			
	2470		1700		700			

Ambient conditions: 1013 mbar abs, 20°C.  
Counter pressure at the exhaust port 1013 mbar abs.

Tolerances on the air flow and power: ±5%



**Speed 2500 rpm : vac. 80% ( 24"Hg ) MAX.**  
Possible overheating of the pump with vacuum rates over 80%

### 2.3.4. PRESSURE MODE OPERATION

RPM	0 mbar Air flow free air		200 mbar		400 mbar	
	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW
1000	2400 40000 1410	3	2050 34200 1210	15	2000 33300 1180	30
1200	3000 50000 1760	4,5	2600 43300 1530	20	2550 42500 1500	39
1400	3450 57500 2030	8	3150 52500 1855	25	3100 52700 1860	46
1600	4000 66700 2350	12	3650 60800 2150	30	3600 60000 2120	56
1800	4600 76700 2710	16	4200 70000 2470	37	4000 66700 2355	67
2000	5050 84200 2975	22	4600 76700 2710	46	4550 75800 2680	75
2200	5750 95800 3385	29	5150 85800 3030	56	5050 84200 2975	88
2400	6100 101700 3600	37	5800 96700 3415	66	5600 93300 3300	95
2500	6400 106700 3770	42	6000 100000 3530	69	5800 96700 3415	100

RPM	600 mbar		800 mbar		1000 mbar	
	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW	Q mc/h l/min CFM	P kW
1000	1900 31700 1120	45	1800 30000 1060	58	1700 28300 1000	72
1200	2450 40800 1440	55	2400 40000 1410	70	2250 37500 1325	87
1400	3000 50000 1770	66	2950 49200 1740	86	2800 46700 1650	105
1600	3550 59200 2090	80	3400 56700 2000	100	3300 55000 1940	120
1800	4000 66700 2355	89	3800 63300 2235	114	3700 61700 2180	134
2000	4300 71700 2535	102	4200 70000 2475	126	4050 67500 2385	151
2200	4800 80000 2825	115	4700 78300 2770	141	4500 75000 2650	165
2400	5450 90800 3210	125	5350 89200 3150	155	5250 87500 3090	180
2500	5650 94200 3330	130	5550 92500 3270	161	5350 89200 3150	188

Ambient conditions: 1013 mbar abs, 20°C.  
pressure at the SUCTION port 1013 mbar abs

Tolerances on the air flow and power: ±5%

### 2.3.5. NOISE

The Noise Power **LwA** from the source and the Noise Pressure **LpA** measured from 1, 3, 7 m distance to the pump in an open field are showed in the following chart.

Regime rotazione rpm	Vac - Press	PVT1000 LwA dB(A)	LpA 1m dB(A)	LpA 3 m dB(A)	LpA 7m dB(A)
1000	Air flow free air	86	78	68	61
	vac 50% - 15"Hg	91	83	73	66
	vac 80% - 24"Hg	100	92	82	75
	ΔP 400mbar	97	89	79	72
	ΔP 600mbar	102	94	84	77
1400	Air flow free air	95	87	77	70
	vac 50% - 15"Hg	99	91	81	74
	vac 80% - 24"Hg	101	93	83	76
	ΔP 400mbar	102	94	84	77
	ΔP 600mbar	105	97	87	80
1800	Air flow free air	99	91	81	74
	vac 50% - 15"Hg	100	92	82	75
	vac 80% - 24"Hg	102	94	84	77
	ΔP 400mbar	103	95	85	78
	ΔP 600mbar	104	96	86	79
2200	Air flow free air	105	97	87	80
	vac 50% - 15"Hg	106	98	88	81
	vac 80% - 24"Hg	108	100	90	83
	ΔP 400mbar	107	99	89	82
	ΔP 600mbar	108	100	90	83
2500	Air flow free air	107	99	89	82
	vac 50% - 15"Hg	108	100	90	83
	vac 80% - 24"Hg	110	102	92	85
	ΔP 400mbar	110	102	92	85
	ΔP 600mbar	111	103	93	86

The noise level is also influenced by the installation conditions such as:

- Possible noise reflection on walls close to the pump.
- Installation of the pump on vibration adsorbing pads ( see par. 4.4 "Installing the vacuum pump") .
- Use of sleeves on the pipes to reduce the propagation of vibrations.

### 3. SAFETY AND ACCIDENTS PREVENTION



THE FOLLOWING INSTRUCTIONS MUST BE IN COMPLIANCE WITH

- When the pump is being transported it must be placed on a stable point and fixed with safety straps.
- Installation and maintenance must be carried out by qualified personnel only, wearing suitable clothing as well as the necessary individual protective gear and tools.
- Before doing any maintenance work:
  - stop the pump and discharge pressure so the system is at atmospheric pressure.
  - disengage power transmission
  - work on the pump only when it is still and cold.
- During operation the pump components can reach very high temperatures (over 100°C). Take all the necessary precautions to avoid contacts.
- Operators working near the pump must avoid prolonged exposure to the noise source, unless they are wearing adequate ear protectors.
- Do not put hands or objects inside the vacuum pump ports when it is running. The rotors can cause serious injury.
- Do not start the machine if the safety devices have been removed from the drive line. Replace damaged guards.
- Safety valves: direct the air flow away from the operators reach.

Do not use the vacuum pump beyond the set limits of use: risk of breakage and possible harm to the operators.

## 4 INSTALLATION

### 4.1. COMPULSORY ACCESSORIES

- Exhaust silencer.
- Suction silencer for the injection system: use the specific PVT 1000 silencer.
- Overheating alarm to connect to the thermostat on the exhaust port.
- An adequate safety filter and/or secondary shutoff on the vacuum line to avoid suction of foreign bodies or liquids.
- Adequate overpressure safety valves.

### 4.2. CHECKING UPON GOODS RECEIVAL

- Remove the packaging and check that all the parts are in perfect condition.
- Make sure that the identification plate is fixed to the vacuum pump. Pumps without this identification plate are to be considered NOT safe, therefore the manufacturer will not take any liability whatsoever. Contact the supplier.

