



DIPLOMATIC
HYDRAULICS

16 200/105 ED



VPPL

VARIABLE DISPLACEMENT AXIAL-PISTON PUMPS FOR INTERMEDIATE PRESSURE SERIES 10

OPERATING PRINCIPLE

- The VPPL are variable displacement axial-piston pumps with variable swash plate, suitable for applications with open circuits and intermediate pressures.
- They are available in five nominal sizes, with displacements of 8, 16, 22, 36 and 46 cm³/rev.
- The pump flow rate is proportional to the rotation speed and to the angle of the swash plate, which can be continuously modulated. The maximum and minimum angle can be limited mechanically via suitable regulating screws.
- They are usually supplied with a SAE J744 2-hole flange and a SAE J744 cylindrical with key shaft.
- They are available with three different types of regulating control, each according to the application needs.

TECHNICAL SPECIFICATIONS

VPPL PUMP SIZE		008	016	022	036	046
Maximum displacement	cm ³ /rev	8	16	22	36	46
Flow rate at 1500 rpm	lt/min	12	24	33	54	69
Operating pressures	bar	210				
Rotation speed	rpm	max 2000 - min 500				
Rotation direction		clockwise (seen from the shaft side)				
Hydraulic connection		SAE flange				
Type of mounting		SAE flange J744 - 2 holes				
Oil volume in the pump body	dm ³	0,2	0,3		0,6	
Mass	kg	8	12	12	23	23

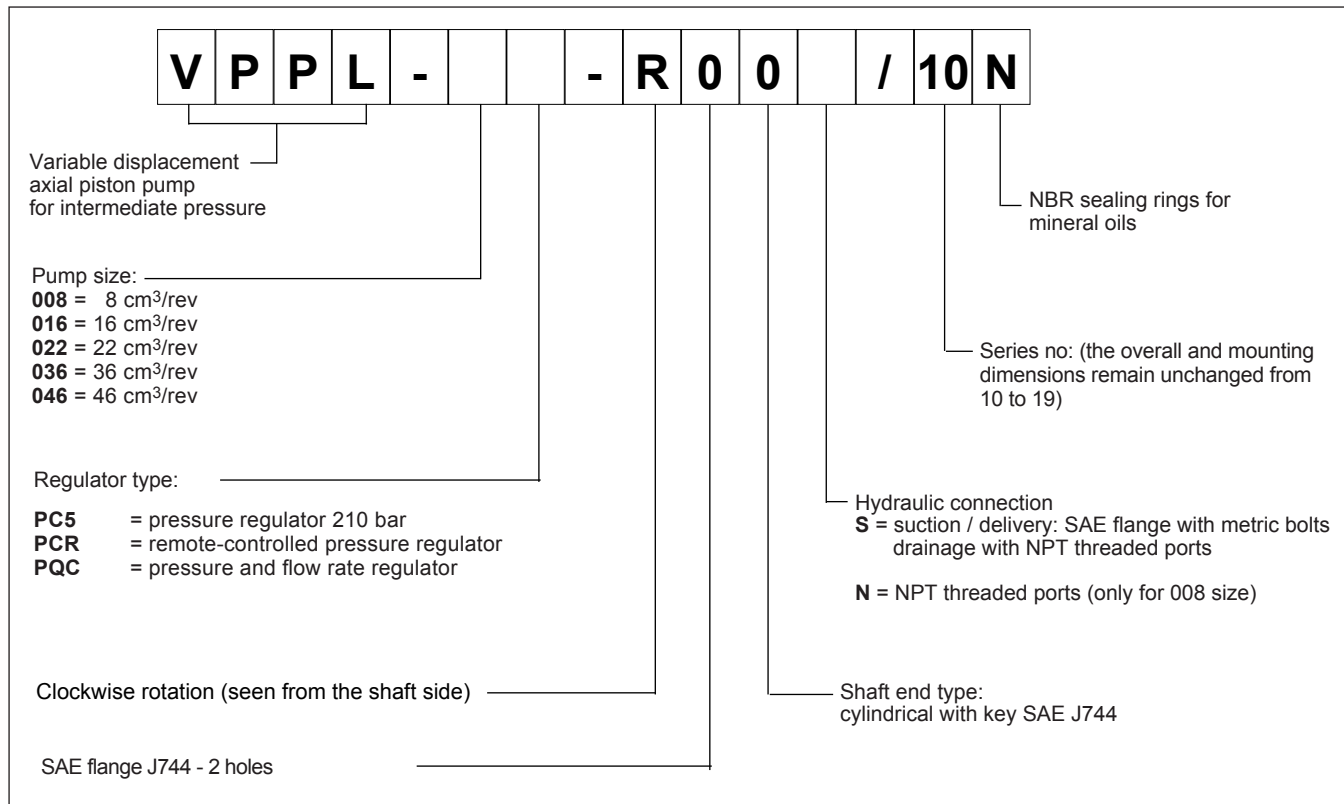
Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	-10 / +70
Recommended viscosity	cSt	20 ÷ 50
Fluid contamination degree	see par. 2.3	

HYDRAULIC SYMBOL





1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil based hydraulic fluids, type HH, HL or HM according to ISO6743-4 standards.

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to a maximum temperature of 90 °C for the drainage fluid
optimum viscosity	20 / 50 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	1000 cSt	limited only to the cold start-up of the pump, which has to be carried out with the plant at minimum pressure.

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to NAS 1638 class 9; therefore the use of a delivery or return filter with $\beta_{20} \geq 75$ is suggested.

A degree of maximum fluid contamination according to NAS 1638 class 7 is recommended for optimum endurance of the pump. Hence, the use of a filter with $\beta_{10} \geq 100$ is recommended.

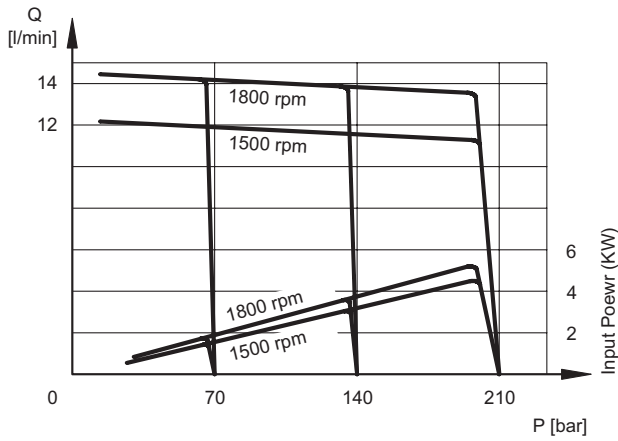
For the installation of filters on the suction line, see par. 8. The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator and should be oversized to avoid cavitation problems.



