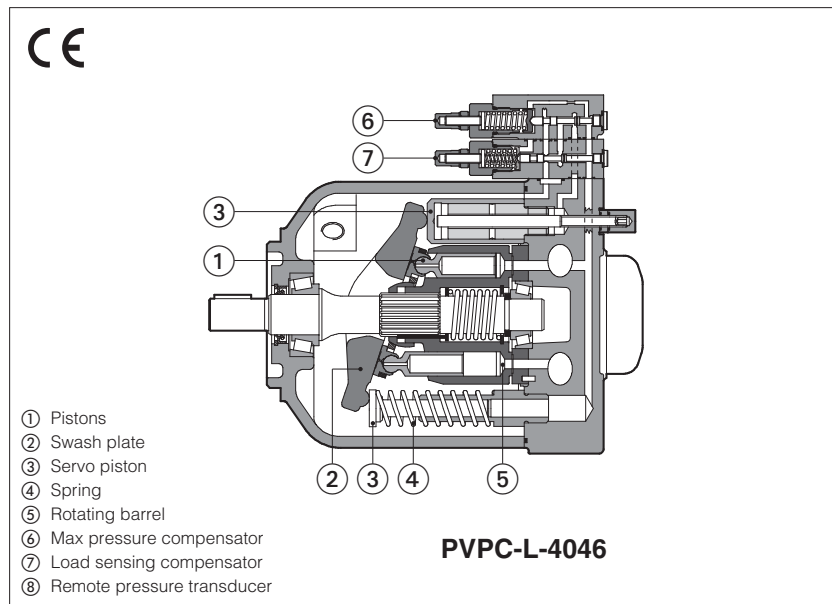


# Axial piston pumps

variable displacement, mechanical controls



## PVPC

Variable displacement axial piston pumps with swash plate design suited for high pressure open circuits.

They are characterized by low noise emission, short response time and flexible operation thanks to the wide range of mechanical controls, see section 12 and 13.

For PVPC pumps with electrohydraulic proportional controls, see tech table AS170.

SAE J744 mounting flange and shaft.

Max displacement (cm <sup>3</sup> /rev)	Max pressure working (bar)	Max pressure peak (bar)
29, 46, 73, 140	280	350
88	250	315

## 1 MODEL CODE

<b>PVPC</b>	<b>X2E</b>	-	<b>C</b>	-	<b>4046</b>	/	<b>1</b>	-	<b>D</b>	-	<b>X</b>	<b>24DC</b>	*	/	*	
Variable displacement axial piston pump																<b>Seals material,</b> see section 5 : - = NBR PE = FKM
<b>Option for pumps with through shaft (1):</b> <b>XA</b> = intermediate flange SAE A <b>XB</b> = intermediate flange SAE B <b>XC</b> = intermediate flange SAE C (only for size 5073 and 5090)  Additional suffix for double pumps: <b>X2E</b> = with a fixed displacement pump type PFE (see tech table A005)																
<b>Type of control, see sections 12 and 13 :</b> <b>C</b> = manual pressure compensator <b>CH</b> = manual pressure compensator, with venting <b>R</b> = remote pressure compensator (1) <b>L</b> = load sensing (pressure & flow) <b>LW</b> = constant power (combined pressure & flow) (2)  For electrohydraulic proportional controls, see tech table AS170																
<b>Coil voltage, see section 4</b> (only for CH version)																
<b>X</b> = without connector (only for CH version) See section 4 for available connectors, to be ordered separately																
<b>Direction of rotation, viewed at the shaft end:</b> <b>D</b> = clockwise <b>S</b> = counterclockwise																
<b>Size and max displacement (3):</b> <b>3029</b> = size 3 - displacement 029 cm <sup>3</sup> /rev <b>4046</b> = size 4 - displacement 046 cm <sup>3</sup> /rev <b>5073</b> = size 5 - displacement 073 cm <sup>3</sup> /rev <b>5090</b> = size 5 - displacement 088 cm <sup>3</sup> /rev <b>6140</b> = size 6 - displacement 140 cm <sup>3</sup> /rev																
<b>Shaft, SAE Standard (4):</b> <b>1</b> = keyed <b>5</b> = splined																

(1) Not available for PVPC-\*-6140

(2) Please specify the requested value of torque setting or power and speed in the PVPC-LW pump order, e.g. 70 Nm or 10 kW at 1450 RPM

(3) Optional intermediate displacements 35 and 53 cm<sup>3</sup>/rev are available on request

(4) Pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

## 2 GENERAL CHARACTERISTICS

Assembly position - see section 7	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.
Ambient temperature range	<b>Standard</b> = -25°C ÷ +80°C / <b>PE</b> option -15°C ÷ +80°C
Storage temperature	<b>Standard</b> = -40°C ÷ +70°C / <b>PE</b> option -20°C ÷ +70°C
Surface protection (pump body)	Black painting RAL9005
Compliance	RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

## 3 HYDRAULIC CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

PVPC size	3029		4046		5073		5090		6140	
Max displacement (cm <sup>3</sup> /rev)	29		46		73		88		140	
Theoretical max flow at 1450 rpm (l/min)	42		66,7		105,8		127,6		203	
Max pressure working / peak (bar)	280 / 350		280 / 350		280 / 350		250 / 315		280 / 350 <b>(1)</b>	
Min/Max inlet pressure (bar abs.)	0,8 / 25		0,8 / 25		0,8 / 25		0,8 / 25		0,8 / 25	
Max pressure on drain port (bar abs.)	1,5		1,5		1,5		1,5		1,5	
Power consumption at 1450 rpm and at max pressure and displacement (Kw)	19,9		31,6		50,1		54,1		122	
Max torque on the shaft (shaft type) (Nm)	Type 1 210	Type 5 270	Type 1 350	Type 5 440	Type 1 670	Type 5 810	Type 1 670	Type 5 810	Type 1 1300	Type 5 1660
Max torque at max working pressure (Nm)	128		203		328		350		780	
Speed rating (rpm)	500 ÷ 3000		500 ÷ 2600		500 ÷ 2600		500 ÷ 2200		500 ÷ 2200	
Body volume (l)	0,7		0,9		1,5		1,5		2,8	

**(1)** The maximum pressure can be increased to 350 bar (working) and 420 bar (peak) after detailed analysis of the application and of the pump working cycle

## 4 ELECTRICAL CHARACTERISTICS - for PVPC-CH

Insulation class	H
Connector protection degree	IP 65
Relative duty factor	100%
Supply voltage tolerance	± 10%

### 4.1 COIL VOLTAGE - only for CH version

Average values based ambient/coil temperature of 20°C.

