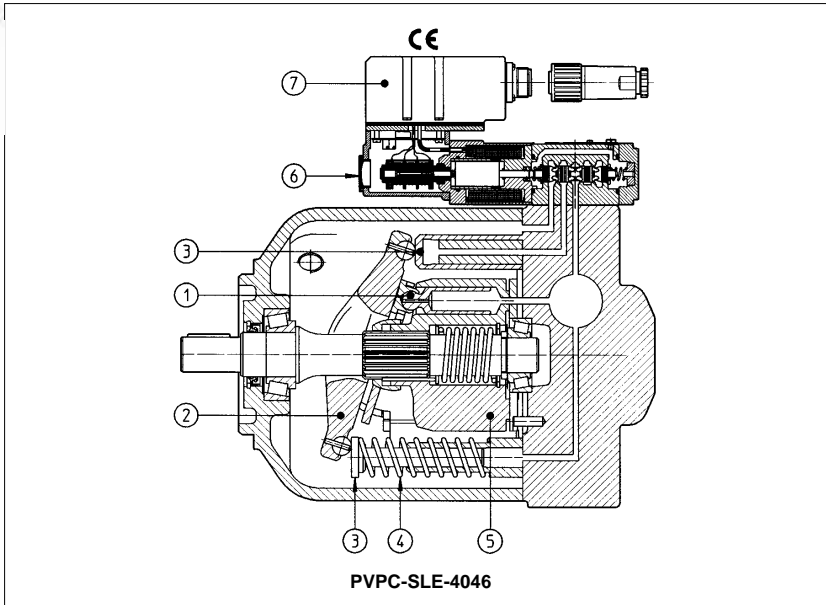


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# Axial piston pumps type PVPC variable displacement

high pressure operation; with hydraulic controls or electrohydraulic servocontrols



PVPC are variable displacement axial piston pumps for high pressure operation, with low noise level, suitable for hydraulic oils or synthetic fluids having similar lubricating characteristics. The actual displacement is dependent upon the length of stroke of the pumping pistons ①. This length of stroke is determined by the position of the swashing plate ② that is achieved by two servo pistons ③ with differential areas, against a spring ④. The rotating barrel ⑤ forces the pistons in a circular path in and out of the barrel and fluid displacement takes place. Typical section on side shows the version SLE where the control of flow is made by means of a proportional valve ⑥ with integral electronics ⑦. Different hydraulic controls and electrohydraulic servocontrols are shown in sections ⑥ and ⑦. Max displacement: 29-46-73 cm<sup>3</sup>/rev. Max pressure: 280 bar working 350 bar peak.

**1 MODEL CODE**

**PVPC**      **X2E** - **C** - **4**      **046**      **/31044** / **1**      **D**      **18**      **10**      **/\***

Variable displacement axial piston pump

Eventual suffix for double pumps  
**X2E** = with a fixed displacement pump type PFE (see tab. A005)

Type of control (see sections ⑥ and ⑦):  
**C** = manual pressure compensator  
**CZ** = proportional pressure compensator  
**R** = remote pressure compensator  
**L** = load sensing (pressure & flow)  
**SL** = proportional control - high dynamics  
**SLE** = as SL option plus integral electronics  
**SLER** = as SLE option plus sequence module

Size:  
**3** = for displacement 029  
**4** = for displacement 046  
**5** = for displacement 073

Synthetic fluids:  
**/WG** = water-glycol  
**/PE** = phosphate ester  
 See notes under section ②

Design number  
**18** = with 18 V<sub>DC</sub> coil instead of standard 12 V<sub>DC</sub> coil (only version CZ)

Direction of rotation (as viewed at the shaft end)  
**D** = clockwise  
**S** = counterclockwise

Shaft:  
**1** = keyed (7/8" for 029 - 1" for 046 - 1 1/4" for 073)  
**5** = splined (13 teeth for 029 - 15 for 046 - 14 for 073)

Type of PFE (for double pumps), see tab. A005

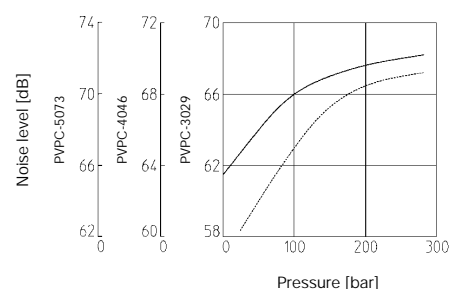
Max displacement of axial piston pump:  
**029** = 29 cm<sup>3</sup>/rev  
**046** = 46 cm<sup>3</sup>/rev  
**073** = 73 cm<sup>3</sup>/rev