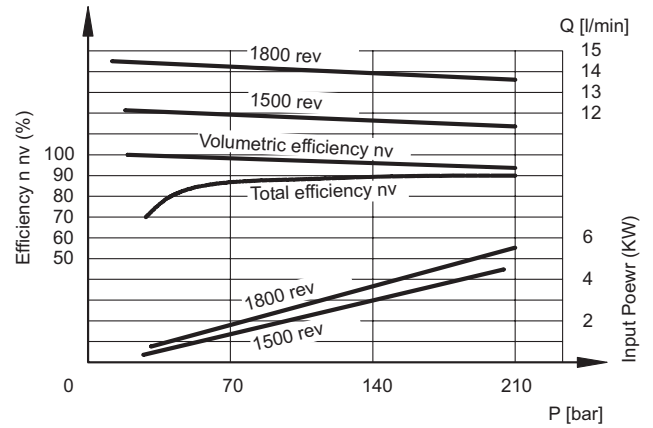
3 - CHARACTERISTIC CURVES

3.1 - VPPL-008 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

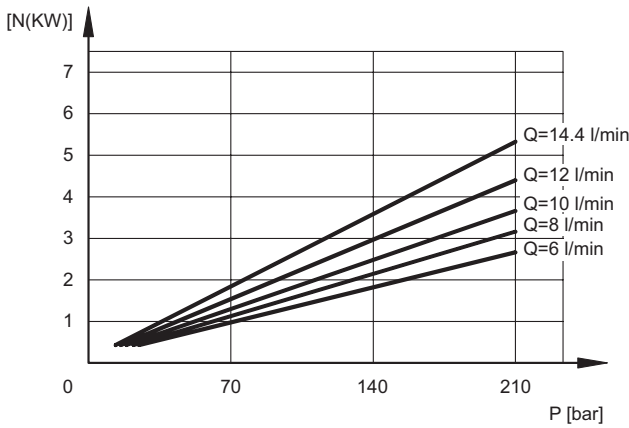
FLOW RATE / PRESSURE CURVES



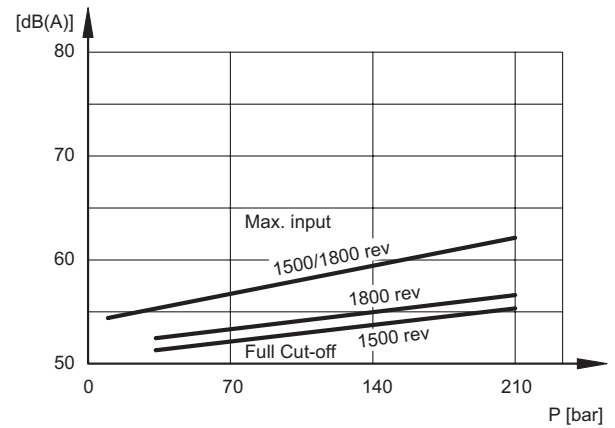
VOLUMETRIC AND TOTAL EFFICIENCY



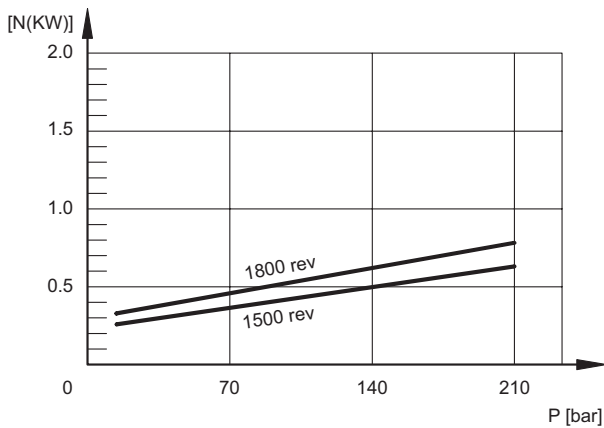
ABSORBED POWER



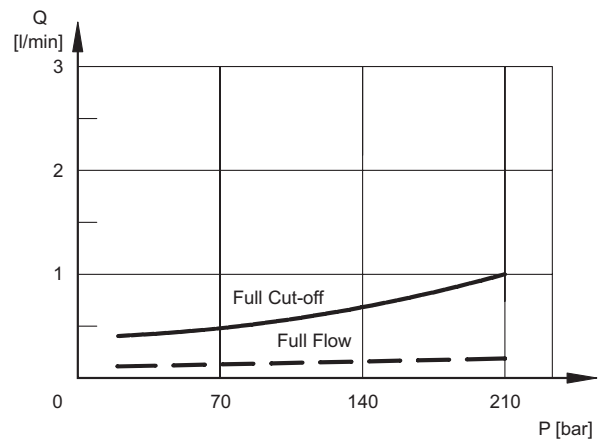
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF



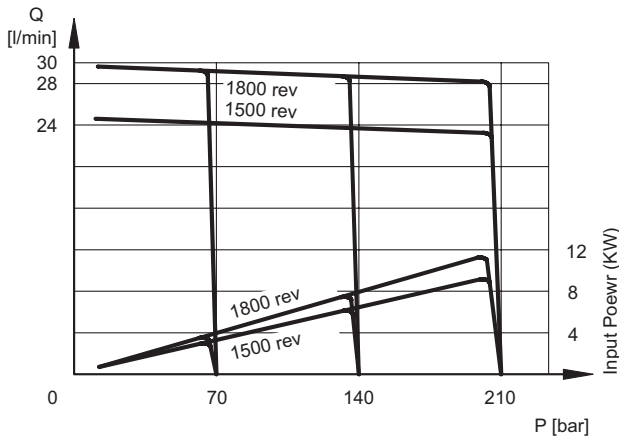
DRAIN FLOW RATE



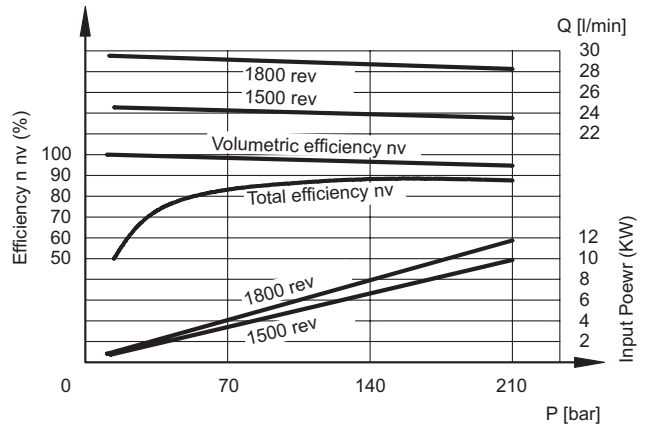


3.2 - VPPL-016 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

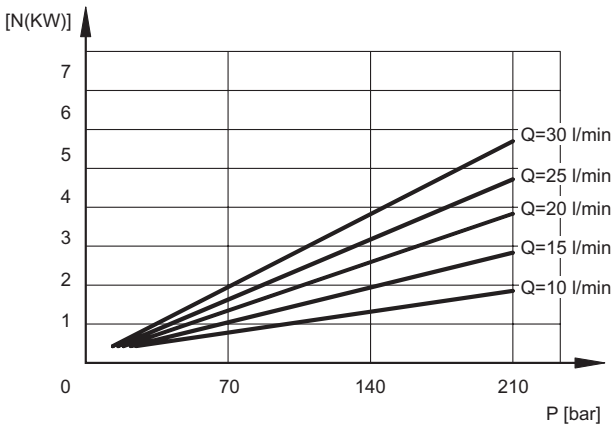
FLOW RATE / PRESSURE CURVES



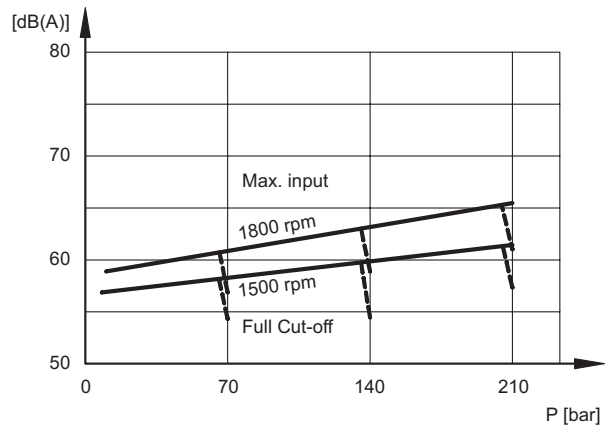
VOLUMETRIC AND TOTAL EFFICIENCY



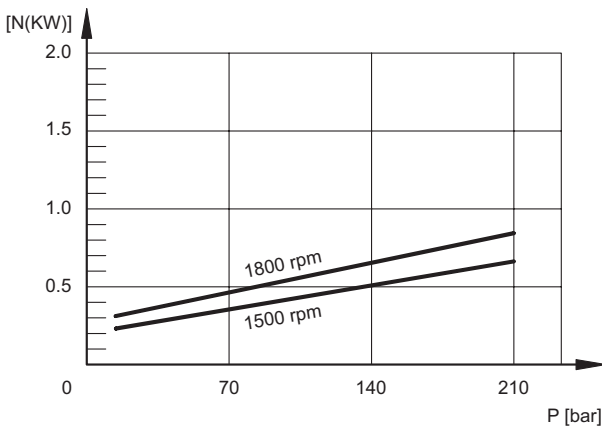
ABSORBED POWER



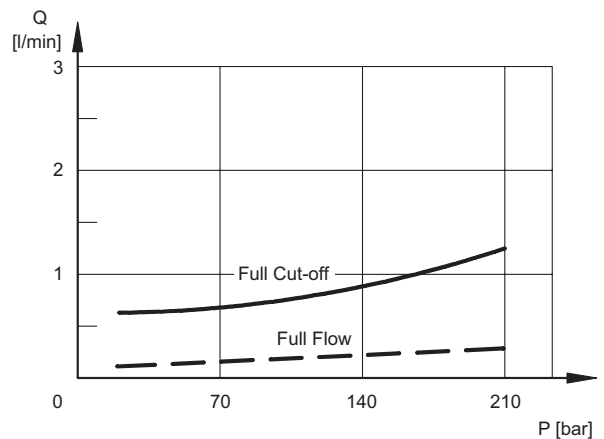
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF



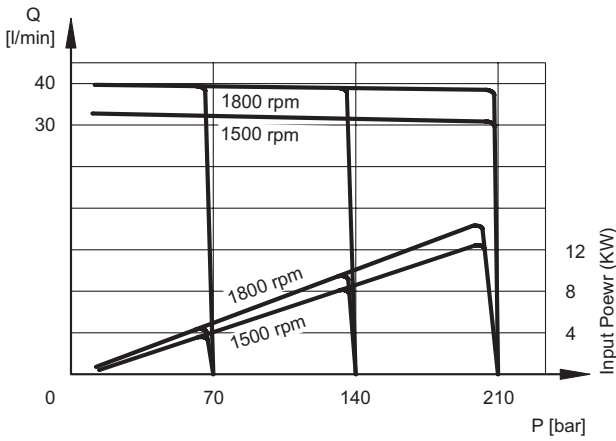
DRAIN FLOW RATE



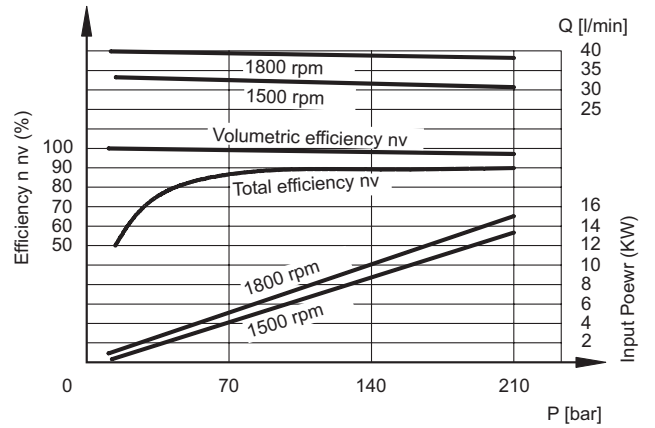


3.3 - VPPL-022 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

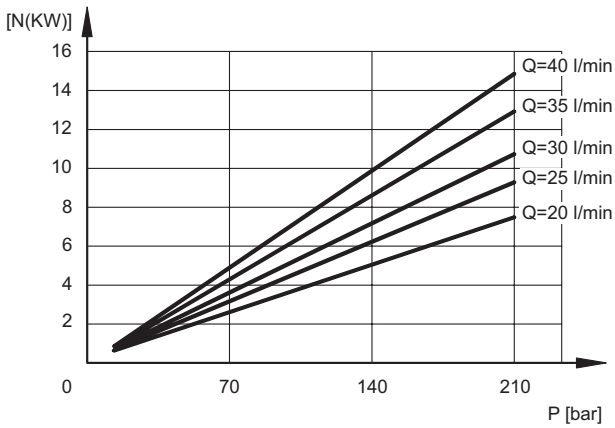
FLOW RATE / PRESSURE CURVES



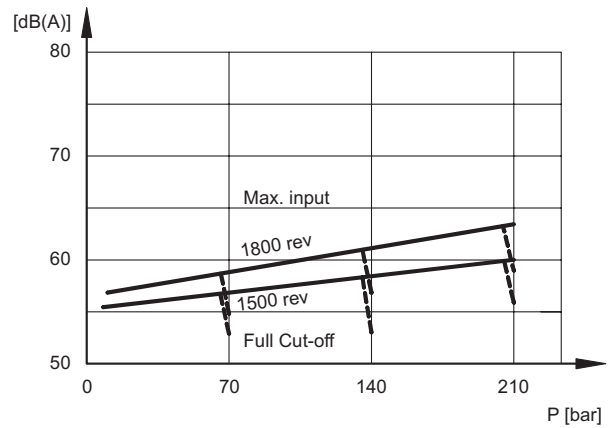
VOLUMETRIC AND TOTAL EFFICIENCY



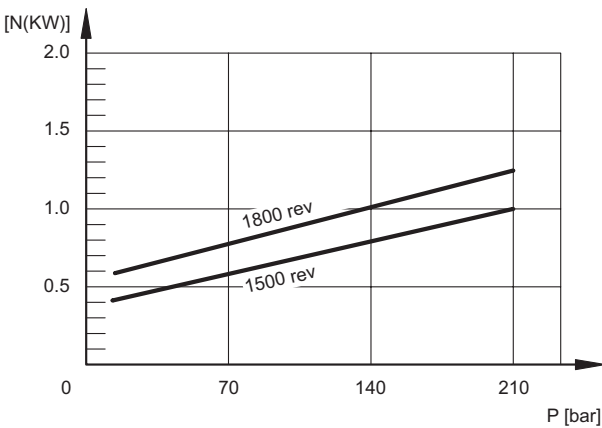
ABSORBED POWER



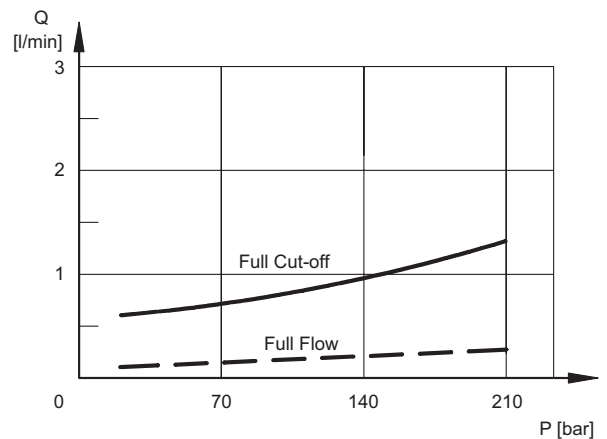
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF



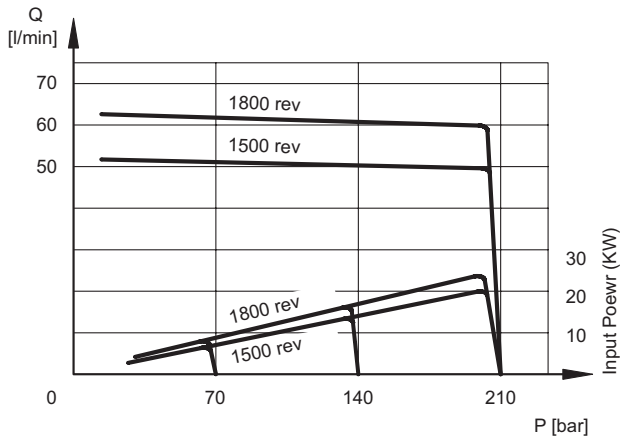
DRAIN FLOW RATE



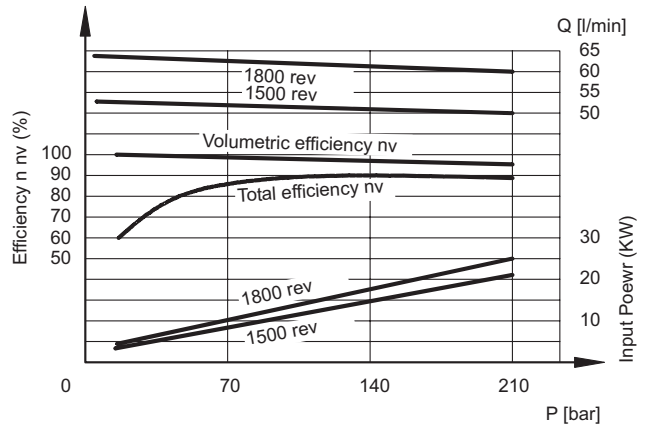


3.4 - VPPL-036 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

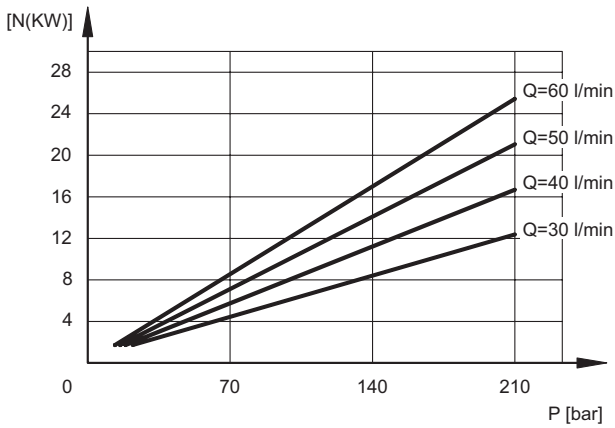
FLOW RATE / PRESSURE CURVES



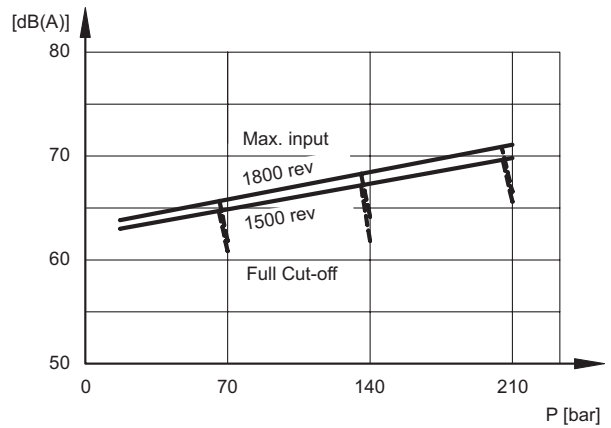
VOLUMETRIC AND TOTAL EFFICIENCY



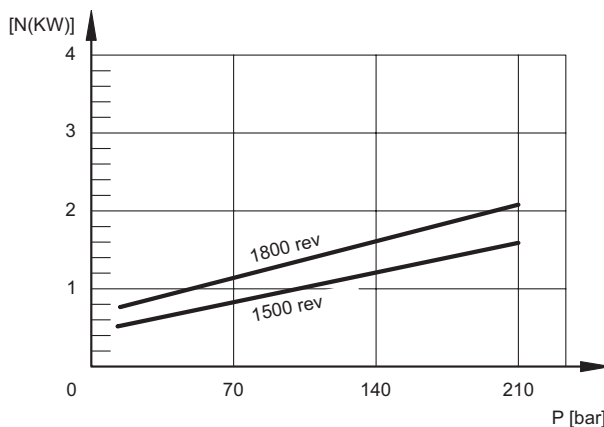
ABSORBED POWER



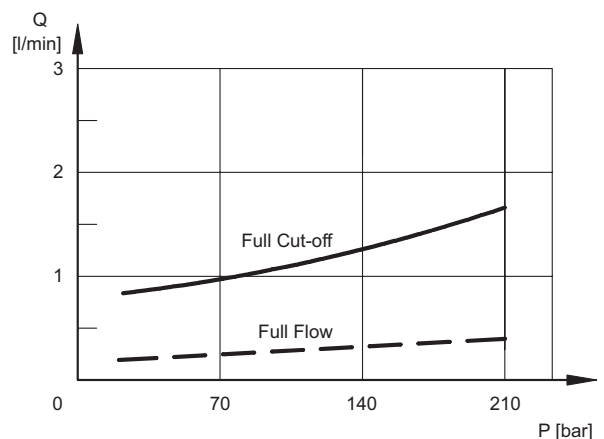
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF



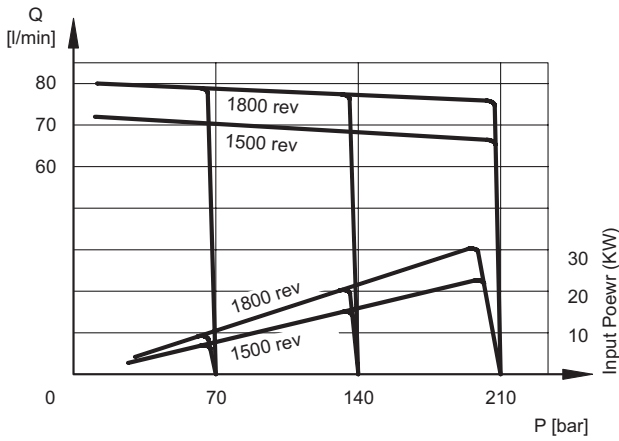
DRAIN FLOW RATE



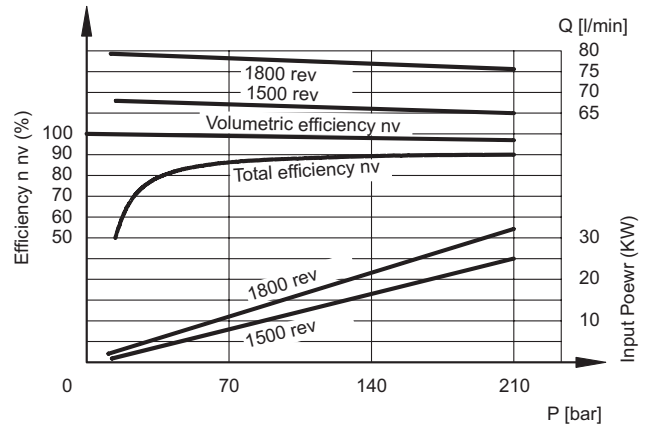


3.5 - VPPL-046 PUMP CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 36 cSt at 50°C)

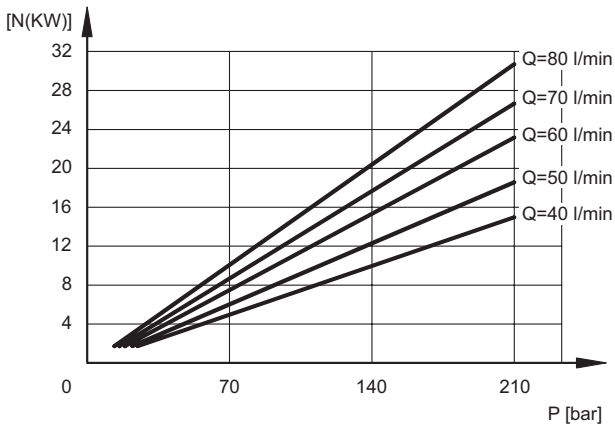
FLOW RATE / PRESSURE CURVES



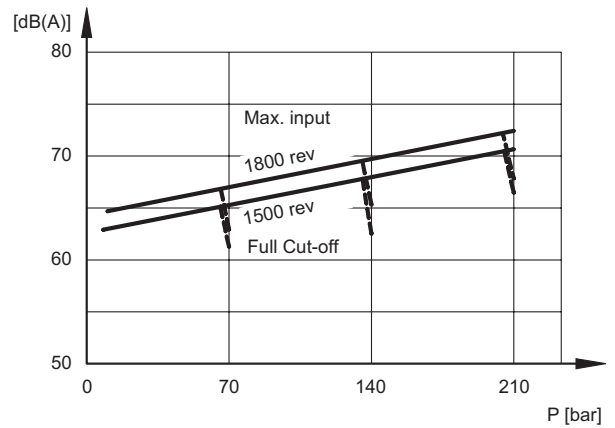
VOLUMETRIC AND TOTAL EFFICIENCY



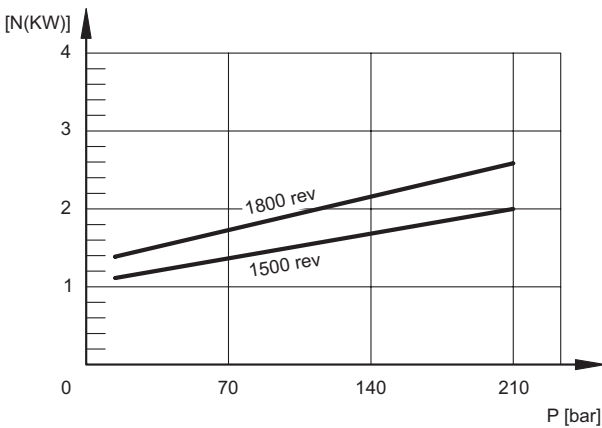
ABSORBED POWER



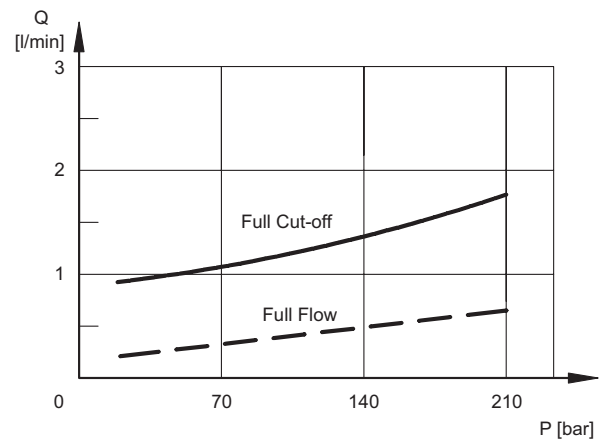
NOISE LEVEL



INPUT POWER AT FULL CUT-OFF

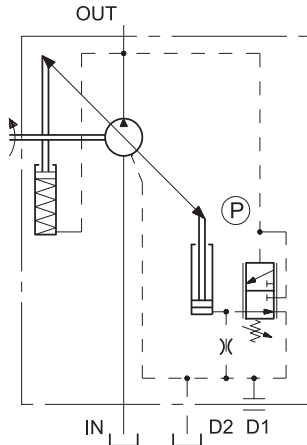


DRAIN FLOW RATE



4 - TYPES OF REGULATORS

4.1 - PRESSURE REGULATOR: PC5



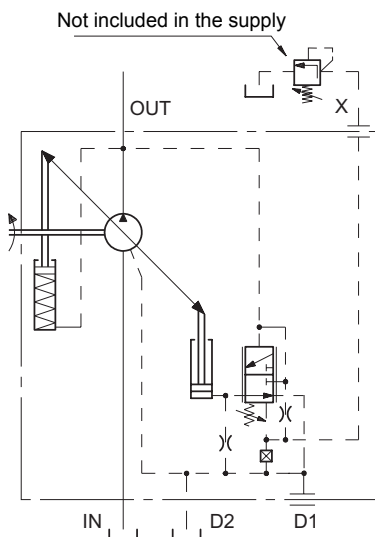
The PC5 pressure regulator keeps the pressure at a constant set level in the circuit, thus adjusting automatically the pump flow rate according to the real need of the system.