### 4.3. STORING IN THE WAREHOUSE

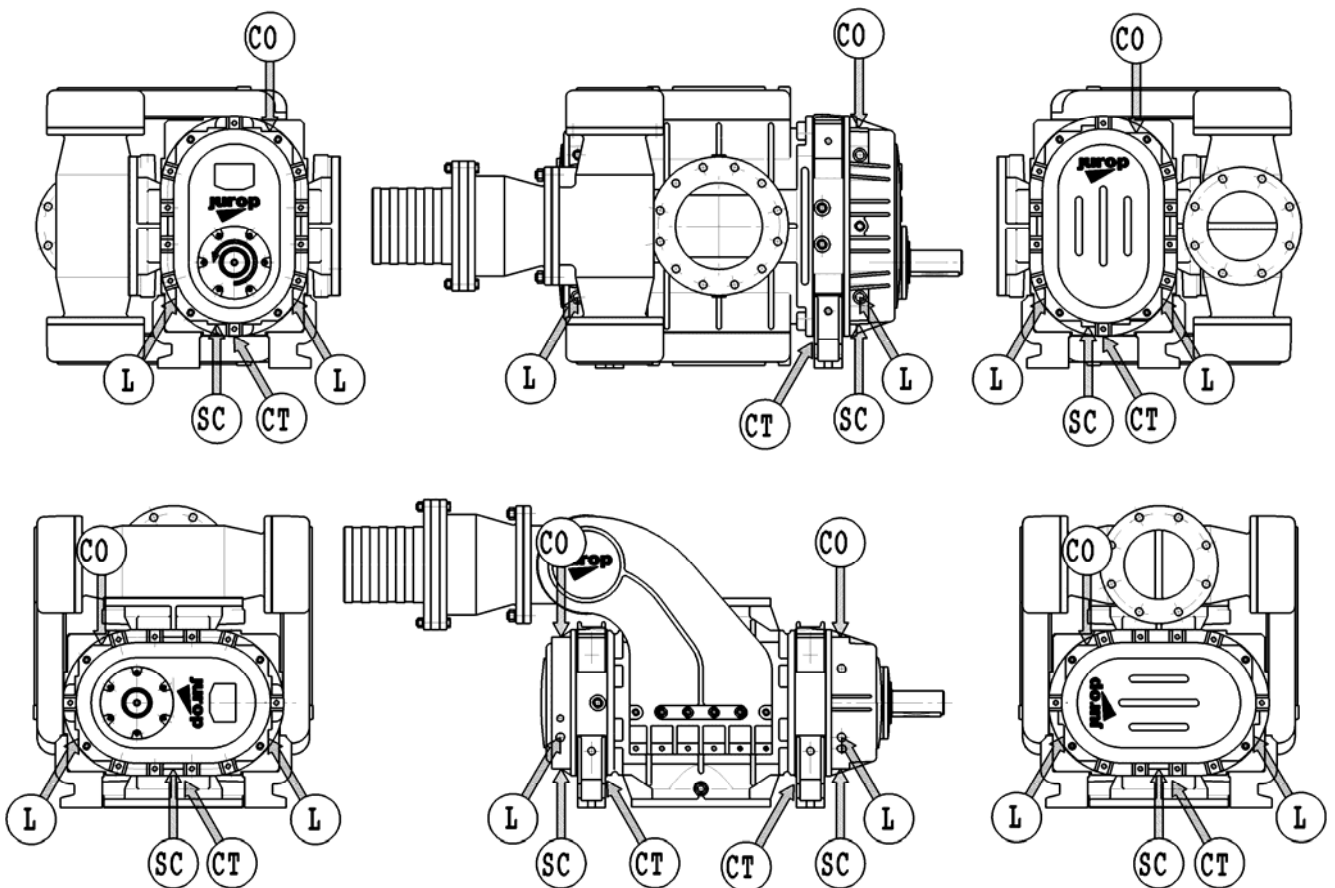
If the vacuum pump will not be installed inside a short time after delivery:

- Remove the guards from the ports and spray a film of protective oil over the inner surfaces of the body, rotors and sides. Then attach again the guards.
- Store in a closed and dry place. Renew the preserving oil periodically.

**4.4. INSTALLING THE VACUUM PUMP**

- When the vacuum pump is installed it must be accessible for maintenance and fitted, with vibration adsorbing pads, to a bearing frame or level base (Max. admitted angle 3°). The size of the frame must be suitable to support the pump weight and avoid bending. It is recommended to install the pump on vibration adsorbing pads to reduce the noise and vibrations produced during its operation.
- Leave enough space around the vacuum pump to allow the free circulation of air for cooling; avoid exposure to dirt and debris.

Leave enough room to access the oil drainage, filling and check ports as well as the seals leaking check ports.



<b>Description :</b>			
<b>L:</b> Oil level	<b>CT :</b> Leakage control	<b>SC:</b> Oil draining	<b>CO:</b> Oil filing

**CAUTION**

The oil vent, level control and drainage plugs are mounted correctly during the final inspection in the factory. Do not change their position. Any changes made to rotation direction or to the assembly position must be agreed with our Technical Assistance.

**NOTE**

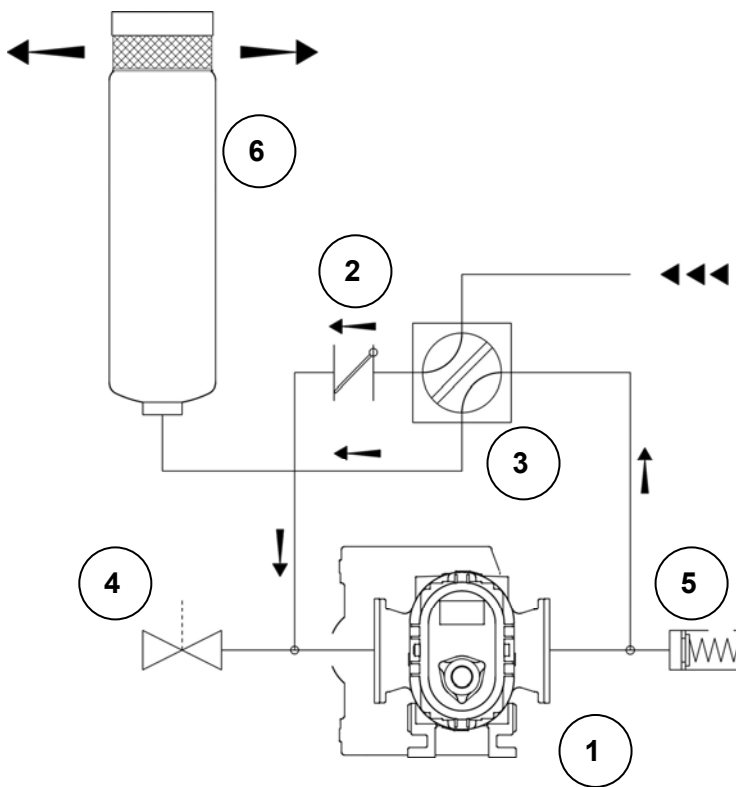
The vacuum pump's rotation direction determines the room taken up by the injection system and flow direction (see par. 2.1 "Dimensions").

## 5. VACUUM – PRESSURE LINE

- The diameter of the vacuum and pressure line pipes must be suitable for the pump's flow rate (approximate average air speed is 15-30 m/s); in any case, it should not be smaller than the ports diameter.
- The weight or dimensions of the pipes must in no way stress the vacuum pump body. Use high temperature resistant rubber sleeves.
- Remove the port guards when mounting. The pipes and components of the whole line must be clean.
- Avoid constrictions and tight curves where they are not essential.
- The exhaust pipes can reach high temperatures. Protect those adequately from the operator reach.
- A clapper valve (2) on pipe suction avoids rotation in the opposite direction when the vacuum pump stops.
- Over-pressure safety relief valve (5) on the vacuum line: install it close to the vacuum pump. Valve relief flow rate must limit the PVT 1000 from exceeding a pressure of 2000 mbar or, in any case, the maximum allowed by the system. Do not interpose shutoff valves on the line between the pump and the safety relief valve.

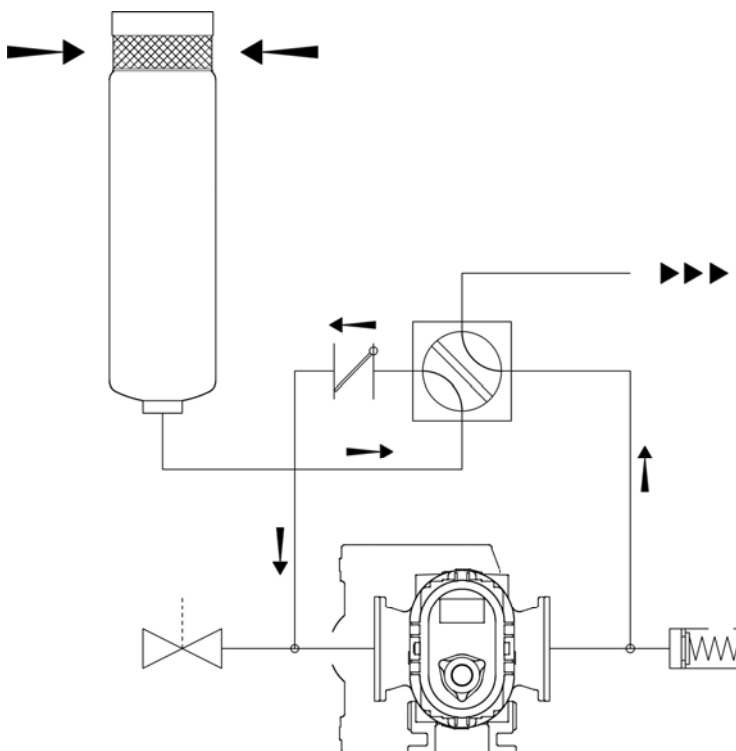
If necessary apply:

- A second shutoff valve or suction filter. Liquids and materials must never reach the pump.
- A venting valve (4) on parallel on the suction line, controlled by the thermostat: when the vacuum pump is overheating, this valve will open a direct connection with the atmosphere and consequently the pump will suck fresh air from the outside, for a better cooling (a 2" valve size can be enough for a good cooling without losing too much vacuum rate).
- Install a silencer filter (6) .
- A 4-way change-over valve (3) to obtain alternatively vacuum or pressure in the system (this is not required if the pump is used only for vacuum or only for pressure).



