

PVPC with proportional controls variable displacement

Axial pistons pump with pressure, flow or high dynamic p/Q proportional controls



Displacement
29 ÷ 160
cm³/rev

Pmax
250 ÷ 350
bar

Features

- Variable displacement
- Analog or Fieldbus interfaces
- Open circuit
- SAE J744 or ISO 3019 mounting flange
- Keyed or splined shaft
- Optional through shaft
- Bluetooth / USB connectivity
- E-SW-SETUP programming software for PC
- Hydraulic power limitation
- Alternated p/Q control
- Internal oscilloscope function
- Optional damping plate to reduce acceleration stress
- IP65 or IP66 / IP67 protection degree

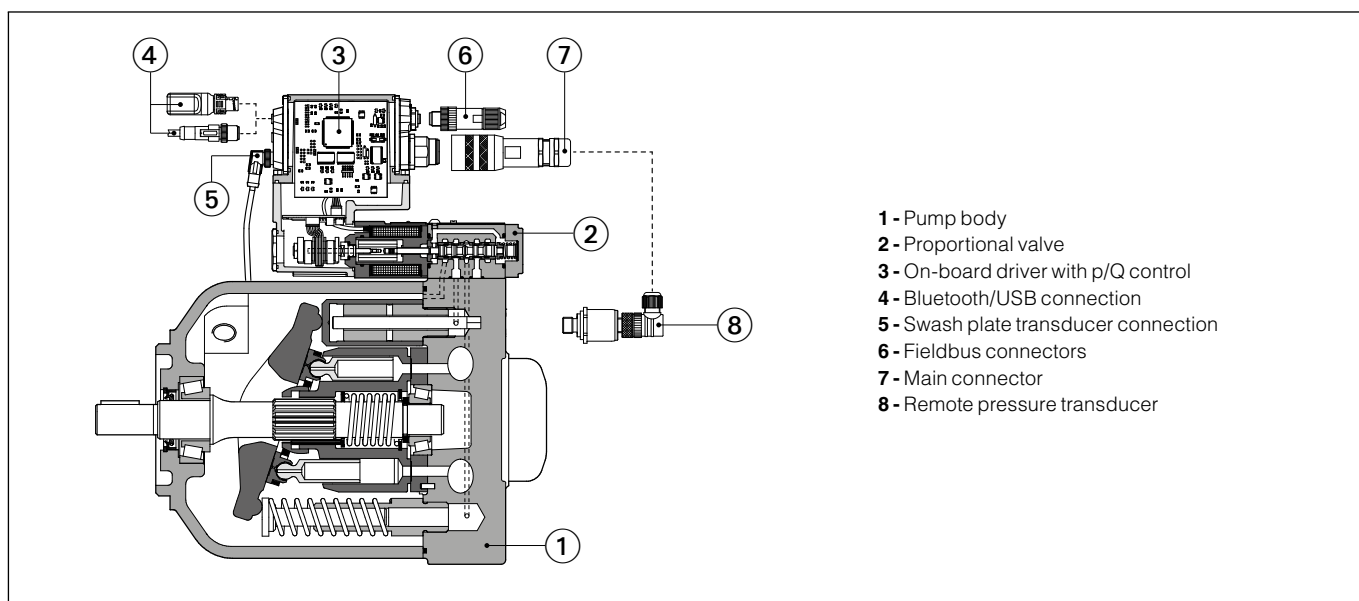
Description

Variable displacement axial piston pumps with swash plate design suited for high pressure open circuits, they are provided with advanced electrohydraulic proportional controls:

- **CZ** open loop pressure control
- **LQZ** open loop flow control (load sensing)
- **PES** closed loop p/Q control
- **PERS** as **PES** with optional sequence module that allows to reduce close to zero the pressure to the delivery line.

That performs alternate controls of pressure and rate flow. It can also perform max power limitation.