External supply nominal voltage ±10%		Voltage code	Power consumption	Nominal current	Coil characteristics
DIRECT CURRENT	12 DC 24 DC	<b>12DC</b> <b>24DC</b>	19,2 W	1,61 A 0,80 A	Insulation Class: <b>H</b> Protection degree: <b>IP65</b>

### 4.2 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 - to be ordered separately

Code of connector	Function
<b>SP-666</b>	Connector IP-65
<b>SP-667</b>	Connector IP-65 but with built-in signal led

**5 SEALS AND HYDRAULIC FLUIDS** - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature	NBR seals (standard) = -25°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷35 mm <sup>2</sup> /s - max allowed range: min 10 cSt (at 80°C) - max 1500 cSt at cold startup (-25°C)		
Max fluid contamination level	normal operation	ISO4406 class 20/18/13 NAS1638 class 9	see also filter section at <a href="http://www.atos.com">www.atos.com</a> or KTF catalog
	longer life	ISO4406 class 18/16/11 NAS1638 class 7	
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR (1)	ISO 12922
Flame resistant with water	NBR	HFC (1)	

(1) See section 6

**6 PERFORMANCE RESTRICTIONS WITH FLAME RESISTANT FLUIDS**

**6.1 HFDU and HFDR - Phosphate ester**

PVPC size	3029	4046	5073	5090	6140
Max pressure working / peak (bar)	200 / 240				(2)
Max speed (1) (rpm @ VMAX)	2050	1850	1700	1550	
Ambient temperature range (°C)	-10 ÷ +80				
Bearing life (% of bearing life with mineral oil) (%)	90				

(1) With an inlet pressure of 1 bar abs

(2) For information about size 6140, contact Atos technical office

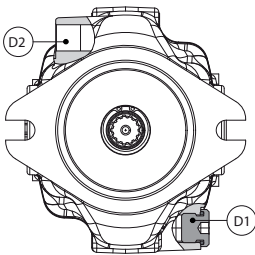
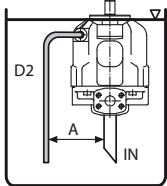
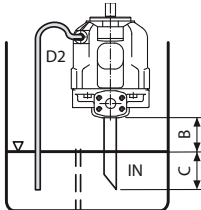
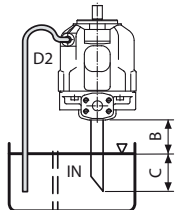
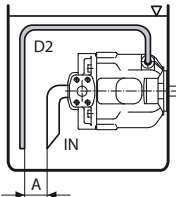
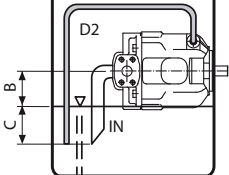
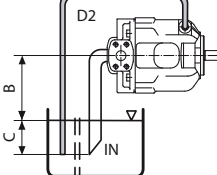
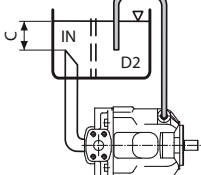
**6.2 HFC - Water-glycol (35 ÷ 55 % of water)**

PVPC size	3029	4046	5073	5090	6140
Max pressure working / peak (bar)	180 / 210				(2)
Max speed (1) (rpm @ VMAX)	2050	1850	1700	1550	
Ambient temperature range (°C)	-10 ÷ +60				
Bearing life (% of bearing life with mineral oil) (%)	40				

(1) With an inlet pressure of 1 bar abs

(2) For information about size 6140, contact Atos technical office

**7 INSTALLATION POSITION**

 <p>The pump is supplied with drain D2 open, and D1 plugged. Before installation fill the pump with hydraulic oil for at least 3/4 of its volume, keeping it in horizontal position. With exception of pump mounted below the oil level, we recommend to interpose a baffle plate between inlet and drain line.</p>	VERTICAL INSTALLATION			
		 <p><b>INSIDE THE TANK</b> Minimum oil level equal or above the pump mounting surface. A ≥ 200mm</p>	 <p><b>INSIDE THE TANK</b> Minimum oil level below the pump mounting surface. Minimum inlet pressure = 0,8 bar absolute B ≤ 800mm, C = 200mm</p>	 <p><b>OUTSIDE THE TANK, above oil level</b> Minimum inlet pressure = 0,8 bar absolute B ≤ 800mm, C = 200mm</p>
	HORIZONTAL INSTALLATION			
	 <p><b>INSIDE THE TANK</b> Minimum oil level equal or above the pump mounting surface. A ≥ 200mm</p>	 <p><b>INSIDE THE TANK</b> Minimum oil level below the pump mounting surface. Minimum inlet pressure = 0,8 bar (absolute) B ≤ 800mm, C = 200mm</p>	 <p><b>OUTSIDE THE TANK, above oil level</b> Minimum inlet pressure = 0,8 bar (absolute) B ≤ 800mm, C = 200mm</p>	 <p><b>OUTSIDE THE TANK, below oil level</b> C = 200mm</p>

IN: inlet line - D2: drain line - A: minimum distance between inlet and drain line - B+C: permissible suction height - C: inlet line immersion dept

**8 MAX PERMISSIBLE LOAD ON DRIVE SHAFT**

PVPC size		3029	4046	5073	5090	6140	
$F_{ax}$ = axial load		N	1000	1500	2000	2000	2000
$F_{rad}$ = radial load		N	1500	1500	3000	3000	3000

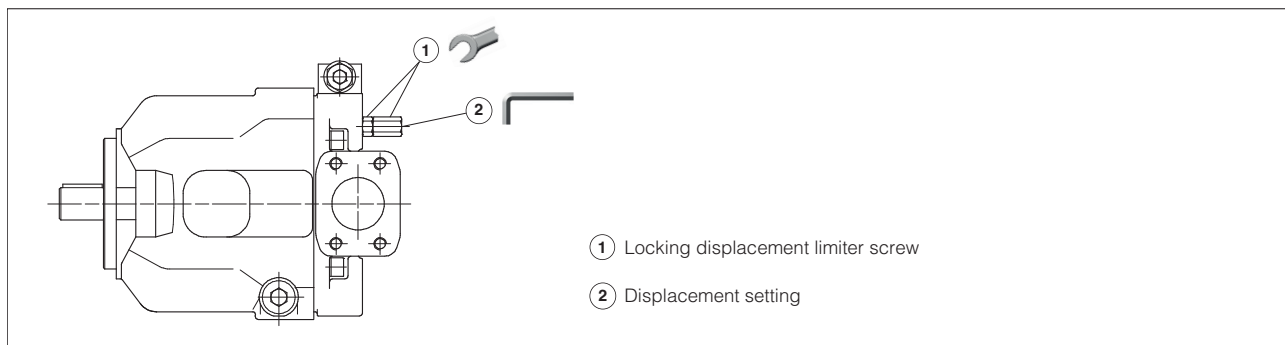
**9 VARIATION OF MAX SPEED VS INLET PRESSURE**

Inlet pressure	Displacement %					% variation of the max. speed
	bar abs.	65	70	80	90	
0,8	120	115	105	97	90	
0,9	120	120	110	103	95	
1,0	120	120	115	107	100	
1,2	120	120	120	113	106	
1,4	120	120	120	120	112	
1,6	120	120	120	120	117	
2,0	120	120	120	120	120	