**VACUUM – PRESSURE LINE**  
(vacuum operation)

ITEM	DESCRIPTION
1	Vacuum pump PVT1000
2	Clapper valve
3	4-way change-over valve (opt.)
4	Overheating safety venting valve (opt.)
5	Over-pressure safety relief valve
6	Silencer



**VACUUM – PRESSURE LINE**  
(pressure operation)

Turning of 90 deg. (from the vacuum position) the 4-way valve changeover, the pump can suck air from the exhaust silencer to pressurize the tank. In this case it is recommended to control the pump speed in order to avoid dangerous overpressure in the line.

**NOTE**

In case of overheating working under pressure condition, opening of the safety venting valve mounted on suction line will not cool down the pump. The only possible solution is to stop the pump drive and wait for a proper cooling.



A clapper valve (2) , on the suction line, avoids opposite rotation of the vacuum pump when it is stopped under vacuum conditions. It is recommended to vent the vacuum tank to the atmospheric pressure in the following cases:

- Before servicing the vacuum pump or its drive system. The pressure difference between inlet/outlet ports can start the machine turning automatically.
- Before starting the machine again: otherwise it would require a higher starting torque.

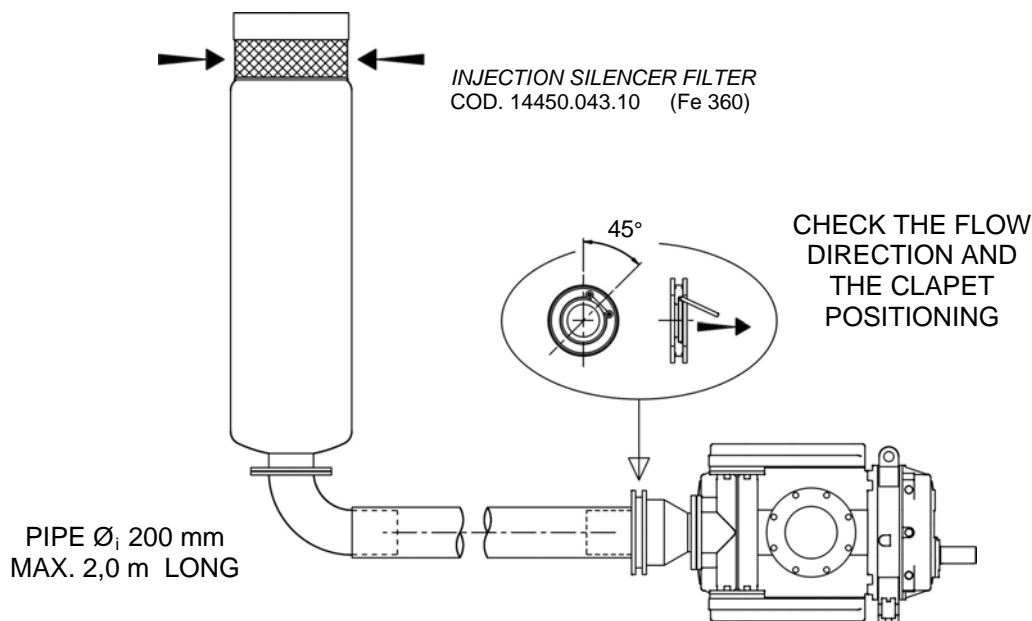
## 6. AIR INJECTION COOLING SYSTEM

(operating only in the vacuum mode).

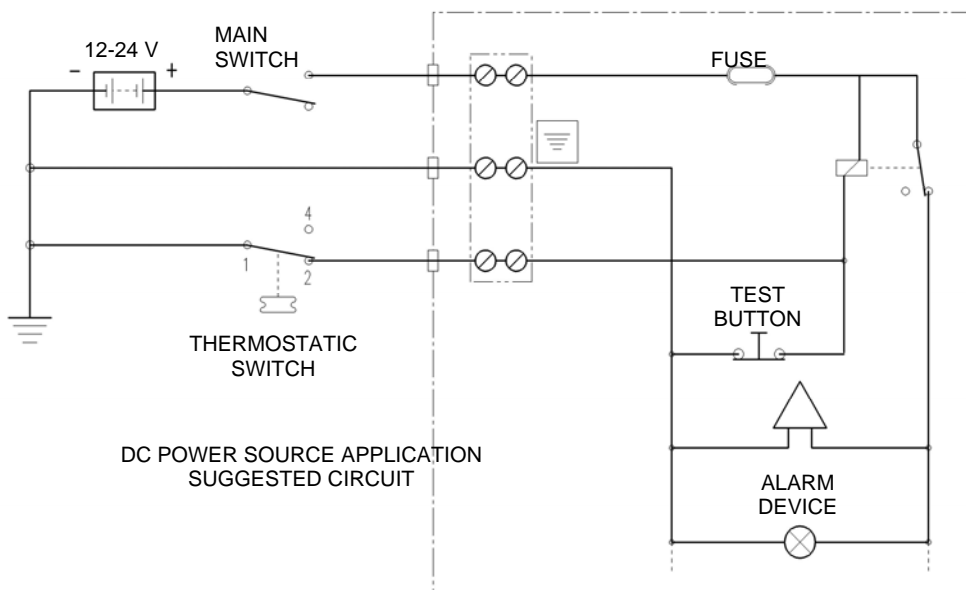
- Use only the specific silencer for the PVT 1000.
- The minimum pipeline diameter of the injection system must be 200 mm.
- The silencer should be mounted as close as possible to the vacuum pump (max. 2,0 m) and in a position protected against debris and water.  
Avoid tight curves.  
Avoid pumping nearby heat sources.



An inefficient AIR injection could cause the vacuum pump to overheat during the vacuum operation.