Overview



1 MODEL CODE

PVPC	XA	-	PES-SP	-	BC	-	4046	/	*	/	1	D	/	M	/	*	/	*	/	*	/	*		
1	2		3		4		5		6		7	8		9		10		11		12		13		14

1 - Pump type	
PVPC	Variable displacement axial piston pump

2 - Option for pumps with through shaft (1)	
-	omit if through shaft is not required
XA	intermediate flange SAE A
XB	intermediate flange SAE B
XC	intermediate flange SAE C
	not for size 6
	only for size 5

(1) For the LQZ and PERS versions, it must be checked that the pump to be coupled does not mechanically interfere with manifold and the OUT port of the first pump - consult our technical office

3 - Type of control	
CZ	proportional pressure control
LQZ	proportional flow control (load sensing) (2)
PES-SP	closed loop on-board driver with p/Q control
PERS-SP	as PES plus sequence module

(2) Not available for PVPC size 6

See section 15, 16

4 - Fieldbus interface - only for PES and PERS	
NP	Fieldbus not present
BC	CANopen
BP	PROFIBUS DP
EH	EtherCAT
EW	POWERLINK
EI	EtherNet/IP
EP	PROFINET RT/IRT

See section 5

5 - Size and max displacement	
3029	size 3 - displacement 029 cm ³ /rev
4046	size 4 - displacement 046 cm ³ /rev
5073	size 5 - displacement 073 cm ³ /rev
5090	size 5 - displacement 090 cm ³ /rev
6140	size 6 - displacement 140 cm ³ /rev
6160	size 6 - displacement 160 cm ³ /rev

6 - Pressure range - only for PERS	
200	200 bar
250	250 bar
280	280 bar
315	315 bar
350	350 bar
	not for PVPC-5090
	only for PVPC-6160
	only for PVPC-6140

7 - Shaft type	
1	keyed
5	splined

8 - Direction of rotation, viewed at the shaft end	
D	clockwise
S	counterclockwise

See section 28

9 - Mounting flange standard	
-	omit for SAE
M	ISO 3019/2 - only for shaft type 1

10 - Coil voltage - only for CZ, LQZ	
-	omit for standard 12 VDC coil
18	optional coil for low current drivers

See section 19

11 - Electronic options - only for PES and PERS	
C	current feedback for pressure transducer 4÷20mA
I	current reference input and monitor 4÷20mA
X	integrated pressure transducer with pre-configured pressure settings (only for PERS)
S	with 2 on-off inputs for multiple pressure PID selection for NP execution or double power supply for fieldbus execution, plus dedicated connector for remote pressure transducer
T	Bluetooth adapter supplied with the pump

See section 18

12 - Damping plate option - only for PES and PERS	
V	damping plate under the digital driver

See section 6

13 - Series identification - not required for ordering	
.....	series number

14 - Seals material	
-	NBR
PE	FKM

See section 10

2 OFF-BOARD ELECTRONIC DRIVERS - only for CZ, LQZ

Drivers model	E-MI-AC-01F		E-MI-AS-IR		E-BM-AS-PS		E-BM-AES
Type	Analog		Digital				Digital
Voltage supply (VDC)	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	plug-in to solenoid				DIN-rail panel		DIN-rail panel
Tech table	G010		G020		G030		GS050

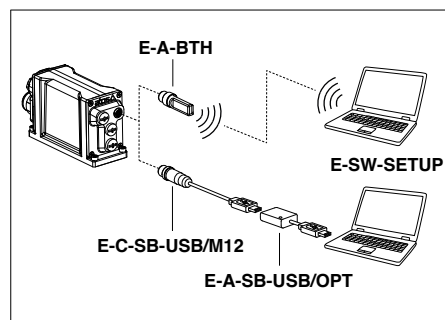
3 PROGRAMMING TOOLS - only for PES, PERS - see tech. table AS800

Free downloadable software for PC allows to set all valve functional parameters and to access complete diagnostic information of digital drivers via USB service port. Atos E-SW-SETUP PC software supports all Atos digital valve drivers and it is available at www.atos.com in MyAtos area.



WARNING: axis card USB port is not isolated! For E-C-SB-USB/M12 cable, the use of E-A-SB-USB/OPT isolator adapter is highly recommended for PC protection

Bluetooth or USB connection



4 BLUETOOTH OPTION - only for PES, PERS - see tech. table AS800

T option adds Bluetooth®; connectivity to Atos valve drivers thanks to E-A-BTH adapter, which can be left permanently installed on-board, to allow the Bluetooth connection with the valve drivers at any time. E-A-BTH adapter can also be purchased separately and used to connect with any supported Atos digital product.

Bluetooth connection to the valve can be protected against unauthorised access by setting a personal password. The adapter leds visually indicates the status of valve driver and Bluetooth connection.



WARNING: for the list of countries where the Bluetooth adapter has been approved, see tech. table AS800

T option is not available for the Indian market, so the Bluetooth adapter must be ordered separately.