**Example**

Displacement: 80% - Inlet pressure: 1,0 bar - Speed: 115%

**10 MAX DISPLACEMENT SETTING**

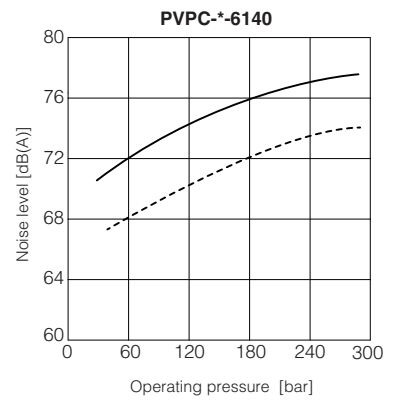
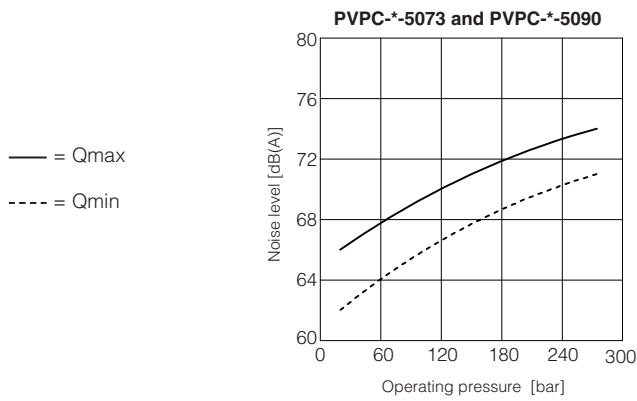
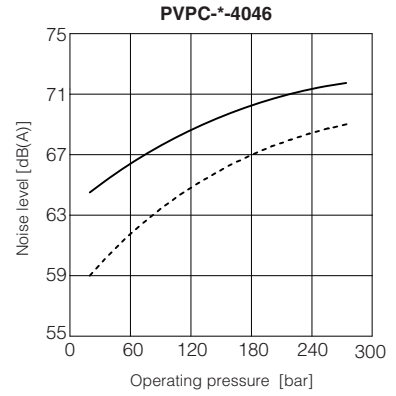
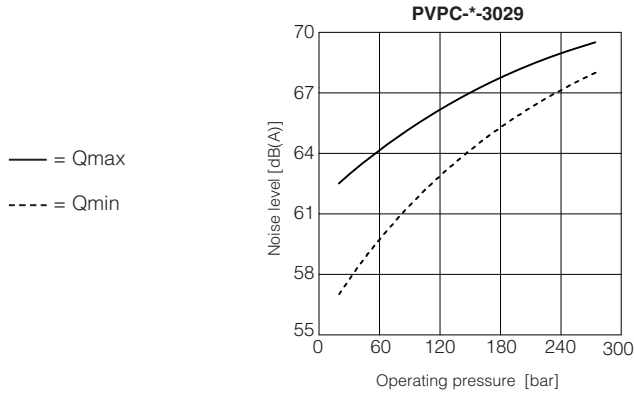


PVPC size		3029	4046	5073	5090	6140
Max displacement setting range	from ÷ to	20,1 ÷ 28,7	31,8 ÷ 45,4	36,8 ÷ 73,6	44,0 ÷ 87,9	70 ÷ 140
One turn of screw changes pump displacement by approximately	cm <sup>3</sup> /rev	1,5	2,2	3,2	3,2	6,0
For locking displacement limiter screw	mm	14	14	17	17	19
For displacement setting	mm	4	4	5	5	6
Tightening torque	Nm	15 ± 1	15 ± 1	15 ± 1	15 ± 1	20 ± 1

**11** DIAGRAMS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

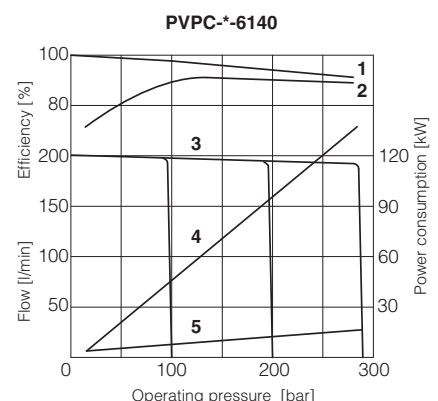
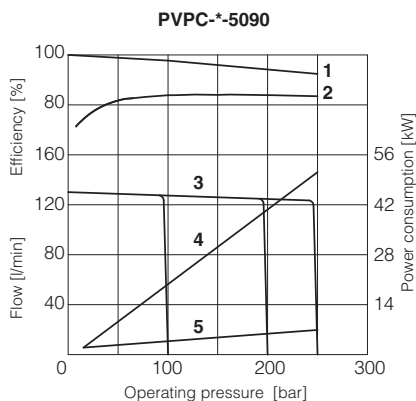
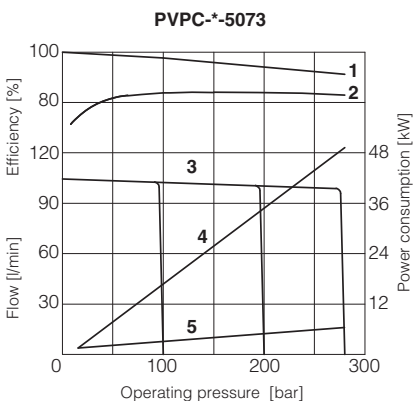
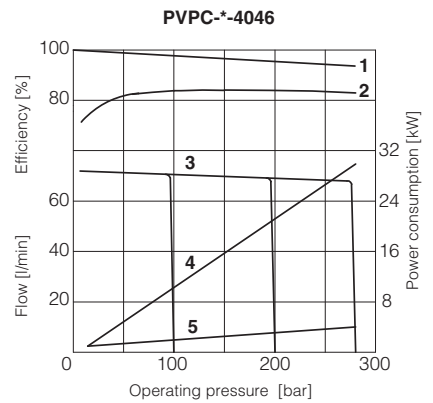
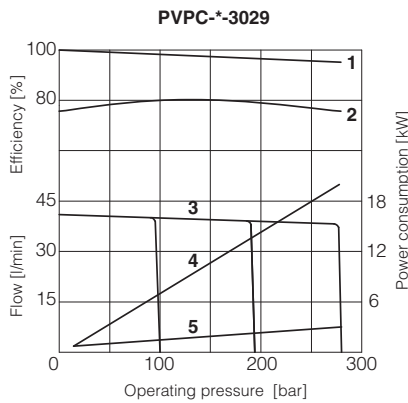
**11.1 Noise level curves**

Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics - Test procedure to define the ambient noise level - Pumps Shaft speed: 1450 rpm.



**11.2 Operating limits**

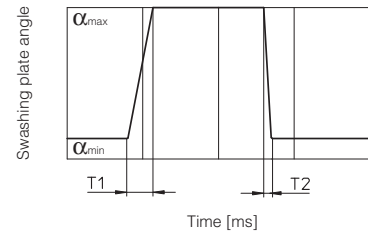
- 1 = Volumetric efficiency
- 2 = Overall efficiency
- 3 = Flow versus pressure curve
- 4 = Power consumption with full flow
- 5 = Power consumption at null flow



### 11.3 Response times

Response times and pressure peak due to variation 0% to 100% and 100% to 0% of the pump displacement, obtained with an instantaneous opening and shut-off of the delivery line.