## 7. OVERHEATING ALARM



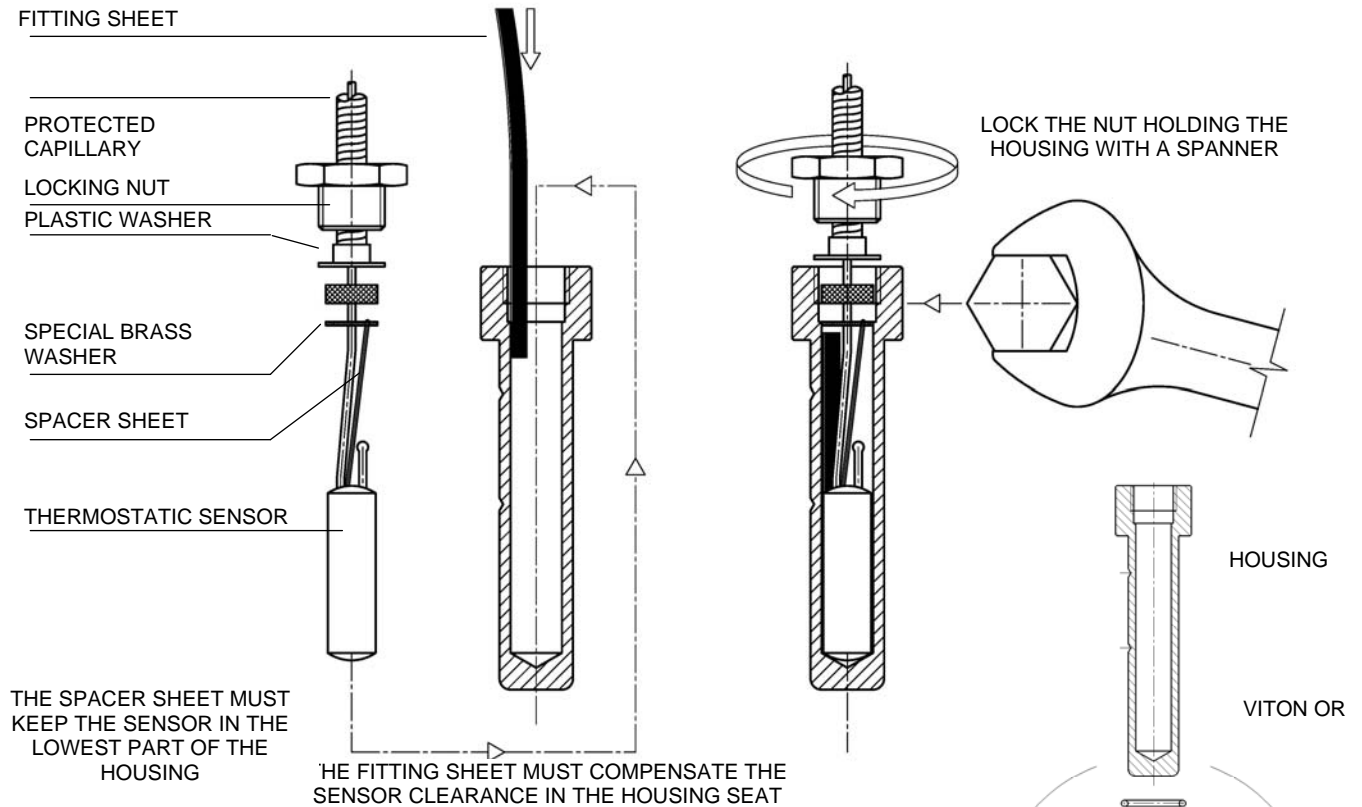
The vacuum pump is supplied with a thermostatic switch on the exhaust port. When the maximum allowed temperature is reached, the switch sends an electric signal to the alarm system or opens a valve on the suction line, to let the fresh air coming in and cool the pump.

Electric characteristics of the SPDT connector:

- DC power supply: max 220V, 12W dc-13 (control coils data)
- AC power supply:
  - max 440V, 10A ca-1 (resistive load)
  - max 440V, 6A ca-3 (start-stop for asynchronous motors)
  - max 440V, 4A ca-15 (power supply with control coils > 72VA)

Protection: IP67 (IEC 529 e DIN 40050).  
 Ambient temperature: from -40 to +70°C.  
 Core hitch: Pg 13.5 for cables from 5 to 14 mm.

Use the NC (normally closed) contact of the switch to control the coils of a power relay. In this way (see above diagram) the alarm advises also in case of accidental wires damage (safety protection of the circuit).



Sensor installation:

- The sensor of the thermostat is supplied by us already fitted inside its housing. In case of disassembling, follow the instruction (above drawing) to reassemble.
- Unwind the protected capillary of the sensor avoiding tight curves or buckling. Fix the unit to a stable support before proceeding (to avoid vibrations or accidental impacts).
- The thermostat operation can be influenced by the ambient temperature. The setting made by the manufacturer is correct to work in ambient temperatures between 0°C and 40°C. If the thermostat is frequently used over said temperature range, it could be necessary a new setting. Please contact the after sale technical service.

Check the following points to grant a correct operation of the thermostat:

- The spacer sheet keeps the sensor fitted on the lowest part of its housing.
- The fitting sheet must fill the clearance between the sensor and its seat in the housing; this is important to grant an easy and correct heat transmission.
- The housing must be locked in the pump with the 2 bolts like shown in the above figure.



Overheating can seize the vacuum pump, causing a damage also in the drive line. Stop the pump for cooling or drive it at free ports conditions (with the suction valves fully opened) to let it cool down properly. The pump can be again operated only when the alarm is turned off after cooling.

## 8. DRIVE SYSTEMS

### 8.1 BELT DRIVE

Install a suitable pulley on the smooth shaft as close as possible to the pump: this to avoid excessive radial load on the drive shaft.

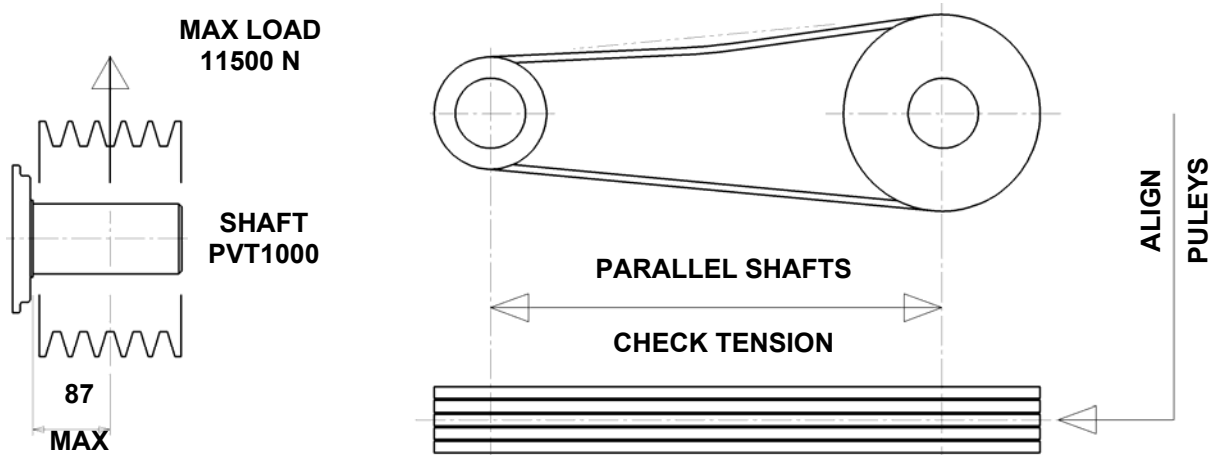
The smaller pulley (usually mounted on the pump shaft) must have the below specified characteristics to grant the best possible pump performances:

Speed rotation rpm	Min. pitch diam. mm	No. grooves	Belts type
500 - 2500	250	5 x XPC	5 x XPC

#### ATTENTION

A higher radial load given by a larger belts number or a pitch diameter smaller than recommended, will stress the shaft and front bearing excessively.

Align the pulleys correctly and do not tighten the belts too much: follow the belt manufacturer's indications. In all cases, do not exceed the maximum load allowed on the pump shaft (see diagram).



#### NOTE

A limited speed ratio will extend the belts life and reduce stress on the shafts. When possible prefer:

- pulleys with a pitch diameter bigger than the one indicated.
- engines or power take-offs with a speed similar to the one of the vacuum pump.

## 8.2 HYDRAULIC DRIVE

The PVT1000 HYD vacuum pump is complete with a fixed displacement high pressure motor suitable for open or closed type oil circuits.

- Motor specifications**

HYD. Motor displacement cc/rev	Max. working pressure bar	Drainage absolute max. c-press. bar	Max. body temperature °C
125	400	2.5	80

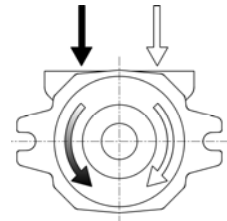
- Oil flow and pressure:** to be defined according to the vacuum pump speed rotation.
- Fluid:** mineral oil for hydraulic systems HLP DIN51524.