5 FIELDBUS - only for PES, PERS - see tech. table GS510

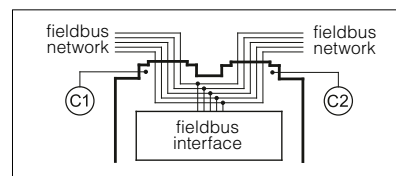
Fieldbus allows valve direct communication with machine control unit for digital reference, valve diagnostics and settings. These execution allow to operate the valves through fieldbus or analog signals available on the main connector.

Two fieldbus communication connectors are always available for digital drivers executions BC, BP, EH, EW, EI, EP. This feature allows considerable technical advantages in terms of installation simplicity, wirings reduction and also avoid the usage expensive T-connectors.

For BC and BP executions the fieldbus connectors have an internal pass-through connection and can be used like end point of the fieldbus network, using an external terminator (see tech table GS500).

For EH, EW, EI and EP executions the external terminators are not required: each connector is internally terminated.

BC and BP pass-through connection



6 DAMPING PLATE OPTION - only for PES, PERS

V option adds a rubber damping plate between the valve and the on-board digital driver to reduce acceleration mechanical stress on electronic components, consequently increasing valve life in applications with high vibrations and shocks. For more information see technical table G004.

7 GENERAL CHARACTERISTICS

Assembly position	Any position. See section 12		
Subplate surface finishing to ISO 4401	Acceptable roughness index: $Ra \leq 0,8$, recommended $Ra 0,4$ – Flatness ratio 0,01/100		
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007		
Ambient temperature range	CZ, LQZ: PES, PERS:	Standard = $-25^{\circ}\text{C} \div +60^{\circ}\text{C}$ Standard = $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$	/PE option = $-15^{\circ}\text{C} \div +80^{\circ}\text{C}$ /PE option = $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$
Storage temperature range	CZ, LQZ: PES, PERS:	Standard = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ Standard = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$	/PE option = $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ /PE option = $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$
Surface protection (pump body)	Black painting RAL 9005		
Surface protection (pilot valve)	Zinc coating with black passivation, galvanic treatment (driver housing)		
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h		
Vibration resistance	See technical table G004		
Compliance	CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) Comply with Directive 2011/65/EU as amended (RoHS 2), including Delegated Directive (EU) 2015/863 and all subsequent delegated directives in force on the date of this statement REACH Regulation (EC) n° 1907/2006		

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).

Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table FS900 and in the user manuals included in the E-SW-SETUP programming software.

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

PVPC size	3029	4046	5073	5090	6140	6160
Max displacement (cm³/rev)	29	46	73	88	140	160
Theoretical max flow at 1450 rpm (l/min)	42	66,7	105,8	127,6	203	232
Max continuous pressure (bar)	280			250	350	315
Peak pressure (1) (bar)	350			315	420	390
Min/Max inlet pressure (bar abs.)	0,8 / 25					
Max pressure on drain port (bar abs.)	1,5					
Power consumption at 1450 rpm and at max pressure and displacement (kW)	20	32	52	55	120	122
Max torque on the shaft (Nm)	Type 1: 210 Type 5: 270	Type 1: 350 Type 5: 440	Type 1: 670 Type 5: 810		Type 1: 1300 Type 5: 1660	
Max torque at max pressure and displacement (Nm)	128	203	328	350	780	803
Speed rating at max displacement (rpm)	500 ÷ 3000	500 ÷ 2600		500 ÷ 2200		500 ÷ 2000
Moment of inertia (Kgm²)	0,0020	0,0050	0,0030		0,0025	
Body volume (l)	0,7	0,9	1,5		2,8	