The desired pressure can be set by manually adjusting the P regulation valve. The clockwise rotation of the adjustment bolt makes the pressure increase.

FEATURES OF THE PC REGULATOR:

- P pressure adjustment range = 40 ÷ 210 bar

4.2- REMOTE-CONTROLLED PRESSURE REGULATOR: PCR



The PCR regulator allows a remote-control of the device via a remote control connected to the X port (typical application for submerged pumps).

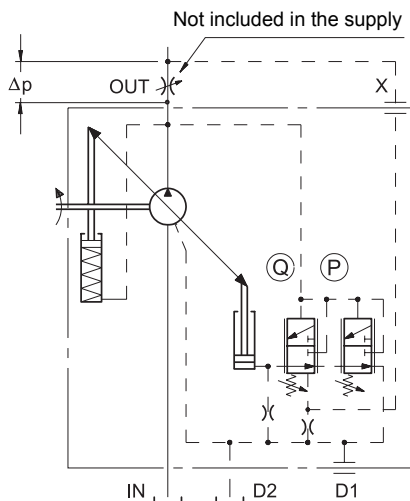
In case a pressure regulating valve is used for the remote-control, it is suggested to use a direct operated valve with a size suitable to 1,5 l/min pilot flow rate.

Note: The maximum length of the connection between the valve and X port of the pump must not be longer than 2 m.

FEATURES OF THE PCR REGULATOR:

- remote-adjustment pressure = 20 ÷ 210 bar
- flow rate available on the X port for the remote-control = about 1,5 l/min (approx.)

4.3 - PRESSURE AND FLOW RATE REGULATOR: PQC



This regulator, in addition to the pressure adjustment (as for the PC5 model), allows the pump flow rate control, according to the Δp pressure drop measured on either side of a throttle valve installed on the user line.

Note: The connection pipe between the X port and the flow line downstream the restrictor (or valve) must always be made (customer charge).

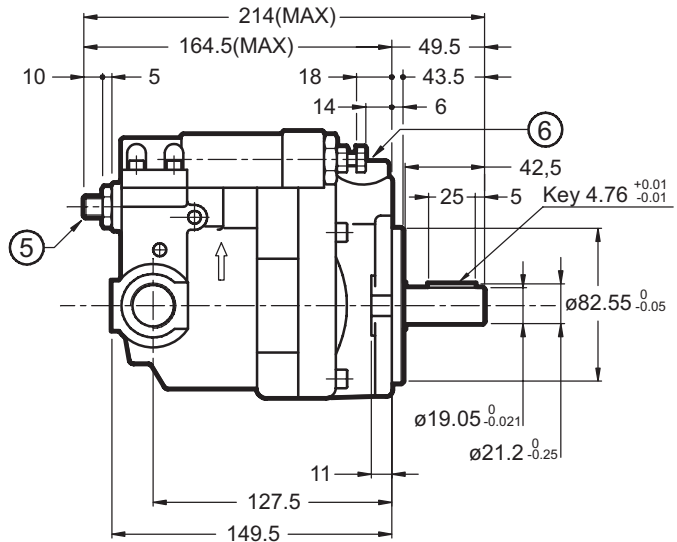
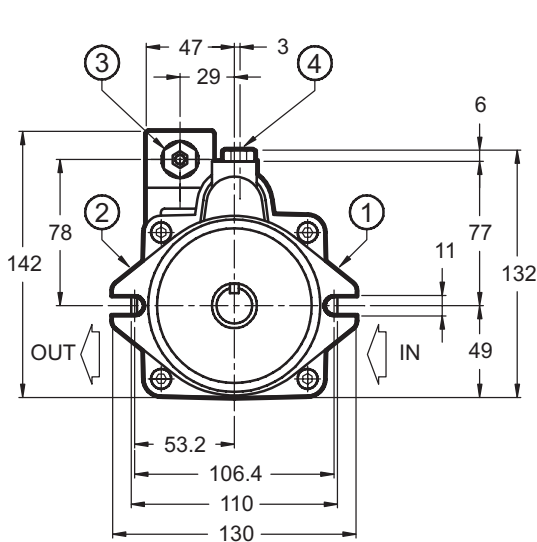
FEATURES OF THE PQC REGULATOR:

- P pressure adjustment range = 40 ÷ 210
- Q differential pressure adjustment range = 16 ÷ 28 bar
- minimum delivery pressure = 20 bar