Temperature °C	Viscosity cSt	Optimal viscosity range cSt	Max. viscosity (at start up) cSt
-20 / +90	10 - 80	15 - 30	1000

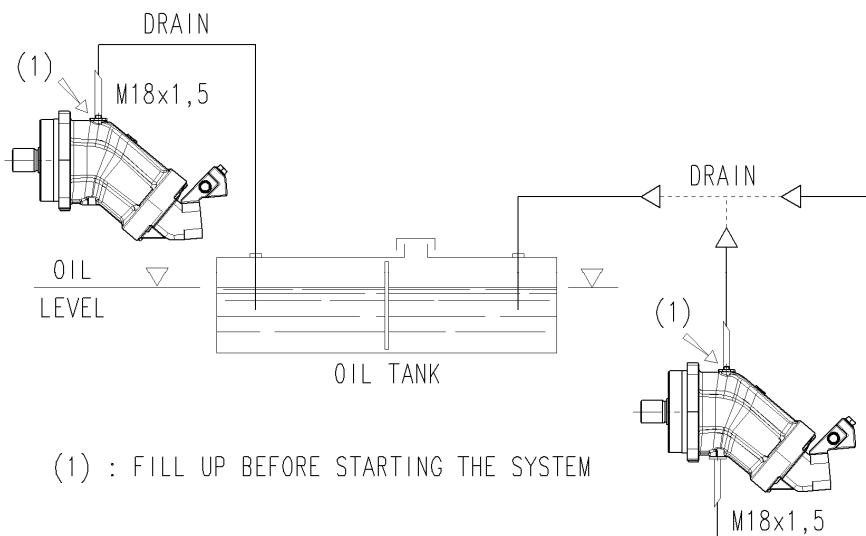
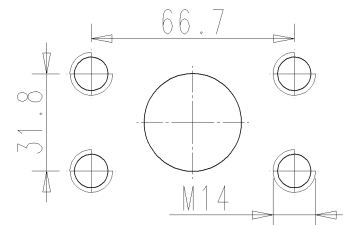
Find the suitable fluid viscosity according to the working temperature.

Working temperature (°C)	Viscosity (cSt) at 40°C
30°C – 40°C	22
60°C – 80°C	46 or 68

- Filtering:** class 18/15 in accordance with ISO 4406.
- Check the oil line connections** that must logically following the rotation direction of the vacuum pump (see the diagram on the right)



**IN OUT HYD MOTOR**  
SAE 1 1/4 " 420 Bar



(1) : FILL UP BEFORE STARTING THE SYSTEM

**Drainage:** connect this line to the oil tank, to avoid dangerous pressure peaks in the hydraulic motor. Max absolute counter-pressure: 2.5 bar

- It is recommended to avoid rotation in the opposite direction when the vacuum pump stops; this because it could damage the hydr. motor whether the circuits are open or closed (see also the “Vacuum – Pressure Line” paragraph). The hydraulic circuit must be protected against overpressures.
- Check the rotation speed, using the inductive sensor mounted on the hydr. motor bracket. Connect it to an electronic rev counter, suitable for 2 kHz max inductive sensors, and set the teeth number at  $z=2$ .

## 9. SYSTEM STARTUP

Check the oil level, in the front and rear gearboxes.

Be assured that all the guards, protections, safety devices and the overheating alarm are installed correctly.

Make sure there are no obstructions in the vacuum line, in the pressure line or in the air injection system.

Verify rotation direction: open all the system’s valves and start slowly



Rotation in the wrong direction is allowed at slow speed: possible damage to the line and/or vacuum pump.

Close the valves and increase pressure or vacuum rate.

Check speed under load and operation: absence of anomalous noise or vibrations.

Check effectiveness of the overheating alarm with test button (see par 7 “Overheating alarm”).

## 10. USE

- In pressure mode adjust the flow via rotation speed: do not use the safety valves to discharge the excess flow produced by the pump.
- Do not squeeze the hoses/pipes.
- Avoid rotation in the opposite direction when stopping the pump. This can be caused by the pressure difference between the delivery and suction ports which makes the rotors turning. Use check valves on the line (see par. 5 “Vacuum – Pressure Line”).
- Avoid to start the pump under load: engine and drive system can be stressed excessively. Therefore vent the tank to the atmospheric pressure before starting the pump

## 11. OPERATING SUGGESTIONS



The manufacturer declines all responsibility for damages caused if the installation, operating and maintenance instructions are disregarded.

- When the overheating alarm advises the operator that the maximum operating temperature has been reached:
  - Stop the vacuum pump and wait until it has cooled down.
  - If possible drive it with all the valves opened for the time necessary to a proper pump cooling.
  - Work can be started again only when the temperature has returned to normal values.
  - If the alarm triggers often during normal use, it is necessary to check the conditions of use (temperature, pressures, speed) and the conditions of the system.
- When ambient temperatures are very low (for instance during the winter) the exhaust temperatures are lower than usual and the overheating alarm does not advise even if you are working at high speed and with high vacuum levels. We recommend to not exceed a temperature difference of 120°C between incoming and outgoing air, in order to avoid anomalous deformation of the components and block/seize of the vacuum pump.
- It is recommended to wash the pump inside according to the following procedure after dusty environments operations, accidental sucking of liquids inside the pump or before a long inoperative period.



- Before washing the pump, be sure that it has cooled down. To obtain this in a short time, it is possible to run the pump for a few minutes at zero vacuum conditions, or stop it at all. It is recommended to avoid doing maintenance on the pump when it is very hot.
- Use 1-2 litre of water mixed with a non-flammable detergent. We suggest some product like Henkel P3 Neutrasel 2860 IT: 5% concentration in water. This detergent grants a good protection against rust and oxidation.
- Use one of the openings placed in the vacuum line (closest to the pump) to suck some water mixed with detergent.
- Start the pump at low speed (about 500 rpm) leaving opened all the suction valves in the tank, in order to keep low the vacuum rate (max vac. 10-20%). Let the detergent mix entering the pump very slowly.
- The detergent mix stays suspended in the pump inside, before being expelled through the exhaust silencer.

After keeping the pump speed for a while to make the product reaching the internal parts, it is necessary to dry the pump preventing oxidation. When the detergent mix is finished, continue running the pump at the lowest possible vacuum rate for a few minutes, then close venting and suction valves up to 50-60% maximum, for a couple of minutes. With this operation the pump will dry from the heated air and protected from the chemical attack of the detergent.

## 12. MAINTENANCE

### 12.1. ROUTINE MAINTENANCE

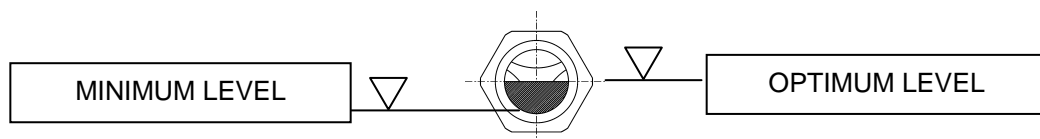


Observe the safety instructions given in the “Safety and preventing accidents” paragraph before starting any maintenance work.

PUMP STATUS	CHECK	FREQUENCY
OPERATING	Pressure	DAILY
	Rotation speed	DAILY
	Temperature	DAILY
	Noise	DAILY
STOPPED	Oil level	WEEKLY
	Oil change in the front and rear box (*)	500 h –5,000 h
	Filters and second shutoff valves on the vacuum – injection line	WEEKLY

#### NOTE

- Check the level of the oil in both gearboxes (front/rear) when the pump is still and cold (see par 4.4 “Installing the vacuum pump”).
- (\*):The first oil change must be done inside 500 hours operation. Following changes every 5000 hours or 12 months.