(1) Max 50ms

9 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)				
Max power consumption	CZ = 30 W LQZ = 30 W (size 3), 35 W (sizes 4 and 5) PES, PERS = 50 W				
Max. solenoid current	2,6 A for standard 12 VDC coil; 1,5 A for standard 18 VDC coil (only for CZ, LQZ)				
Coil resistance R at 20°C	Size 3: 3,1 Ω for standard 12 VDC coil; 13,1 Ω for 18 VDC coil (only for version CZ) 3 ÷ 3,3 Ω for standard 12 VDC coil; 13 ÷ 13,4 Ω for 18 VDC coil (only for version LQZ) Size 4, 5: 3,1 Ω for standard 12 VDC coil; 13,1 Ω for 18 VDC coil (only for version CZ) 3,8 ÷ 4,1 Ω for standard 12 VDC coil; 12 ÷ 12,5 Ω for 18 VDC coil (only for version CZ, LQZ)				
Analog input signals	Voltage: range ±10 VDC (24 VMAX tolerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω				
Monitor outputs	Output range: voltage ±10 VDC @ max 5 mA current ±20 mA @ max 500 Ω load resistance				
Enable input	Input range: 0 ÷ 5 VDC (OFF state), 9 ÷ 24 VDC (ON state), 5 ÷ 9 VDC (not accepted); Input impedance: Ri > 10 kΩ				
Fault output	Output range: 0 ÷ 24 VDC (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 50 mA external negative voltage not allowed (e.g. due to inductive loads)				
Pressure transducer power supply	+24VDC @ max 100 mA (E-ATR-8 see tech table GS465)				
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions, alarms history storage function				
Insulation class	H (180°) Due to the occurring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account				
Protection degree to DIN EN60529	CZ, LQZ = IP65 PES, PERS = IP66/67 with mating connector				
Duty factor	Continuous rating (ED=100%)				
Tropicalization	Tropical coating on electronics PCB				
Additional characteristics	Short circuit protection of solenoid's current supply; 3 leds for diagnostic; spool position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply				
Recommended wiring cable	LiYCY shielded cables, see section 22				
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158	
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet, insulated 100 Base TX	

Note: a maximum time of 800 ms (depending on communication type) has to be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero

10 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) = -15°C ÷ +80°C		
Recommended viscosity	20÷100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	ISO4406 class 18/16/13 NAS1638 class 7	ISO4406 class 16/14/11 NAS1638 class 5	see also filter section at www.atos.com or KTF catalog
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFD-U (glycol based), HFD-R (1)	ISO 12922
	NBR, FKM	HFD-U (ester based)	
Flame resistant with water	NBR	HFC (1)	

(1) See section 11

11 PERFORMANCE RESTRICTIONS WITH FLAME RESISTANT FLUIDS

11.1 HFD-R (Phosphate ester) and HFD-U (glycol based)

PVPC size	3029	4046	5073	5090	6140	6160
Max continuous pressure (bar)	200					
Max peak pressure (bar)	240					
Max speed (1) (rpm @ VMAX)	2050	1850	1750	1550	1500	1450
Ambient temperature range (°C)	-10 ÷ +80					
Bearing life (% of bearing life with mineral oil) (%)	90					

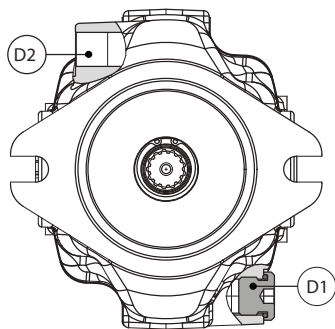
(1) With an inlet pressure of 1 bar abs

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

PVPC size	3029	4046	5073	5090	6140	6160
Max continuous pressure (bar)	180					
Max peak pressure (bar)	210					
Max speed (1) (rpm @ VMAX)	2050	1850	1750	1550	1500	1450
Ambient temperature range (°C)	-10 ÷ +60					
Bearing life (% of bearing life with mineral oil) (%)	40					

(1) With an inlet pressure of 1 bar abs

12 INSTALLATION POSITION



During commissioning the axial piston pump must be bled. This rule must be observed in the event of prolonged down period, as the pump may empty through the hydraulic pipes. The pump is supplied with drain D2 open, and D1 plugged. Before installation fill the pump with hydraulic oil, 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.

HORIZONTAL INSTALLATION

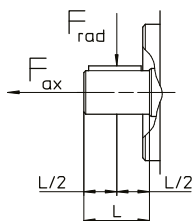
	OUTSIDE THE TANK above oil level Minimum inlet pressure = 0.8 bar absolute
	OUTSIDE THE TANK below oil level C = 200mm

IN: inlet line
D2: drain line
A: minimum distance between inlet and drain line
B÷C: permissible suction height
C: inlet line immersion depth
H: minimum height to avoid pump emptying

VERTICAL INSTALLATION

	INSIDE THE TANK Minimum oil level below the pump mounting surface Minimum inlet pressure = 0.8 bar absolute B ≤ 800mm C ≤ 200mm H ≥ 25mm
	OUTSIDE THE TANK above oil level Minimum inlet pressure = 0.8 bar absolute
	OUTSIDE THE TANK below oil level Minimum inlet pressure = 0.8 bar absolute C = 200mm