**2 OPERATING CHARACTERISTICS**

Pump model	PVPC-*-3029		PVPC-*-4046		PVPC-*-5073	
	Type 1	Type 5	Type 1	Type 5	Type 1	Type 5
Displacement [cm <sup>3</sup> /rev]	29		46		73	
Max flow at 1500 rpm and 7 bar [l/min]	42		66,7		105,8	
Max working pressure / Peak pressure [bar]	280/350		280/350		280/350	
Max inlet pressure [bar]	25		25		25	
Max absolute pressure on drain port [bar]	2		2		2	
Power consumption at 1450 rpm and at maximum pressure and displacement [kW]	19,9		31,6		50,1	
Max torque on the first shaft [Nm]	155	190	220	330	400	620
Speed ratings [rpm]	600 ÷ 3000		600 ÷ 2600		600 ÷ 2200	

**Noise level**

in decibel [dB] and measured with ambient conditions according to ISO 4412-1 standards at 1450 rpm with mineral oil having a viscosity of 24 mm<sup>2</sup>/sec and 40°C. Continuous line: at maximum flow. Dotted line: at null flow.



**Notes :** For speeds over 1800 rpm the inlet port must be under oil level with adequate pipes. Maximum pressure for all models with option /WG is 160 bar, with option /PE is 190 bar. Max speed with options /WG and /PE is 2000/1900/1600 rpm respectively for the three sizes.

**3 MAIN CHARACTERISTICS OF VARIABLE DISPLACEMENT AXIAL PISTON PUMP TYPE PVPC**

Installation position	Any position. The drain port must be on the top of the pump. Drain line must be separated and unrestricted to the reservoir and extended below the oil level as far from the inlet as possible. Suggested maximum line length is 3 m.
Loads on the shaft	Axial and radial loads are not allowed on the shaft. The coupling should be sized to absorb the peak horsepower developed.
Ambient temperature	from -20°C to +70°C for -CZ, -R, -L, -SL versions / from 0°C to +50°C for -SLE and -SLER versions
Fluid	Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity	15÷100 mm <sup>2</sup> /sec at 40°C (ISO VG 15÷100). Maximum start-up viscosity: 1000 mm <sup>2</sup> /sec
Fluid contamination class	ISO 16/13 (filters at 10 µm value with β <sub>10</sub> ≥ 75 recommended)
Fluid temperature	T < 70°C, if T > 60°C select /PE seals. With water-glycol T < 50°C
<b>ONLY FOR PUMPS WITH PROPORTIONAL ELECTROHYDRAULIC CONTROLS type CZ, SL(E)</b>	
Coil resistance R at 20°C	3 ÷ 3,3 Ω for standard 12 V <sub>dc</sub> coil; 13 ÷ 13,4 Ω for 18 V <sub>dc</sub> coil (only for version CZ)
Relative duty factor	Continuous rating (ED = 100%)
Max solenoid current	2,6 A for standard 12 V <sub>dc</sub> coil; 1,5 A for 18 V <sub>dc</sub> coil (only for version CZ)
Max power	35 Watt

**4 ELECTRONIC DRIVERS FOR PUMPS WITH PROPORTIONAL ELECTROHYDRAULIC CONTROLS**

The operation of pumps with proportional controls, see section 6 and 7 according to the type of control (second column), is optimized in association with Atos electronic drivers supplied with factory preset electronic calibration.