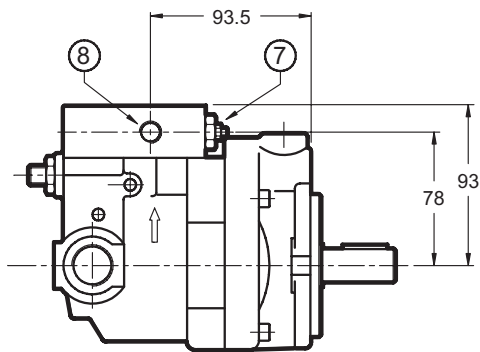


5 - VPPL-008 PUMPS OVERALL AND MOUNTING DIMENSIONS

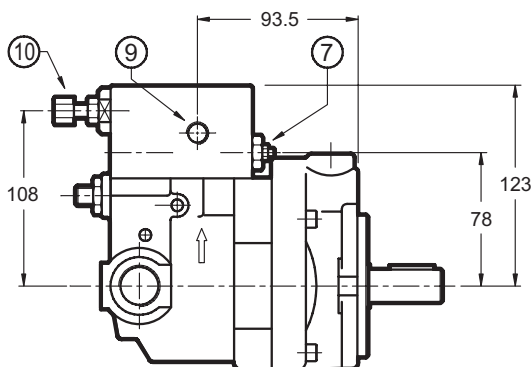
VPPL-008PC5 PUMPS



VPPL-008PCR PUMPS



VPPL-008PQC PUMPS



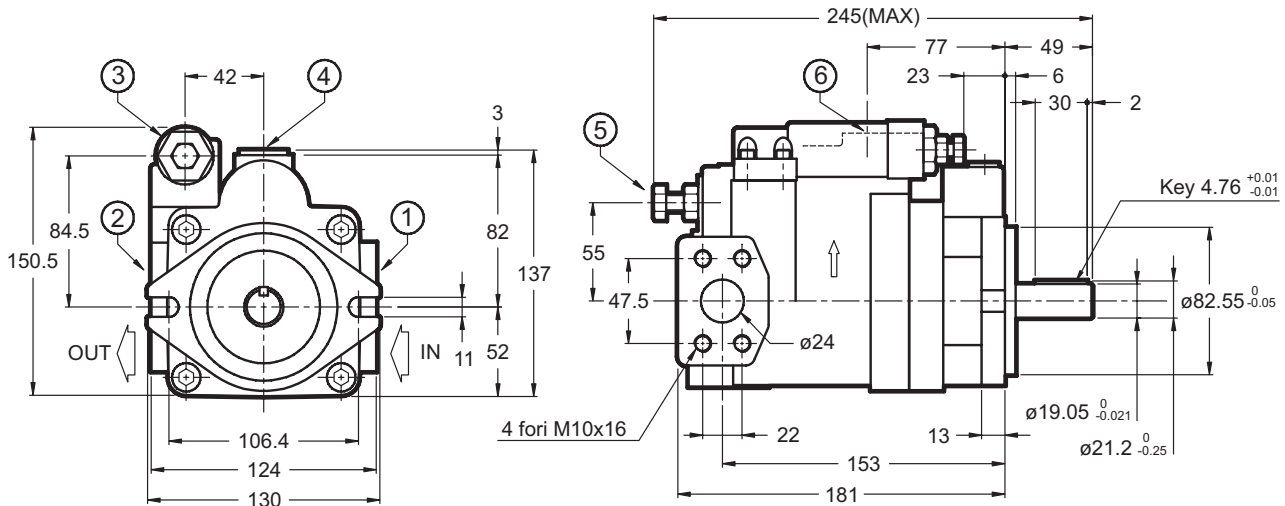
dimensions in mm

1	Suction port IN: 1/2" NPT
2	Delivery port OUT: 1/2" NPT
3	Pressure adjustment bolt (for PC5 version)
4	Filling plug
5	Flow adjustment bolt
6	Drainage port: 3/8" NPT
7	Differential pressure (not adjustable)
8	Pressure remote-setting port (for PCR version): 1/4" NPT
9	Load Sensing port (for PQC version): 1/4" NPT
10	Pressure adjustment bolt (for PQC version)

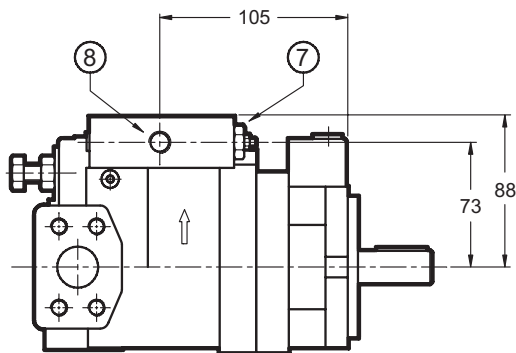


6 - VPPL-016 and VPPL-022 PUMPS OVERALL AND MOUNTING DIMENSIONS

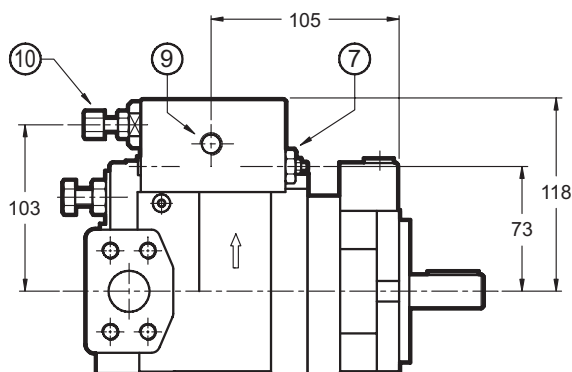
VPPL-016PC5 and VPPL-022PC5 PUMPS



VPPL-016PCR and VPPL-022PCR PUMPS



VPPL-016PQC and VPPL-022PQC PUMPS



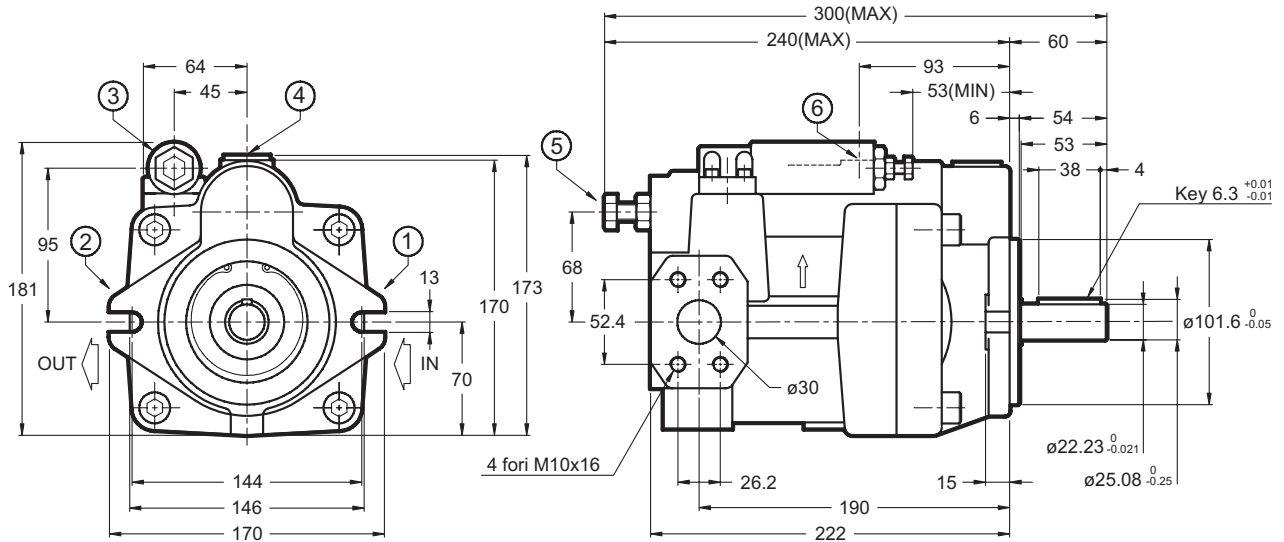
dimensions in mm

1	Suction port IN: SAE 3000 1" flange (see par. 9)
2	Delivery port OUT: SAE 3000 3/4" flange (see par. 9)
3	Pressure adjustment bolt (for PC5 version)
4	Filling plug
5	Flow adjustment bolt
6	Drainage port: 3/8" NPT
7	Differential pressure (not adjustable)
8	Pressure remote-setting port (for PCR version): 1/4" NPT
9	Load Sensing port (for PQC version): 1/4" NPT
10	Pressure adjustment bolt (for PQC version)