13 MAX PERMISSIBLE LOAD ON DRIVE SHAFT



PVPC size	3029	4046	5073	5090	6140	6160
Fax = axial load (N)	±1000	±1500	±2000			
Frad = radial load (N)	1500			3000		

14 VARIATION OF MAX SPEED VS INLET PRESSURE

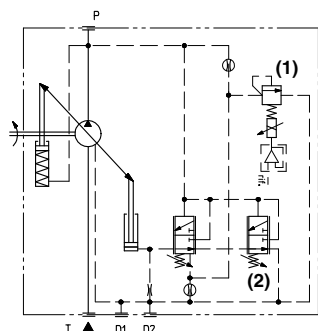
Inlet pressure	Displacement %					% variation of the max. speed
bar abs.	65	70	80	90	100	
0,8	120	115	105	97	90	
0,9	120		110	103	95	
1,0	120		115	107	100	
1,2	120			113	106	
1,4	120				112	
1,6	120				117	
2,0	120					

Example

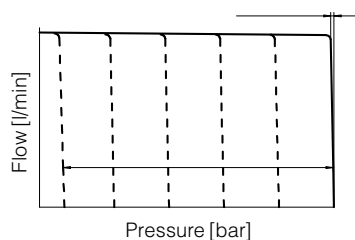
Displacement: 80% - Inlet pressure: 1,0 bar - Speed: 115%

15 OPEN LOOP ELECTROHYDRAULIC CONTROLS

CZ - Proportional pressure control



Hysteresis and pressure increase: max 4 bar



Pump max pressure open loop proportional control.

Pump displacement, and thus the flow, remains constant as far as the circuit pressure reaches the value set on the proportional pilot valve (1), then the flow is reduced to maintain the circuit pressure to the set value. The maximum pressure in the circuit can be continuously modulated by means of the reference signal.

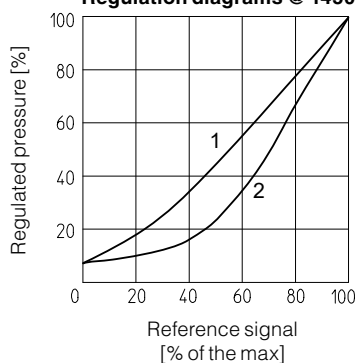
Proportional pressure setting range: see below pressure control diagram.

Compensator (2) setting range:

20 ÷ 280 bar for 3029, 4046, 5073; 20 ÷ 250 bar for 5090

20 ÷ 350 bar for 6140; 20 ÷ 315 bar for 6160

Regulation diagrams @ 1450 rpm



1 = regulation characteristics linearized with Atos digital drivers

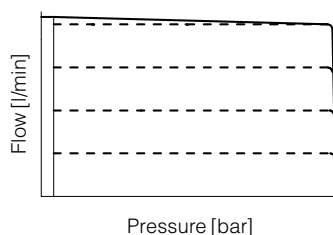
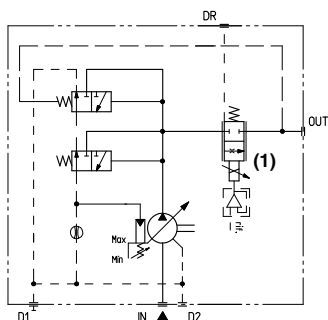
2 = regulation characteristics without linearization

Max reference current [A]

only for versions without digital driver (without linearization)

	3029	4046	5073	5090	6140	6160
std	1.9	1.9	1.9	1.9	2.2	2.2
/18	0.95	0.95	0.95	0.95	1.1	1.1

LQZ - Proportional flow (load-sensing) control

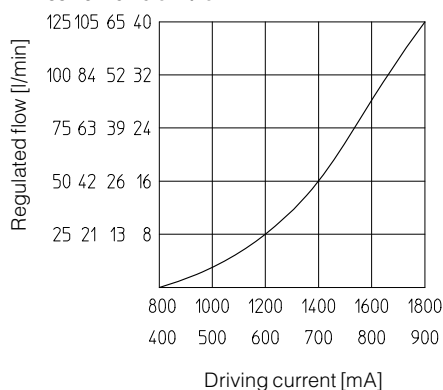


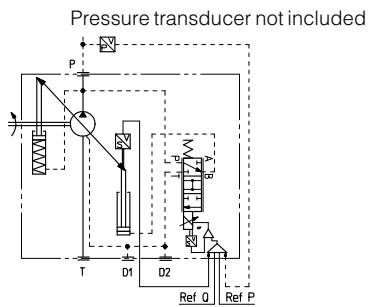
Pump with flow rate load sensing proportional control. The pump displacement is self adjusted to maintain a constant pressure drop across the proportional flow control valve (1) independently from the load.