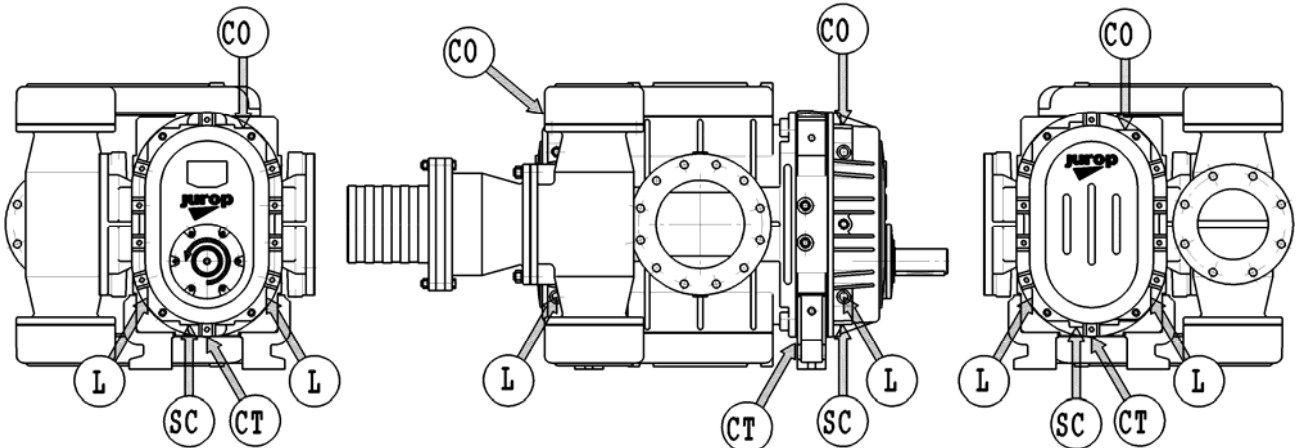


#### ATTENTION

The level of oil (L) must not drop below minimum otherwise there is the risk of rapid wear of the internal components.

- Accidental breakage of the internal labyrinth seals will cause the level of oil in the boxes to drop. It is recommended to check frequently the oil level: daily or weekly as maximum, because frequent oil refills is a clear signal of worn out seals.
- The oil fails to reach the rotors, accumulating in the seal leak check points (see par. 2.2 “Construction Characteristics” ). Unscrew the plugs and check (CT).

**PVT 1000 WITH HORIZONTAL PORTS**



**Quantity of oil (litres)**

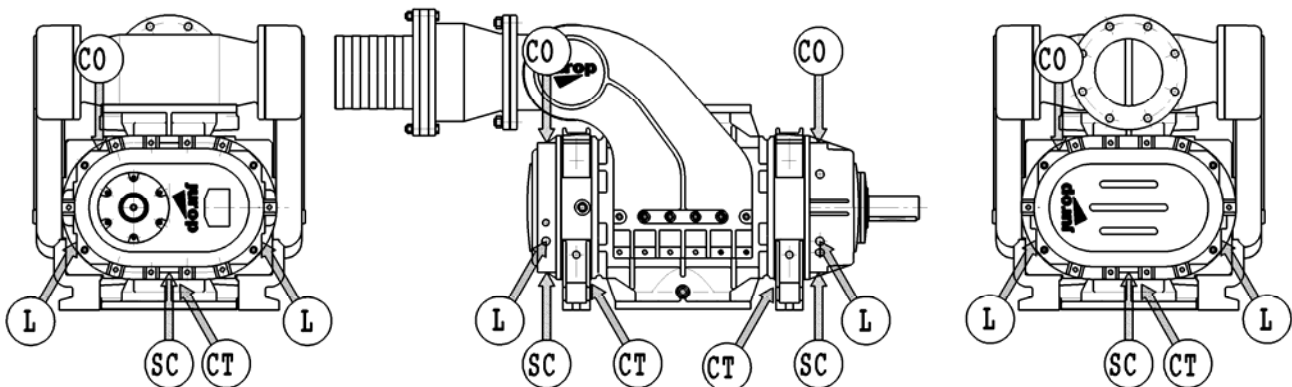
**Rear box**

**Front box**

**1.7**

**2.3**

**PVT 1000 WITH VERTICAL PORTS**



**Quantity of oil (litres)**

**Rear box**

**Front box**

**3.0**

**4.0**

**L:** level indicator

**CO:** filling up plug

**SC:** drainage plug

**CT:** leak check

Recommended lubricant: synthetic gear oil, biodegradable type:

**PANOLIN EP GEAR SYNTH ISO 150**

If this oil is not available, it is possible to refill the level with a gear oil composed of polyalphaolefine (PAO).

Make	CASTROL	FUCHS	KLÜBER	MOBIL (ESSO)	TOTAL (ELF)	SHELL
ISO VG150	ALPHASYN T RANGE 150	RENOLIN CLP 150	KLÜBERSYNTH EG 4 150	SHC 629	CARTER SH 150	OMALA OILS RL 150



It is recommended to refill the oil level always with the same type: mixing of various oil types is to be avoided. To avoid losing the biodegradability characteristics, use the recommended oils for further refills. Dispose of used oil in accordance with the current standards.

When changing the oil, also replace the washer on the drainage plug.  
Check the drive system: follow the manufacturer's instructions.

## 12.2. EXTRAORDINARY MAINTENANCE

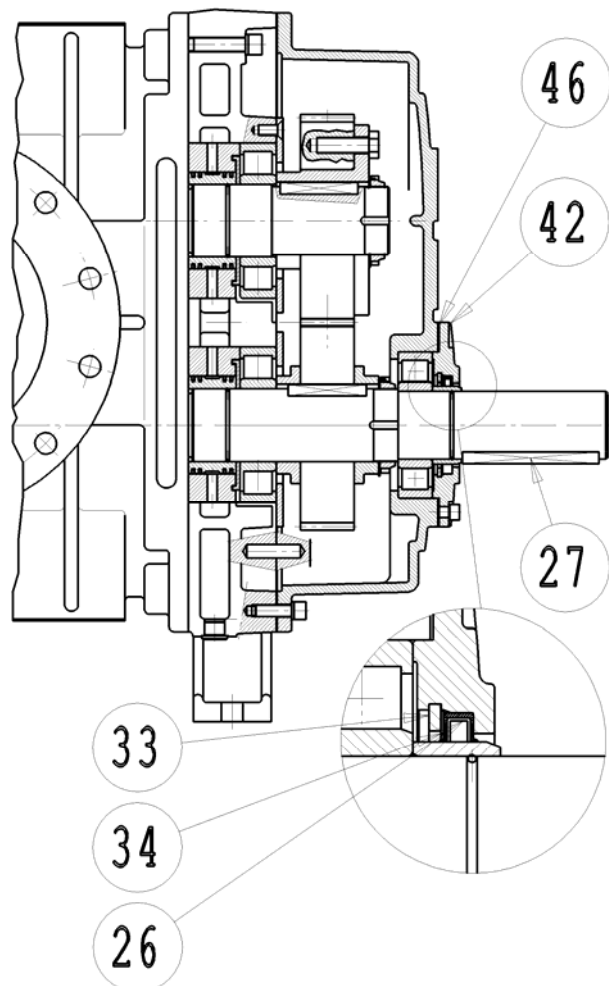
With the exception of the cases described below, extraordinary maintenance on a PVT 200 must be done by specialized personnel, otherwise the guarantee will be invalidated.



Comply with the safety instructions given in the par. 3 "Safety and accident prevention" before starting any maintenance work.

### Replacing the front seal ring

- Remove the tab (27)
- Remove the flange (42)
- Remove the seeger (33) from the flange (42)
- Remove the spacer (34)
- Replace the seal ring (26) and filled with high temperature grease (220°C NLGI2)
- Reassemble the spacer (34) and seeger (33) in the flange (42)
- Change the gasket (46)
- Pay attention: do not damage, do not throw back seal's lips when positioning the front box (see also the drawing below : correct fitting)
- Reassemble the flange (42)



### Cleaning the rotors and body

This is necessary to eliminate hard formations.