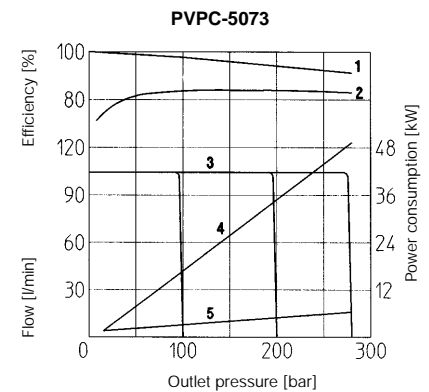
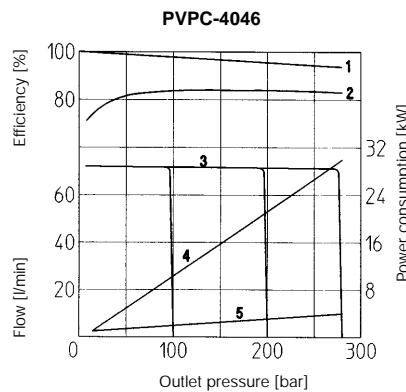
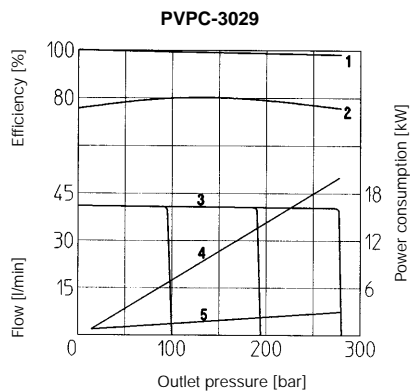
Driver model	Type of pump control	Execution (1)	Max power consumption (2)	Reference signal (3)	Ramps (4)	Special functions (5)
E-MI-AC-01F	CZ	I	40W	C, (A)	YES	NO
E-BI-AC-01F	CZ	B	50W	C	YES	NO
E-ME-AC-01F	CZ	E	50W	C, (A)	YES	ENABLE
E-ME-L-01H	SL	E	50W	C, (A)	YES	ENABLE
E-RI-LE-01H	SLE SLER	X	50W	C, (A)	NO	MONITOR or FAULT

**NOTE**

- (1) Execution, Format/Connection  
 I = plug DIN 43650-IP65, VDE 0110 direct on solenoid;  
 B = fast plug in standard undecal base housing, relay type;  
 E = Eurocard 100x160 (plug in unit DIN 41494);  
 X = sealed box on the valve: IP65 - 40050
- (2) Power supply at 24 V<sub>dc</sub> ± 10%
- (3) Reference signals  
 A (option //) = 4 ÷ 20 mA  
 0 ÷ 20 mA (only for E-MI)  
 C = 0 ÷ 10 V<sub>dc</sub> or  
 0 ÷ 5 V<sub>dc</sub> (not available for E-RI)
- (4) Ramps options, i.e. control of rapidity on rise and fall of supply current and consequently of hydraulic parameters.
- (5) Enable: to allow driver operation only with an electric enabling signal.  
 Monitor (/M option): position of the swashing plate of the pump (0 ÷ 10 V<sub>dc</sub>).  
 Fault: to signal anomalous operating conditions of the driver.

Electronic drivers type E-RP-AC-01F in sealed box execution available on request.

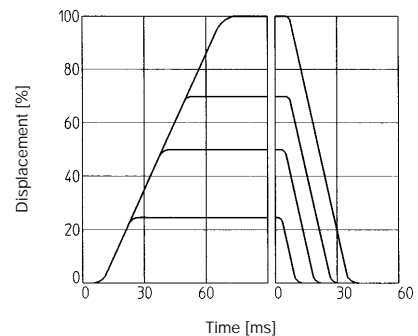
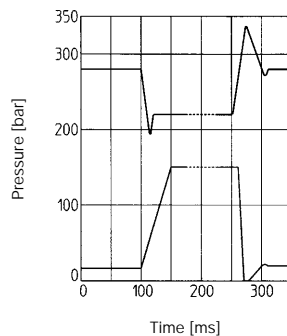
**5 DIAGRAMS at 1500 rpm**



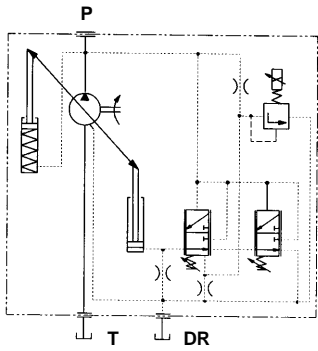
- 1 = Volumetric efficiency
- 2 = Overall efficiency
- 3 = Flow versus pressure curve
- 4 = Power consumption with full flow
- 5 = Power consumption at pressure compensation

**Response times**

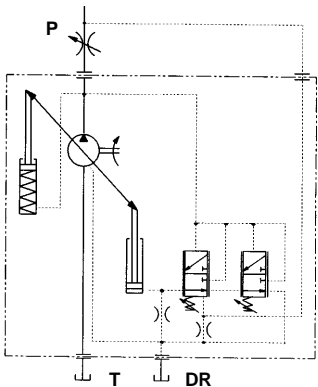
Diagrams on side:  
 • the curves of the diagram on the left side show the pressure variation (above) and the movement of the swashing plate (below) for a step variation of the outlet pressure, for pumps type PVPC-4046 in -C version.  
 • the diagram on the right side shows the response times of displacement variation for a step variation of the electronic reference signal, for pumps type PVPC-SLE-4046 at 100 bar  
 For pumps type PVPC-3029 and PVPC-5073 the response times are analogous, respectively slightly smaller or greater (data on request).