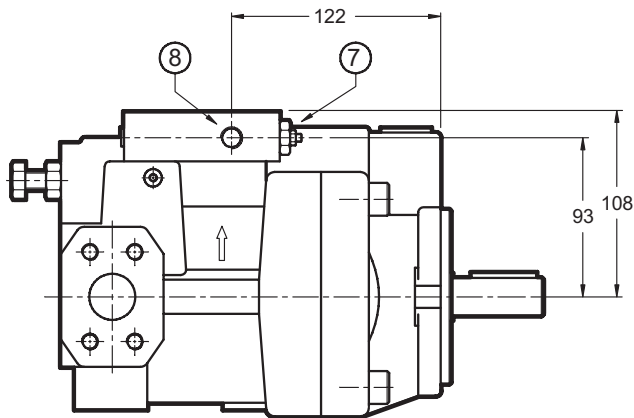


7 - VPPL-036 and VPPL-046 PUMPS OVERALL AND MOUNTING DIMENSIONS

VPPL-036PC5 and VPPL-046PC5 PUMPS

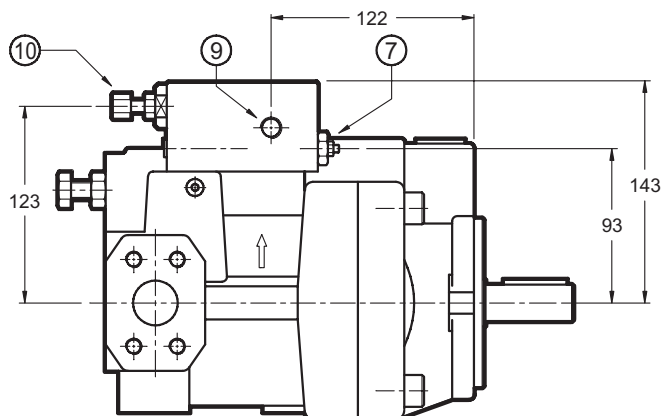


VPPL-036PCR and VPPL-046PCR PUMPS



dimensions in mm

VPPL-036PQC and VPPL-046PQC PUMPS



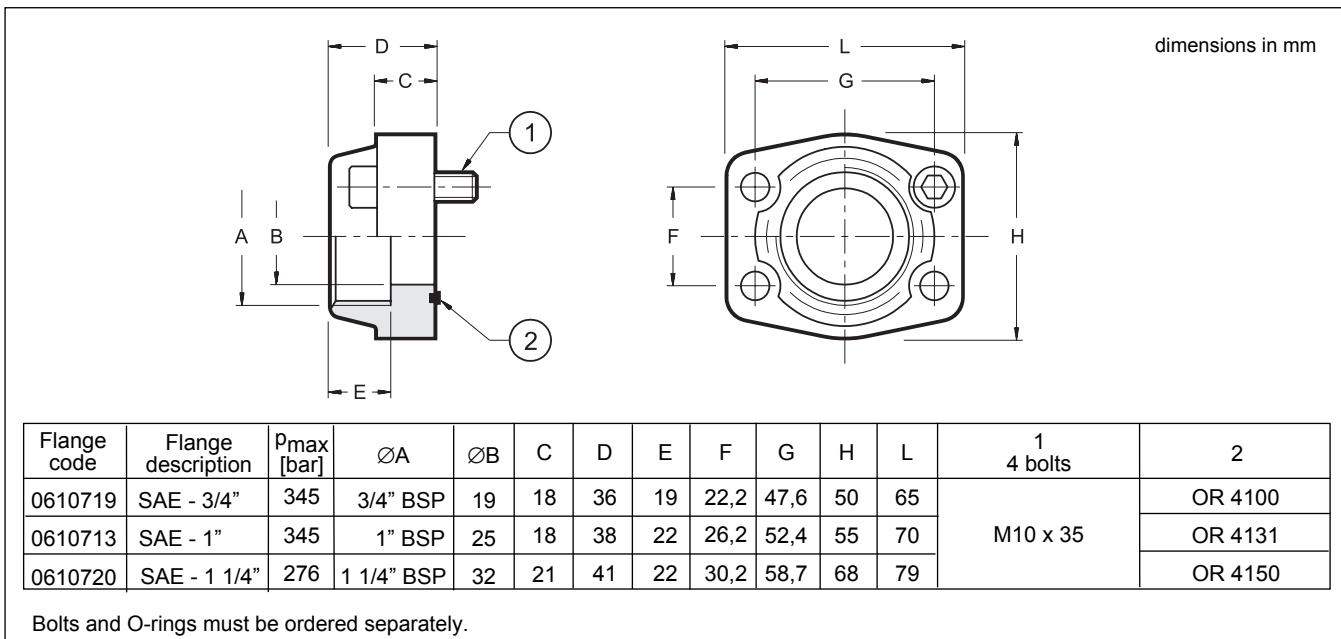
1	Suction port IN: SAE 3000 1 1/4" flange (see par. 9)
2	Delivery OUT: SAE 3000 1" flange (see par. 9)
3	Pressure adjustment bolt (for PC5 version)
4	Filling plug
5	Flow adjustment bolt
6	Drainage port: 1/2" NPT
7	Differential pressure (not adjustable)
8	Pressure remote-setting port (for PCR version): 1/4" NPT
9	Load Sensing port (for PQC version): 1/4" NPT
10	Pressure adjustment bolt (for PQC version)



8 - INSTALLATION

- The VPPL pumps can be installed both in a horizontal and vertical position, with the shaft in an upward position.
Note: The drainage port has to be oriented so that the oil level inside the pump body is never lower than 3/4 of its volume.
- In the case of installation above the oil level, check that the min. suction pressure is not lower than -0.2 bars (relative). If a low noise emission level is required, the installation inside the tank is suggested.
In case of an installation inside the tank, with an oil level which does not grant complete pump submersion, it is suggested that the drain tube is adjusted so that the pump higher bearing can be always lubricated.
- **Before starting, the pump body has to be filled with the fluid.**
- Check the rotation direction of the pump.
- It is necessary to vent the air from the delivery connection before operating it the first time. If the air venting should be difficult, the use of a venting valve is recommended.
The pump start up, especially at a cold temperature, should occur with the plant at minimum pressure.
- The suction tube has to be suitably sized so that the suction pressure is never lower than -0.2 bar (relative). Bends or restrictions or an excessive tube length could further decrease the value of the suction pressure with a following increase in the noise emissions and a decrease in the pump lifetime.
- The drainage tube has to be sized so that the pressure inside the pump body is always lower than 0.5 bars (relative), even during the dynamic change and flow rate phases. The minimum piping size is 3/8" for the pump type 008, 016 and 022, while it should be at least 1/2" for the pumps type 036 and 046.
The drainage tube has to unload inside the tank far from the suction area.
- No check valves allowed on the suction line. As for details and the installation of filter elements, see par. 2.3.
- The motor-pump connection must be carried out directly with a flexible coupling, to reduce at the minimum the axial and radial loads on the pump shaft. The alignment tolerance between the two shafts must be within 0,05 mm.

9 - SAE 3000 CONNECTION FLANGES



<p>DIPLOMATIC HYDRAULICS</p>	<p>DIPLOMATIC OLEODINAMICA SpA 20025 LEGNANO (MI) - P.le Bozzi, 1 / Via Edison Tel. 0331/472111 - Fax 0331/548328</p>
---	--