Pump type	T1 (ms)	T2 (ms)
PVPC-*-3029	140	36
PVPC-*-4046	140	42
PVPC-*-5073	160	44
PVPC-*-5090	160	44
PVPC-*-6140	220	150

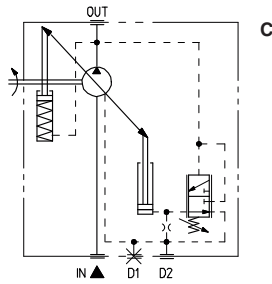


### 11.4 Minimum power/torque setting for PVPC-LW (constant power regulator)

For the pump correct operation, the power / torque factory setting has to be higher than the values reported in the below table. In case of lower power/torque setting values, the regulator limits the maximum working pressure to a value lower than the standard setting.

**Note:** please specify the requested value of torque setting or power and speed in the PVPC-LW pump order, e.g. 70 Nm or 10 kW at 1450 RPM

Pump type	Minimum torque (Nm)	Minimum power (Kw)
PVPC-LW-3029	43	6,7
PVPC-LW-4046	68	10,7
PVPC-LW-5073	113	17,8
PVPC-LW-5090	132	20,7
PVPC-LW-6140	197	30



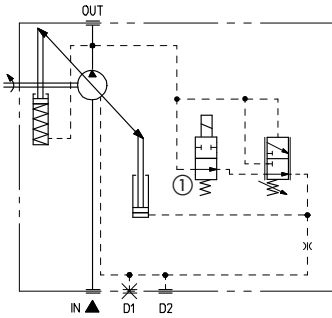
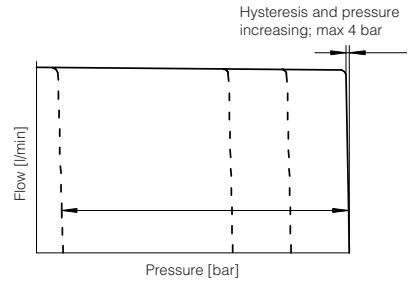
C

**Manual pressure compensator**

The pump displacement is zeroed when the line pressure approaches the setting pressure of the compensator.

Compensator setting range:  
 20 ÷ 280 bar for 3029, 4046, 5073  
 20 ÷ 250 bar for 5090

Compensator standard setting:  
 280 bar for 3029, 4046, 5073  
 250 bar for 5090



CH

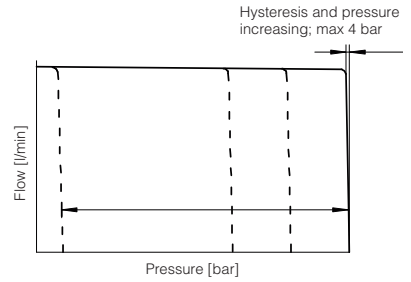
**Manual pressure compensator with venting**

As C plus venting function, when a long unloading time is required and heat generation and noise have to be kept at lowest level.

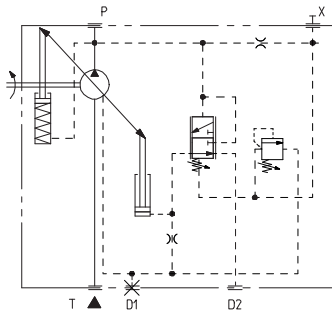
Venting valve solenoid voltage, see section 4  
 Venting valve OFF = null displacement  
 Venting valve ON = max displacement

Compensator setting range:  
 20 ÷ 280 bar for 3029, 4046, 5073  
 20 ÷ 250 bar for 5090, 6140

Compensator standard setting:  
 280 bar for 3029, 4046, 5073  
 250 bar for 5090, 6140



① solenoid venting valve



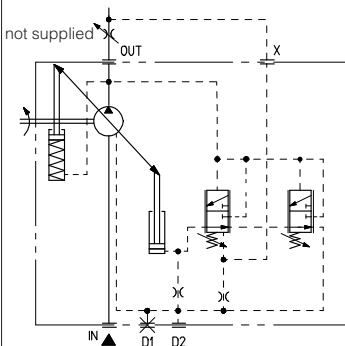
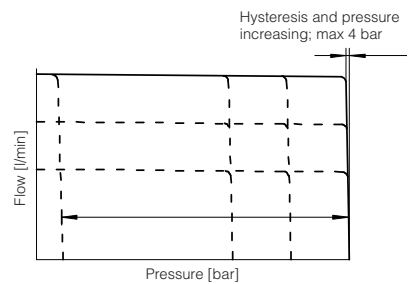
R

**Remote pressure compensator**

As C, but predisposed with X piloting port for connection of a remote pilot relief valve.

Compensator setting range:  
 20 ÷ 280 bar for 3029, 4046, 5073  
 20 ÷ 250 bar for 5090

Compensator standard setting:  
 280 bar for 3029, 4046, 5073  
 250 bar for 5090



L

**Load sensing**

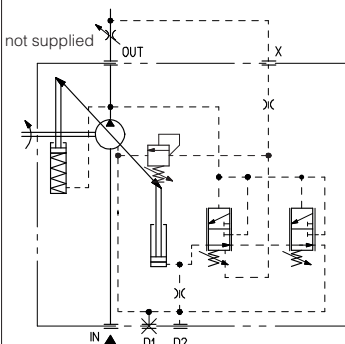
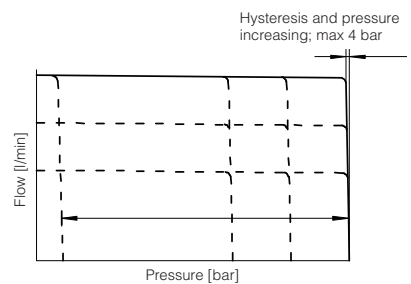
The pump displacement is automatically adjusted to maintain a constant (load independent) pressure drop across an external throttle. Changing the throttle regulation, the pump flow is consequently adjusted.

Load sensing control always incorporates a hydraulic compensator to limit the maximum pressure.

Compensator setting range:  
 20 ÷ 280 bar for 3029, 4046, 5073  
 20 ÷ 250 bar for 5090

Compensator standard setting:  
 280 bar for 3029, 4046, 5073  
 250 bar for 5090

Differential pressure setting range: 10 ÷ 40 bar  
 Differential pressure standard setting: 14 bar

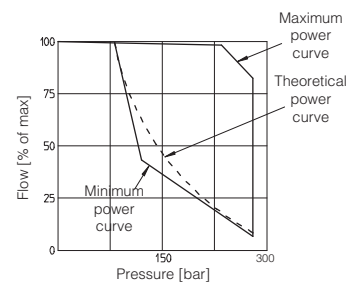


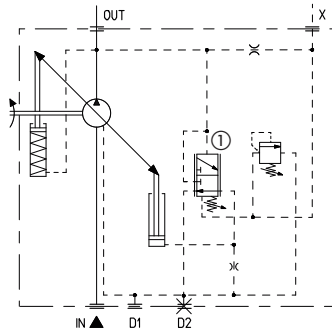
LW

**Constant power**

In order to achieve a constant drive torque with varying operating pressure. The swashing angle and therefore the outlet flow is varied so that the product of flow and pressure remains constant.