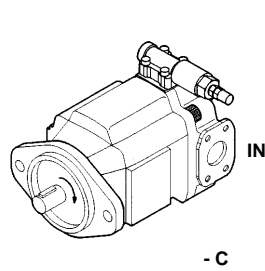
6 HYDRAULIC AND ELECTROHYDRAULIC CONTROLS



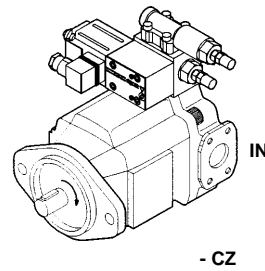
"CZ" versions



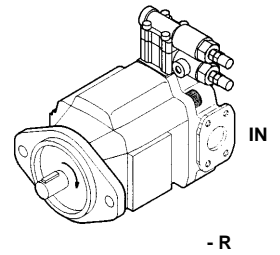
"L" versions



- C



- CZ



- R

- L

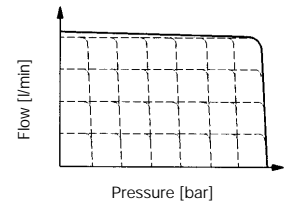
In this line of controls, the displacement variation is regulated by a pressure rate which can be set manually (C) or proportionally (CZ) or remote (R) or by a differential pressure through an external throttle (L).

**C** = hydraulic pressure compensator; the pump displacement decreases (down to null) when the line pressure approaches the setting pressure of the hydraulic compensator.

**CZ** = proportional pressure compensator; as above but the setting pressure of the compensator is continually adjustable by varying the electronic signal to the driver and consequently the current to the proportional valve.

**R** = remote pressure compensator; as version C but with remote setting of the compensator by means of a pressure relief valve on piloting line.

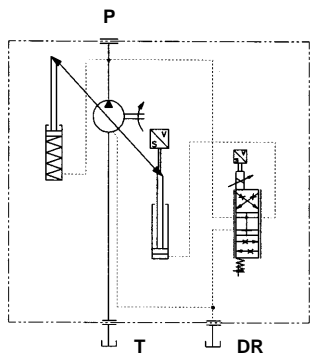
**L** = load sensing; the pump displacement is automatically adjusted to give a flow rate that generates a  $\Delta P$  of 10 bar through an external throttle; changes of the throttle restriction command changes of flow rates. Load sensing control always incorporates an hydraulic compensator to limit the maximum pressure.



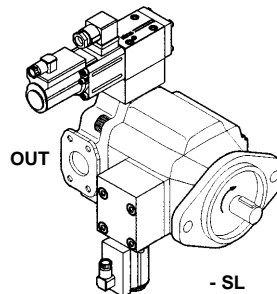
Typical functional diagram for controls type C, CZ, R and L

On request the pumps can be supplied with hydraulic control type **LW** for constant power (combined control of displacement and pressure). Information on request.

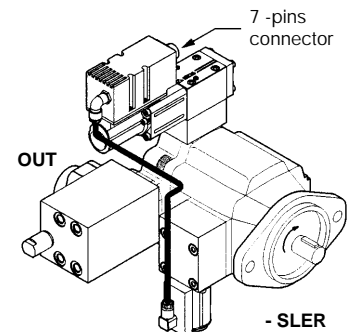
7 ELECTROHYDRAULIC SERVOCONTROLS



"SL", "SLE" versions



- SL



- SLER

In this line of servocontrols, the displacement variation is regulated by a proportional system in double closed loop with a feedback transducer on the swashing plate and a feedback transducer on the proportional valve: in this way high performances and high dynamics can be reached.