- Remove the pipes from the suction and exhaust ports.
- Clean the inside surface of the body and rotors with solvents and scrape without scratching.

### Checking the clapper valve on the injection

Check it periodically to avoid the accidental suction of solid particles inside the vacuum pump (see par 6 " Air injection cooling system).

- Once a year: change the O rings.
- Once every 3 years: change the clapet and related screws and washers.

### 13. TROUBLESHOOTING

Reduced performances	
Not correct speed	Check and restore
Pipes and/or filters clogged or leaking	Check conditions and restore
Pipes are undersized	Check the maximum pump performance
Safety valves not adjusted	Check and adjust correctly

Overheating	
Ambient and/or suction or injected air temperature is too high.	Reduce pressure or vacuum rate
Not correct speed	Check and restore
Inefficient air injection	Check that the filter is clean, check condition of the injection line and clapet valve.
Pipes are undersized	Check, close to the pump ports, the effective suction and delivery pressure. Do not exceed operating limits.

Oil leak	
Front sealing ring is worn	Replace it
Level indicators broken	Replace it
Leaking from the sealing rings (oil in the check points is leaking from the labyrinth seals).	Oil level is too high. Restore. Check the pump inclination (max. 3°). If this is not enough to solve the problem, contact the after sale Service to check the labyrinth seals.

Abnormal vibrations or noise (stop the vacuum pump)	
The rotors are getting in contact	Temperature is over the max working limits ( $T_2 > 160^\circ\text{C}$ and/or $T_2 - T_1 > 130^\circ\text{C}$ : see par. 11). Stop the pump and leave it cooling. Start again only after the alarm has reset.
Rotors with hard formations on the surface	Remove the in/out pipes and clean rotors and housing.
Suction of liquids or foreign bodies	If they have caused the incrustations the pipes must be removed and the rotors and body cleaned.
Not uniform power transmission	Check the operating conditions. Do not install propellers too much angled.

## 14. SCRAPPING

The pump can be scrapped according to the current rules.

If the scrapping is made by the end user company itself, all the different materials must be separated and discharged in special collection areas.

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

## 15. REQUEST FOR SPARE PARTS

When ordering spare parts please provide the following information:

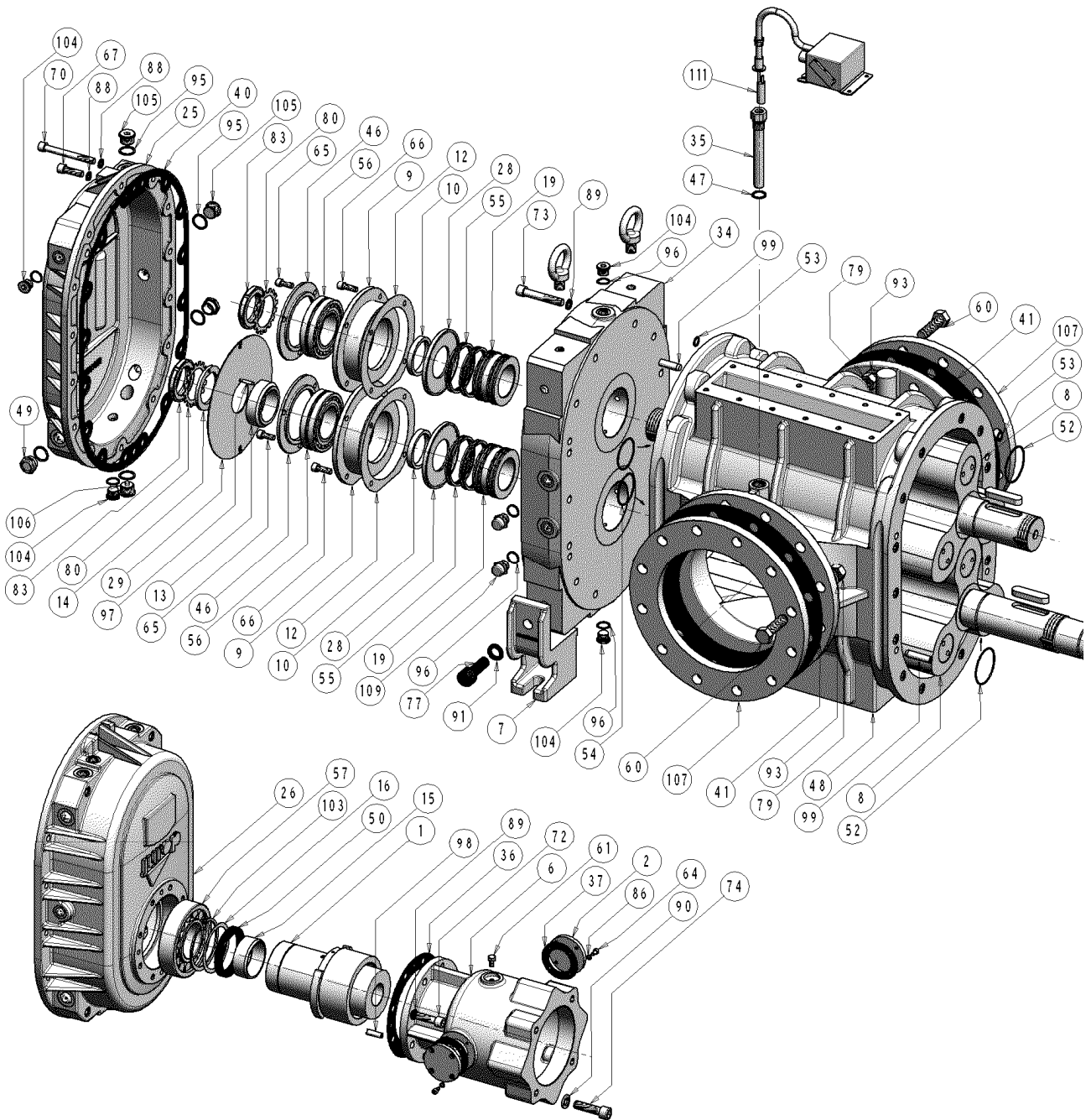
*Referring to the spare parts drawing:*

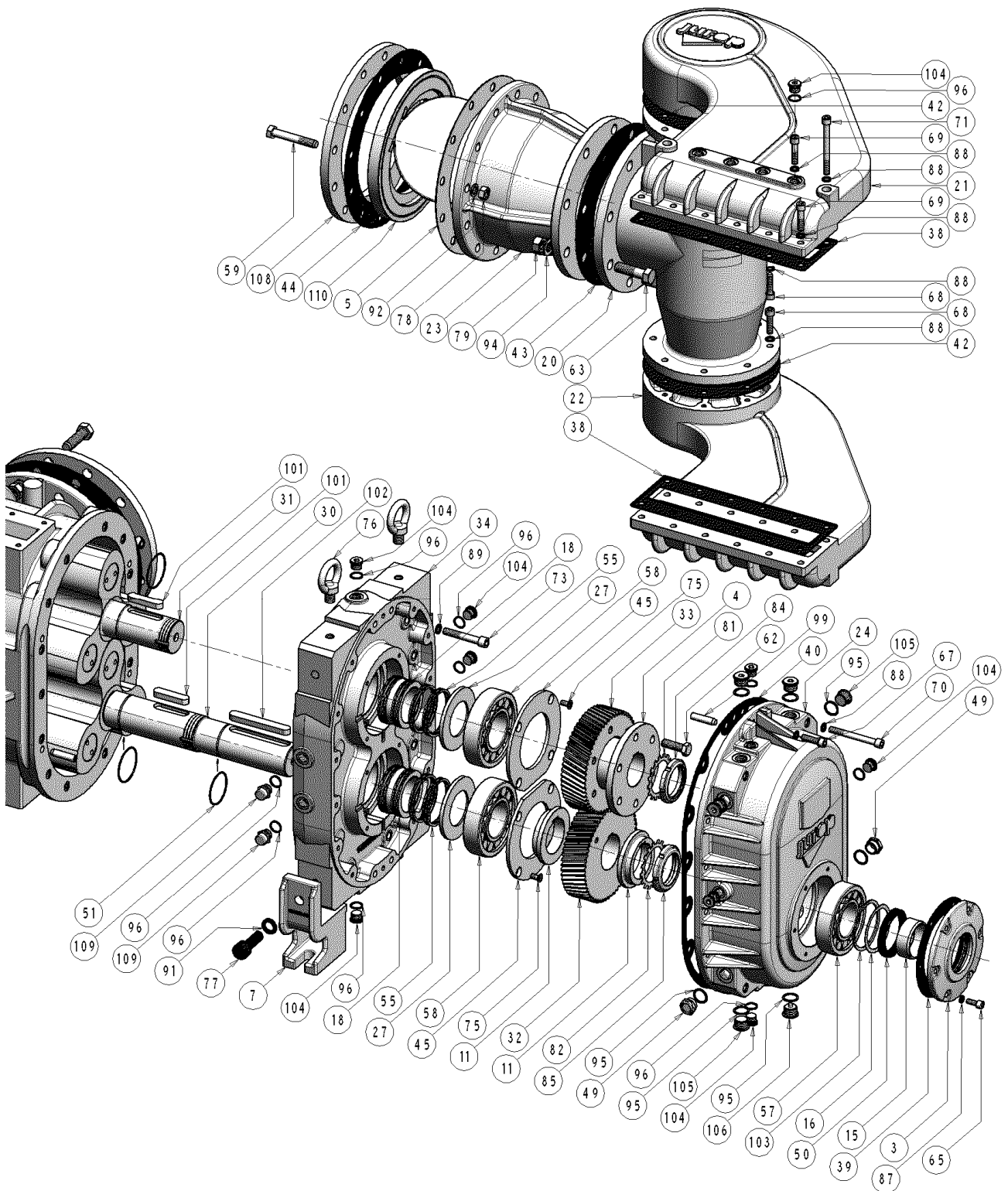
- code
- description
- no. of pieces needed  
(e.g.: code 1680710600; box gasket; 1 pc)

*Referring to the vacuum pump data plate:*

- model
- serial number  
(e.g.: PVT 1000; H700013)

**16. Spare parts list PVT1000 and PVT1000 HDR**





Pos	Art.	Description	Pcs	Pos	Art.	Description	Pcs
1	1470106300	Drive joint coupling	1	45	1681008800	Bearing flange	2
2	1610051700	Flange	2	46	1681008900	Bearing flange	2
3	1610513700	Flange	1	47	16851ABUB0	Washer	1
4	161104EAB0	Adjusting hub	1	48	1687508800	Housing	1
5	161208A9B0	Clapet flange	1	49	4022104504	Oil sight glass G3/4	4
6	1612504600	HDR motor mounting flange	1	50	4022104152	Y seal	1
7	1613501600	Support	4	51	4022200305	Or 3256 Viton	1
8	1621507100	Lobe	2	52	4022200327	Or 3275 Viton	2
9	1624038700	Bearing flange	2	53	4022200328	Or 119 Viton	28
10	1624038800	Spacer	2	54	4022200329	Or 3237 Viton	2
11	1624038900	Spacer	2	55	4022203613	Cast iron ring	16
12	1624039000	Adjusting spacer thickness 0.5	Check	56	4023105014	Bearing 22213 E C3	2
	1624039100	Adjusting spacer thickness 0.1		57	4023110096	Bearing NU314 ECJ C3	1
	1624039200	Adjusting spacer thickness 0.3		58	4023110097	Bearing NU315 ECJ C3	2
13	1624039300	Spacer	1	59	4026100812	Screw M16x100	12
14	1624039400	Spacer	1	60	4026101817	Screw M20x70	24
15	162404TSB0	Bushing	1	61	4026103402	Screw M8x1x10	1
16	162404TWB0	Spacer	1	62	4026103402	Screw M16x50	6
17	1624502300	Bushing	4	63	4026107717	Screw M20x70	8
18	1624502400	Bushing	2	64	4026120301	Screw M6x12	8
19	1624502500	Bushing	2	65	4026120505	Screw M10x25	12
20	1627506800	Injection manifold	1	66	4026120506	Screw M10x30	8
21	1627506900	Injection manifold	1	67	4026120611	Screw M12x40	20
22	1627507000	Injection manifold	1	68	4026120612	Screw M12x45	16
23	1627507100	Clapet manifold	1	69	4026120613	Screw M12x50	20
24	1640501400	Front flange	1	70	4026120618	Screw M12x90	8
25	1640501600	Rear flange	1	71	4026120620	Screw M12x110	4
26	1640501700	Front flange HDR	1	72	4026120712	Screw M14x45	8
27	1647001400	Disc	2	73	4026120740	Screw M14x85	28
28	1647001500	Disc	2	74	4026121215	Screw M16x60	4
29	1647001600	Oil disc	1	75	4026125807	Screw M10x20	8
30	1650021500	Driving shaft	1	76	4026190003	Eye bolt M20	4
31	1650021600	Drived shaft	1	77	4026101813	Screw M20x50	4
32	165104E6B0	Gear	1	78	4026300809	Bolt M16	12
33	165104E7B0	Adjusting gear	1	79	4026300811	Bolt M20	32
34	1562500300	Bench	2	80	4026306313	Ring washer 65x2	2
35	1663063800	Thermostat housing	1	81	4026306314	Ring washer 70x2	1
36	1680701400	Gasket	1	82	4026306315	Ring washer 75x2	1
37	1680709700	Gasket	2	83	4026306513	Ring M65x2 Self locking	2
38	1680710400	Gasket	2	84	4026306514	Ring M70x2 Self locking	1
39	1680710500	Gasket	1	85	4026306515	Ring M75x2 Self locking	1
40	1680710500	Gasket	2	86	4026350503	Washer Grower M6 square	8
41	1680710600	Gasket	2	87	4026350506	Washer Grower M10 square	6
42	1680710700	Gasket	2	88	4026350508	Washer Grower M12 square	68
43	1680710800	Gasket	1	89	4026350509	Washer Grower M14 square	37
44	1680710900	Gasket	1				

Pos	Art.	Description	Pcs
90	4026350611	Washer Grower M16 flat	4
91	4026350613	Washer Grower M20 flat	4
92	4026350711	Washer Grower M16 flat z	12
93	4026350713	Washer Grower M20 flat z	24
94	4026356111	Washer M20	8
95	4026359000	Washer 32x26x1.5 Al	13
96	4026359003	Washer 21.5x26x1.5 Al	26
97	4026401208	Pin 6x24	1
98	4026401806	Pin 10x36	4
99	4026402011	Pin 14x55 M8	8
100	4026501314	Tab 18x11x140	2

Pos	Art.	Description	Pcs
101	4026501403	Tab 20x12x80	2
102	4026501408	Tab 20x12x140	1
103	4026510552	Seeger 102	1
104	4026701603	Plug ½"	22
105	4026701604	Plug ¾"	7
106	4026701622	Magnetic plug¾"	2
107	4026713414	Flange DN250 PN10	2
108	4026713712	Flange DN250 PN6	1
109	4026910002	Ventil plug ½"	4
110	4027400416	Clapet valve DN250 PN6	1
111	4028249B00	Therm. KPS83-MOD 060L3108	1

<b>Series</b> PVT 1000 GB	<b>Issue date</b> 13 febbraio 2007	<b>Review n°</b> 1	<b>Review date</b> 11 marzo 2009	<b>Compiled by</b> U.T.	<b>Confirmed by</b> A.T.
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