**See section 11.4 for min power/torque setting**





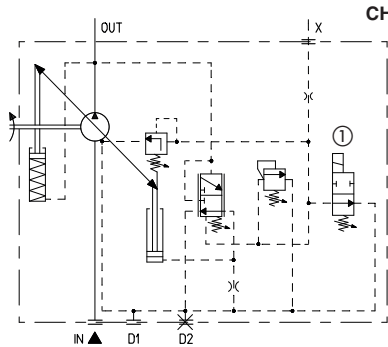
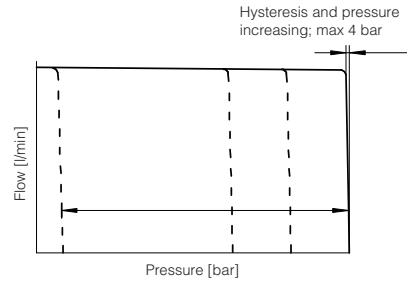
**C Manual pressure compensator**

The pump displacement is zeroed when the line pressure approaches the setting pressure of the compensator.

Compensator setting range: 20 ÷ 280 bar

Compensator standard setting: 280 bar

**Note:** do not modify the setting of differential pressure compensator ①



**CH Manual pressure compensator with venting**

As C plus venting function, when a long unloading time is required and heat generation and noise have to be kept at lowest level.

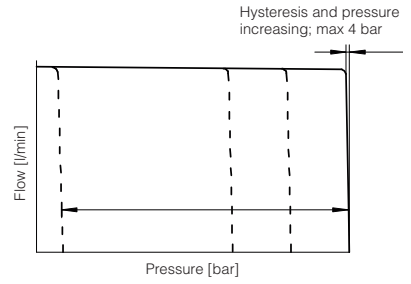
Venting valve solenoid voltage, see section 4

Venting valve OFF = null displacement

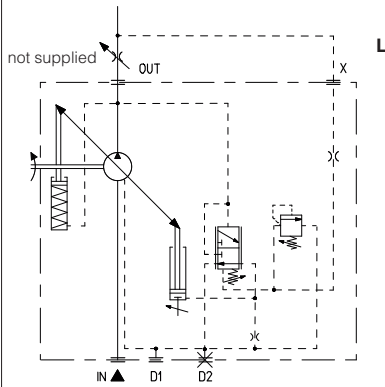
Venting valve ON = max displacement

Compensator setting range: 20 ÷ 280 bar

Compensator standard setting: 280 bar



① solenoid venting valve



**L Load sensing**

The pump displacement is automatically adjusted to maintain a constant (load independent) pressure drop across an external throttle. Changing the throttle regulation, the pump flow is consequently adjusted.

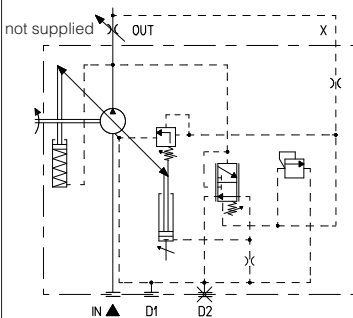
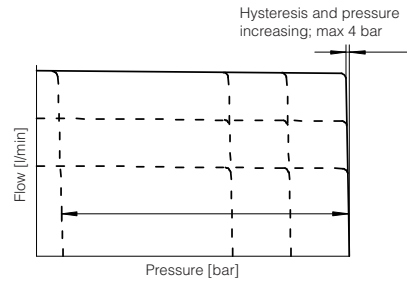
Load sensing control always incorporates an hydraulic compensator to limit the maximum pressure.

Compensator setting range: 20 ÷ 280 bar

Compensator standard setting: 280 bar

Differential pressure setting range: 10 ÷ 40 bar

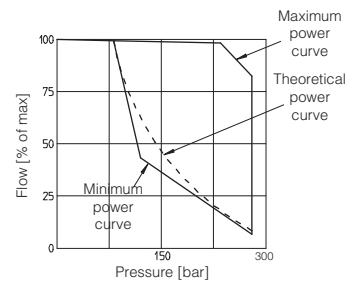
Differential pressure standard setting: 14 bar



**LW Constant power**

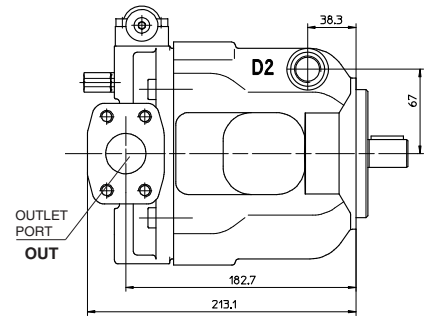
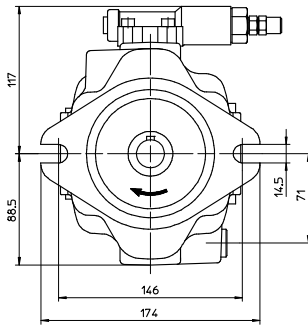
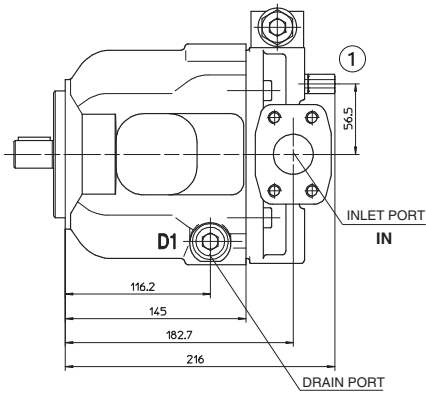
In order to achieve a constant drive torque with varying operating pressure. The swashing angle and therefore the outlet flow is varied so that the product of flow and pressure remains constant.

**See section 11.4 for min power/torque setting**





14 INSTALLATION DIMENSIONS OF PVPC-\*-3029: BASIC VERSION "C" CONTROL



PORTS DIMENSION

IN = Flange SAE 3000 1 1/4"

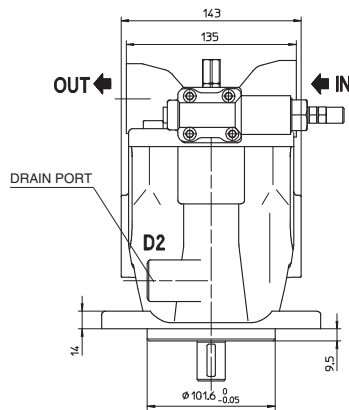
OUT = Flange SAE 6000 3/4"

D1, D2 = 1/2" BSPP

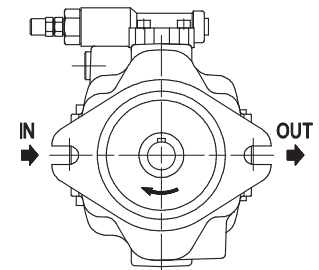
① = Screw for max displacement setting.