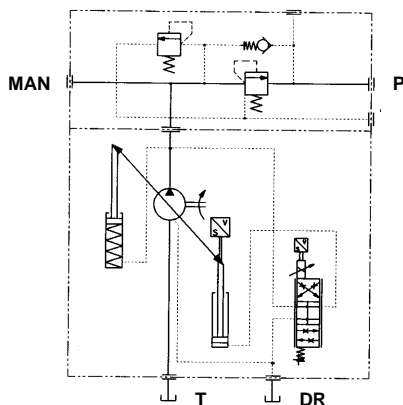
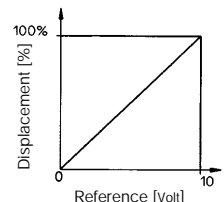
The regulated displacement have a linear relation with the electronic control signal  $0 \div 10 V_{DC}$ , see diagram on side.

The electronic driver can be separated, Eurocard type (see table G150) or integral on the pump (see table G200), see also section 4 of this table.

**SL** = proportional flow servocontrol.

**SLE** = as above with integral electronics, single 7-pins connector for electric supply and reference signals.

**SLER** = as above with sequence module RES to grant a minimum piloting pressure (18 bar) when the actual pressure of the system can fall under that value. This version can be used for the combined control of pressure and flow coupled with an electronic regulator type **E-ME-K-0PQ** in Eurocard format (see tab. G230) and with a pressure transducer (see tab. G450) which can be integral or separated.



"SLER" versions

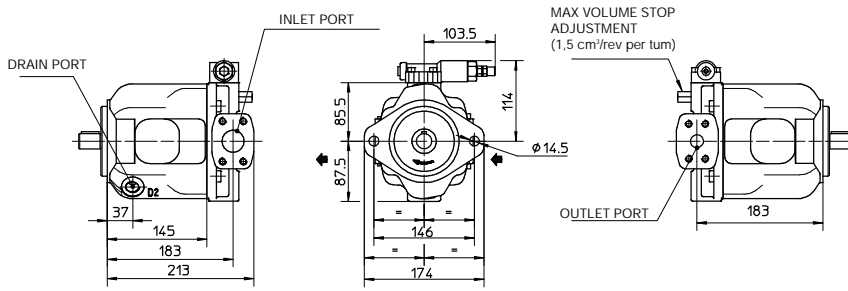
**Note:** The minimum pressure to grant a correct functioning of the servocontrol in SL and SLE versions cannot be under 18 bar.

The pumps with servocontrols type SL, SLE must be protected for safety with an external relief valve against pressure peaks. This is not necessary for version SLER because the sequence module RES includes the maximum pressure protection.

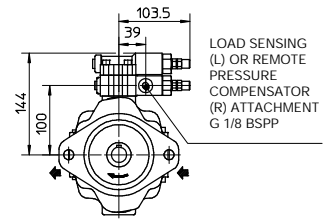
**PORTS DIMENSION**

IN = Flange SAE 3000 1 1/4"  
 OUT = Flange SAE 6000 3/4"  
 DR = 1/2" BSPP

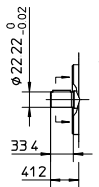
**BASIC VERSION "C"**



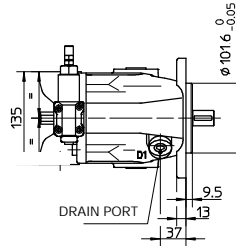
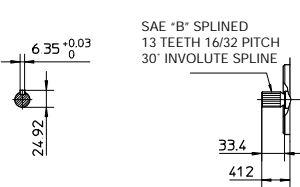
**VERSIONS "L", "R"**



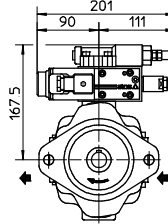
**SHAFT TYPE "1"**



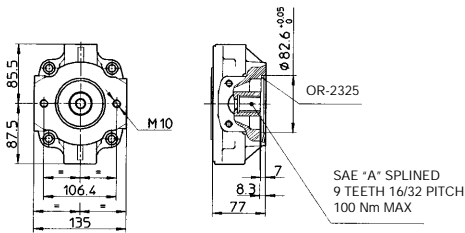
**SHAFT TYPE "5"**



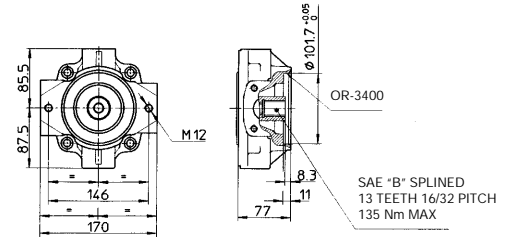
**VERSION "CZ"**



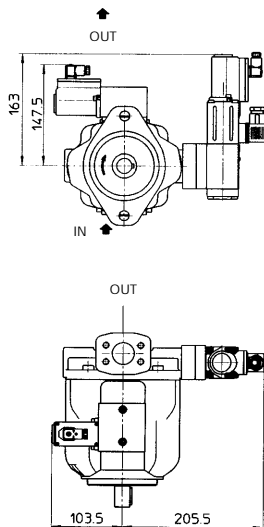
**INTERMEDIATE FLANGE SAE "A" FOR PFE-31**



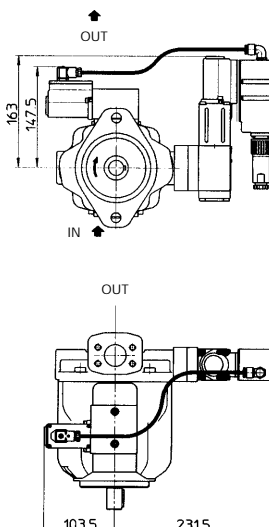
**INTERMEDIATE FLANGE SAE "B" FOR PFE-41**



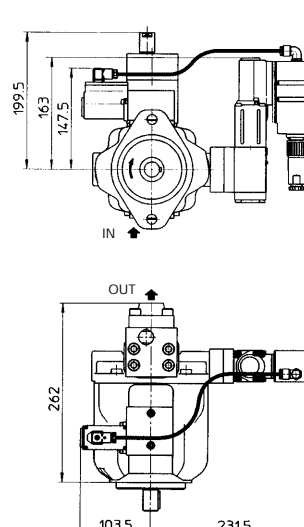
**VERSION "SL"**



**VERSION "SLE"**



**VERSION "SLER"**



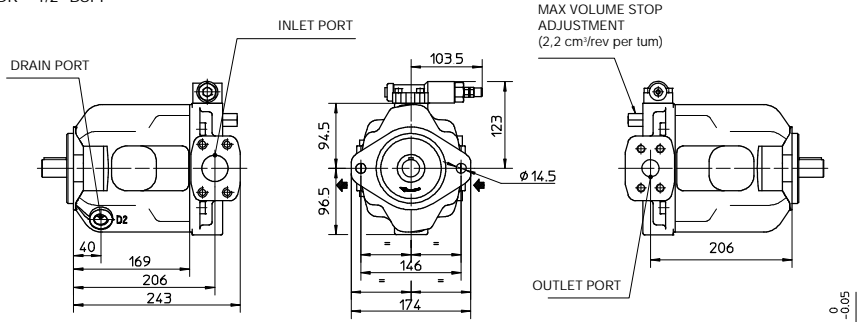
Drawings show pumps with clockwise rotation (option D); pumps with counterclockwise rotation will have inlet and outlet ports inverted. Also the positions of the transducer and of the sequence module RES will be modified.

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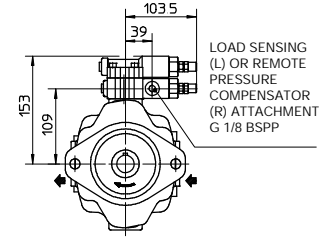
**PORTS DIMENSION**

IN = Flange SAE 3000 1 1/2"  
 OUT = Flange SAE 6000 1"  
 DR = 1/2" BSPP

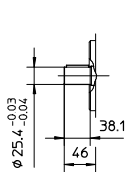
**BASIC VERSION "C"**



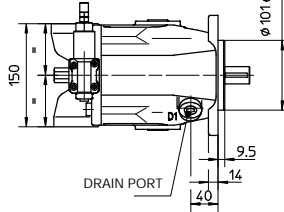
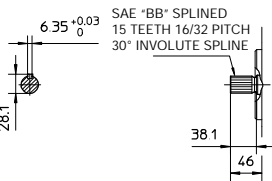
**VERSIONS "L", "R"**