In case of double pumps, the screw is not available for version XB

Mass [kg]	
PVPC-*-3029	18

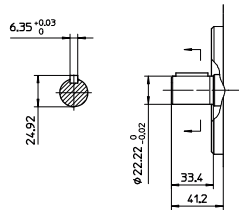


version S  
counterclockwise rotation  
viewed at the shaft end

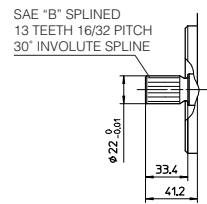


Pumps with counterclockwise rotation (S) have the IN and OUT inverted and consequently the position of the compensators

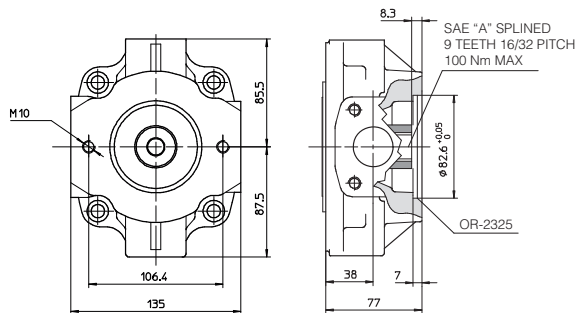
SHAFT TYPE "1"



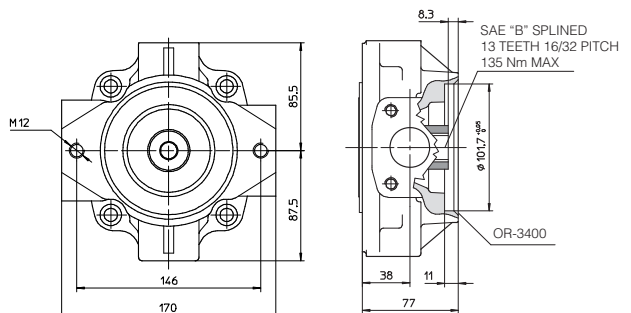
SHAFT TYPE "5"

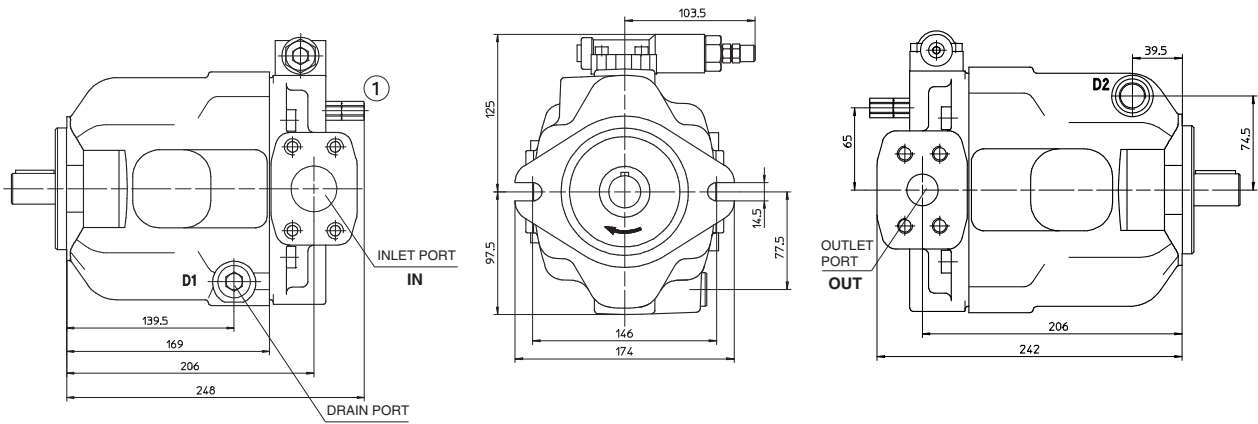


CODE XA - INTERMEDIATE FLANGE SAE "A" FOR PFE-31



CODE XB - INTERMEDIATE FLANGE SAE "B" FOR PFE-41  
screw for max displacement setting not available

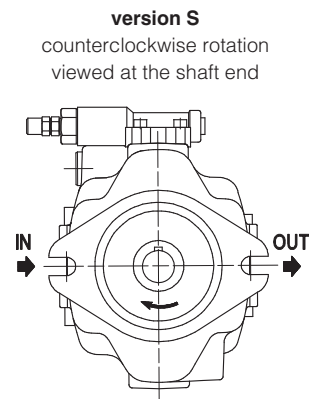
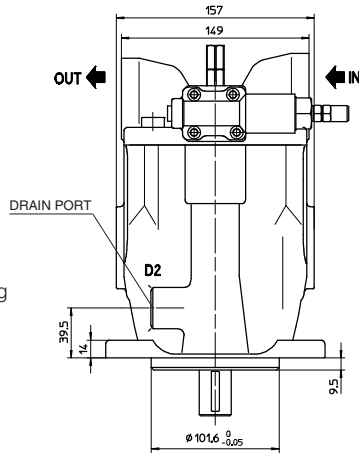




**PORTS DIMENSION**

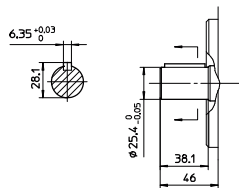
- IN = Flange SAE 3000 1 1/2"
- OUT = Flange SAE 6000 1"
- D1, D2 = 1/2" BSP
- ① = Screw for max displacement setting

Mass [kg]	
PVPC-*-4046	24

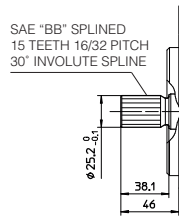


Pumps with counterclockwise rotation (S) have the IN and OUT inverted and consequently the position of the compensators