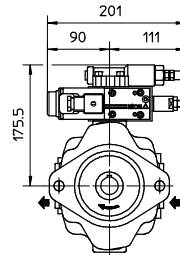
**SHAFT TYPE "1"**



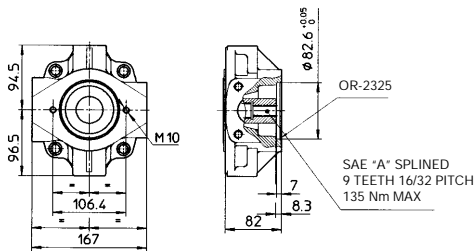
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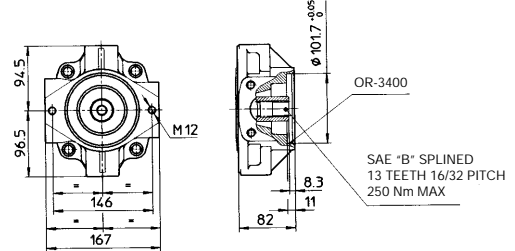
**VERSION "CZ"**



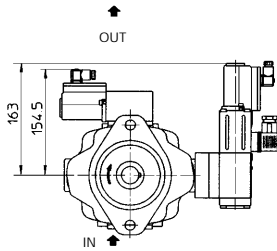
**INTERMEDIATE FLANGE SAE "A" FOR PFE-31**



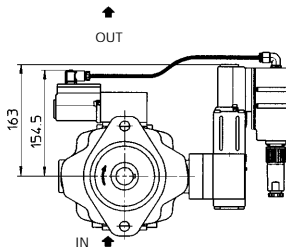
**INTERMEDIATE FLANGE SAE "B" FOR PFE-41**



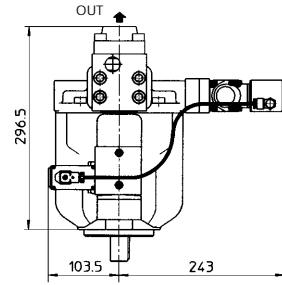
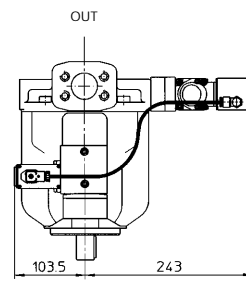
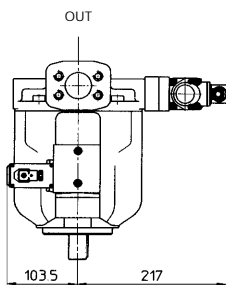
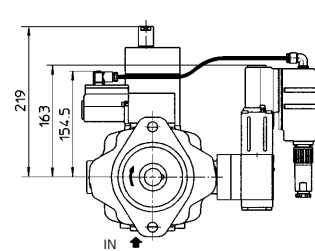
**VERSION "SL"**



**VERSION "SLE"**



**VERSION "SLER"**



Drawings show pumps with clockwise rotation (option D); pumps with counterclockwise rotation will have inlet and outlet ports inverted. Also the positions of the transducer and of the sequence module RES will be modified.

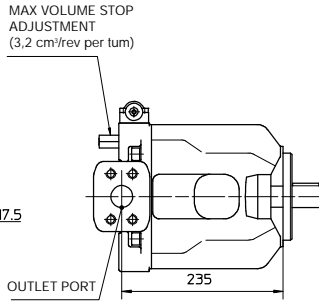
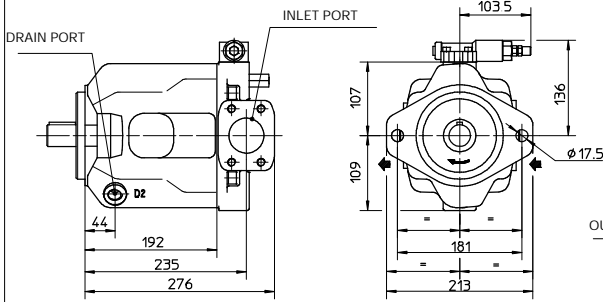
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10 DIMENSIONS OF PVPC-<sup>2</sup>-5073

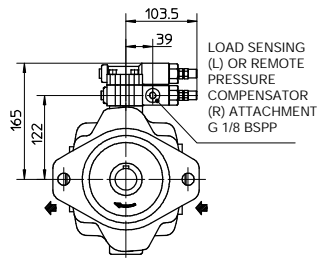
PORTS DIMENSION

IN = Flange SAE 3000 2"  
 OUT = Flange SAE 6000 1 1/4"  
 DR = 3/4" BSPP

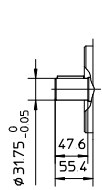
BASIC VERSION "C"