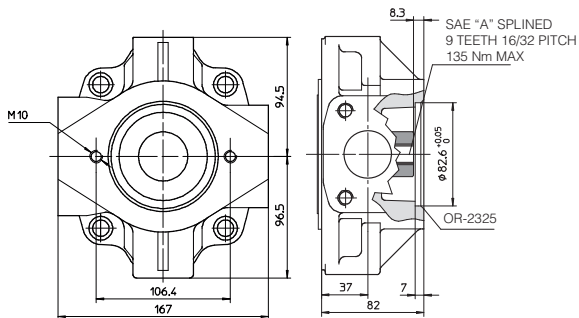
**SHAFT TYPE "1"**



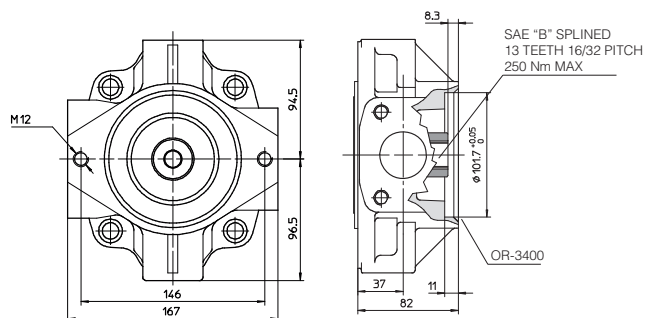
**SHAFT TYPE "5"**



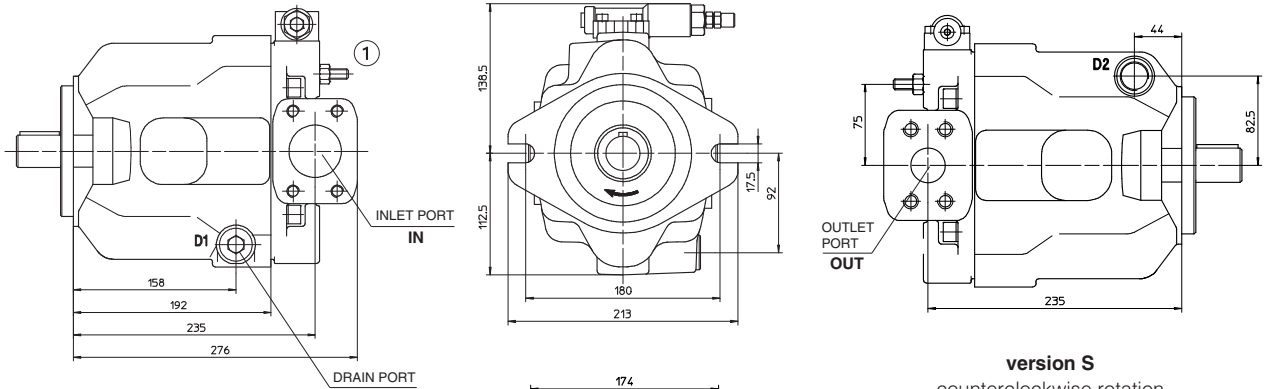
**CODE XA - INTERMEDIATE FLANGE SAE "A" FOR PFE-31**



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



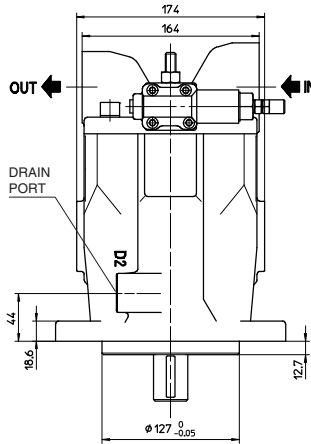
Drawing shows pumps with clockwise rotation (option D); pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted



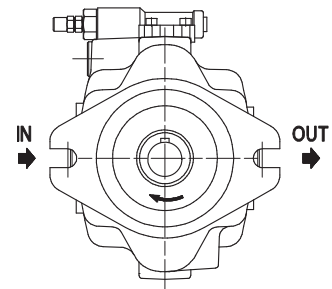
**PORTS DIMENSION**

IN = Flange SAE 3000 2"  
 OUT = Flange SAE 6000 1 1/4"  
 D1, D2 = 3/4" BSPP  
 ① = Screw for max displacement setting.  
 In case of double pump the screw is not available for version XC

Mass [kg]	
PVPC-*-5073	33
PVPC-*-5090	

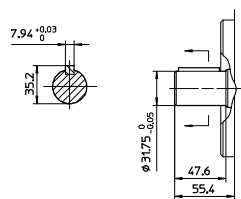


**version S**  
 counterclockwise rotation  
 viewed at the shaft end

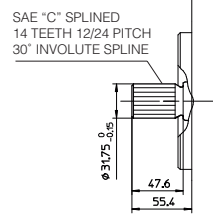


Pumps with counterclockwise rotation (S) have the IN and OUT inverted and consequently the position of the compensators

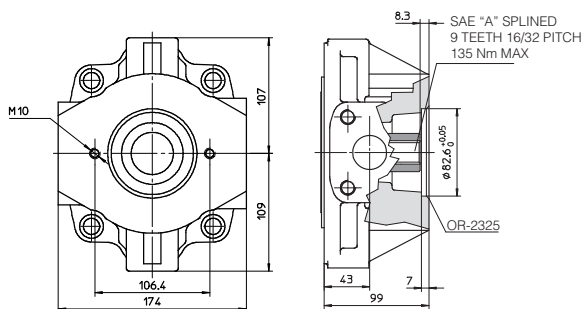
**SHAFT TYPE "1"**



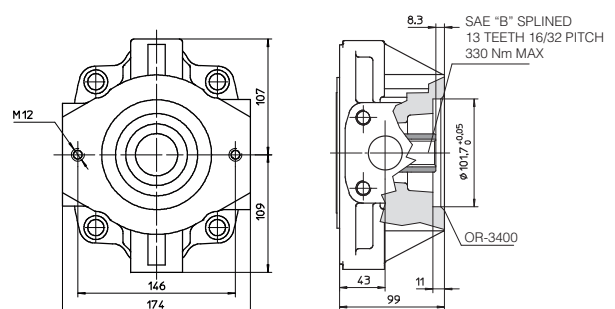
**SHAFT TYPE "5"**



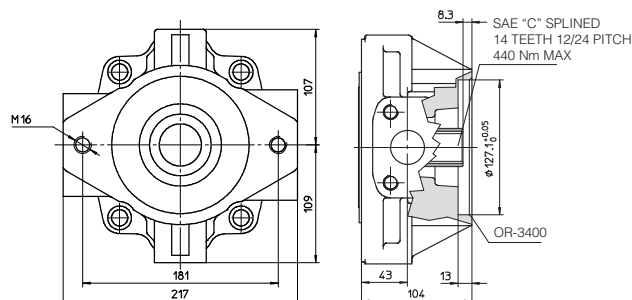
**CODE XA - INTERMEDIATE FLANGE SAE "A" FOR PFE-31**



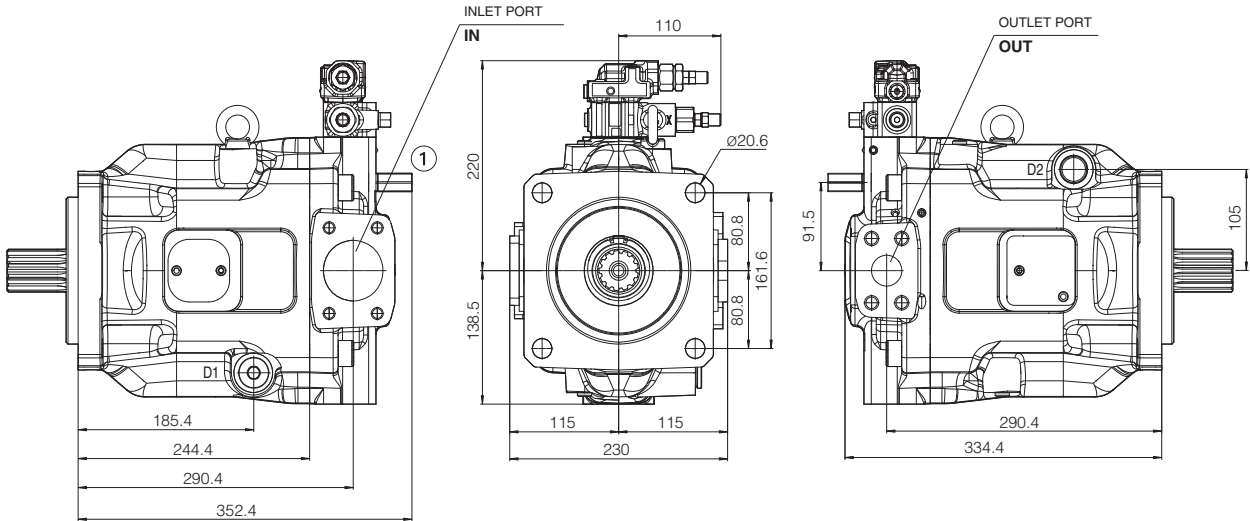
**CODE XB - INTERMEDIATE FLANGE SAE "B" FOR PFE-41**



**CODE XC - INTERMEDIATE FLANGE SAE "C" FOR PFE-51**



Drawing show pumps with clockwise rotation (option D); pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted



**PORTS DIMENSION**

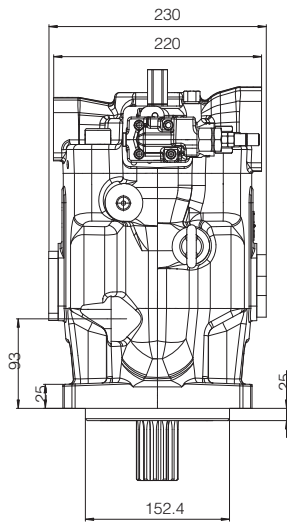
IN = Flange SAE 3000 2 1/2"

OUT = Flange SAE 6000 1 1/4"

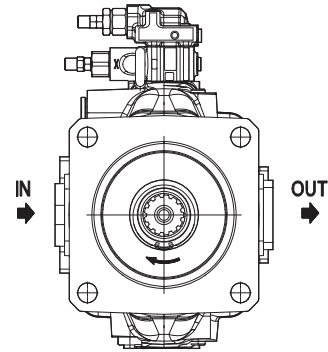
D1, D2 = 1 1/16"-12UNF

① = Regulation screw for max displacement setting.

Mass [kg]	
PVPC-*-6140	69

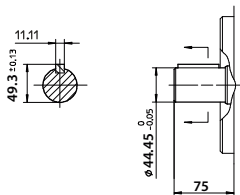


**version S**  
counterclockwise rotation  
viewed at the shaft end

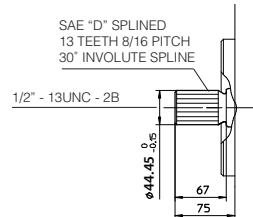


Pumps with counterclockwise rotation (**S**) have the IN and OUT inverted and consequently the position of the compensators

**SHAFT TYPE "1"**

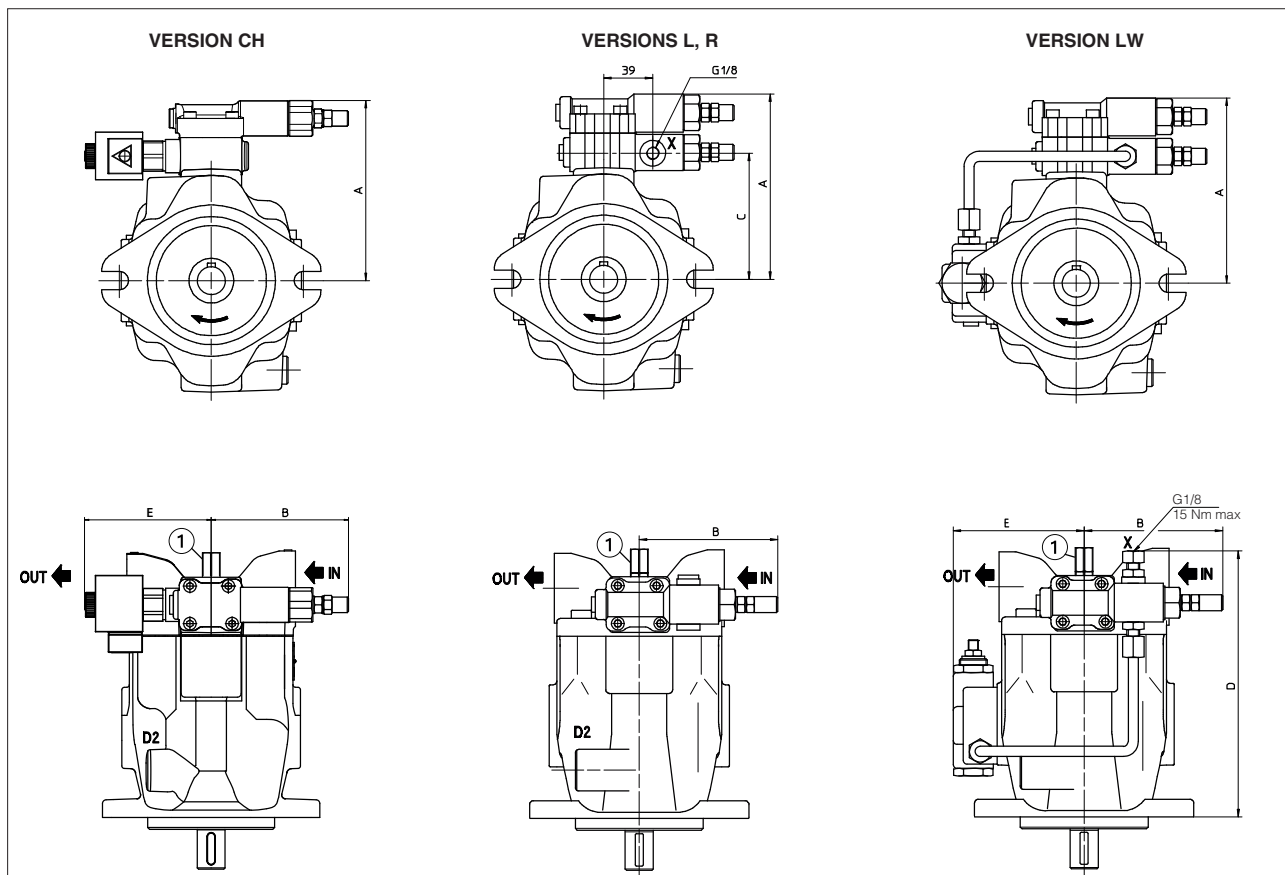


**SHAFT TYPE "5"**



18 INSTALLATION DIMENSIONS OF OTHER CONTROLS

18.1 PVPC size 3, 4 and 5



① = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement).  
 In case of double pump the regulation screw is not always available, please contact our technical office.

Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and also the consequently position of the control groups

Pump type	Version	A	B	C	D	E	Mass (kg)
PVPC-*-3029	CH	144	111	-	-	102	22
	L-R	144	111	100	-	-	19,2
	LW	144	111	-	211	104	20
PVPC-*-4046	CH	153	111	-	-	102	28
	L-R	153	111	109	-	-	25,2
	LW	153	111	-	235	111	26
PVPC-*-5073 PVPC-*-5090	CH	166	111	-	-	102	36,9
	L-R	166	111	122	-	-	34,2
	LW	166	111	-	258	120	35

18.2 PVPC size 6

**VERSION CH**

Mass [kg]	
PVPC-*-6140	74

**VERSION L**

Mass [kg]	
PVPC-*-6140	70.2

**VERSION LW**

Mass [kg]	
PVPC-*-6140	71

① = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement).  
 In case of double pump the regulation screw is not always available, please contact our technical office.  
 Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and also the consequently position of the control groups

**19 RELATED DOCUMENTATION**

<b>A900</b>	Operating and maintenance information for pumps
<b>K800</b>	Electric and electronic connectors