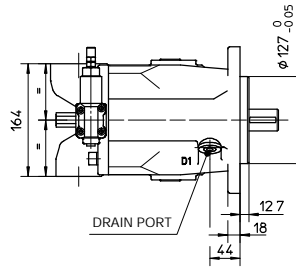
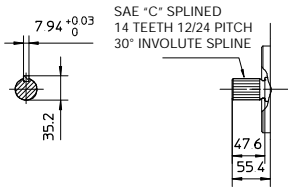
VERSIONS "L", "R"



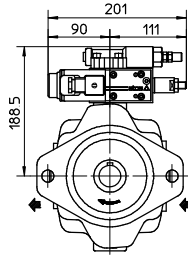
SHAFT TYPE "1"



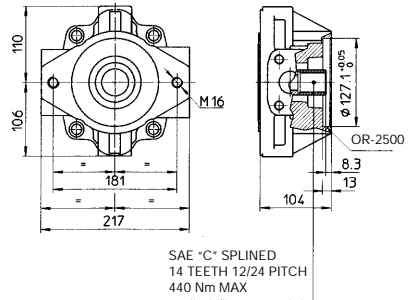
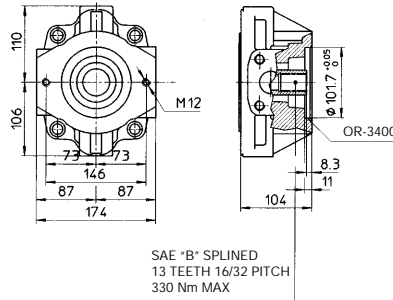
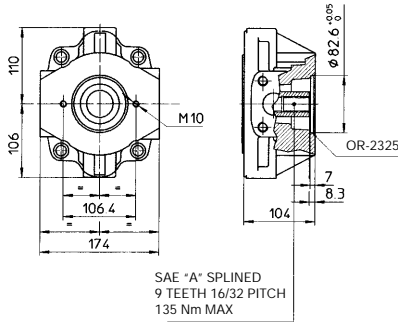
SHAFT TYPE "5"



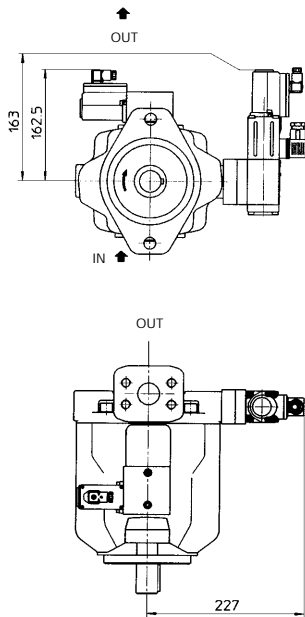
VERSION "CZ"



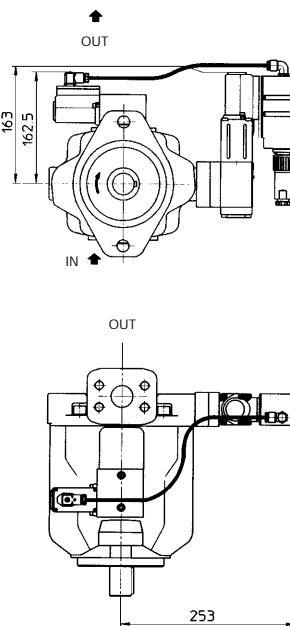
INTERMEDIATE FLANGE SAE "A" FOR PFE-31 INTERMEDIATE FLANGE SAE "B" FOR PFE-41 INTERMEDIATE FLANGE SAE "C" FOR PFE-51



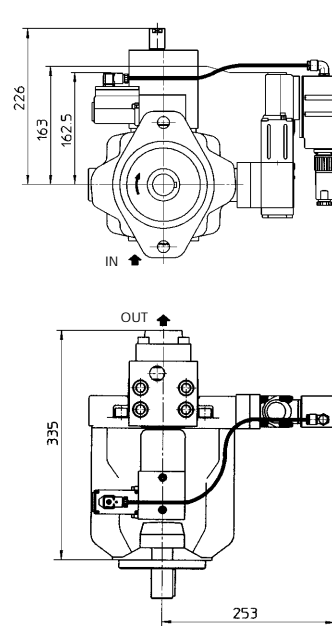
VERSION "SL"



VERSION "SLE"



VERSION "SLER"



Drawings show pumps with clockwise rotation (option D); pumps with counterclockwise rotation will have inlet and outlet ports inverted. Also the positions of the transducer and of the sequence module RES will be modified.