The pump flow can be continuously regulated by modulating the proportional valve (1).

Regulation diagrams @ 1450 rpm

Pump size
88 73 46 29 cm³/rev



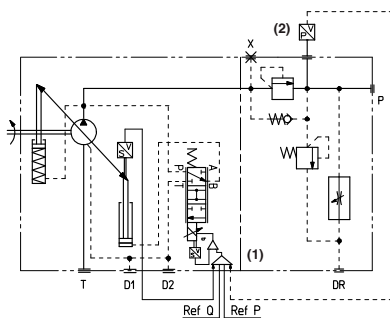
PES - closed loop

The p/Q control algorithm automatically selects which control, between pressure and flow rate is active.

Flow control is active when the actual system pressure is lower than the pressure reference input signal: the pump flow is regulated according to the flow reference input.

Pressure control is activated when the actual pressure grows up to the pressure reference input signal: the pump flow is then reduced in order to regulate and limit the max system pressure (if the pressure tends to decrease under its command value, the flow control returns active).

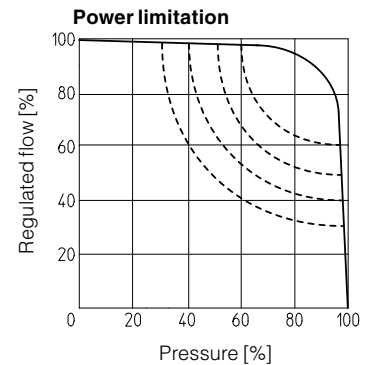
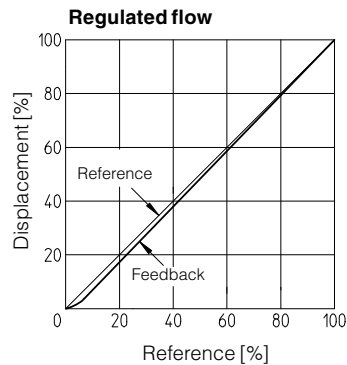
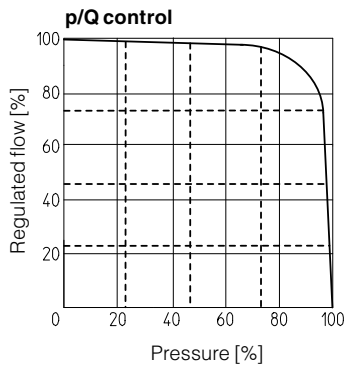
PVPC-PES needs a remote pressure transducer to be installed on the system and its feedback has to be interfaced to the pump on-board digital driver, through the 12 poles connector.

PERS - as PES, plus sequence module

PVPC-PERS as **PES** version plus sequence module RESO (1) which:

- grants a minimum piloting pressure (18 bar) when the actual pressure falls below that value;
- integrates a safety relief valve
- allows to depressure the line through a compensated oil drain

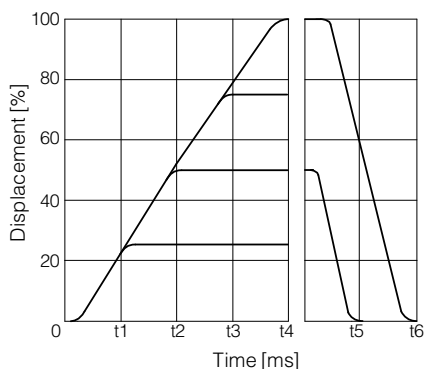
The **/X** option allows to integrate on the RESO module a pressure transducer (2), with output signal 4÷20 mA, factory wired to the pump on-board digital driver.



The power limitation algorithm allows to limit the hydraulic power of the pump to the value set via software or fieldbus see section 20.12

Response time

Displacement variation response time for a step change of the flow rate reference signal. The indicated times refer to tests performed with a pilot pressure of 50 bar.



Pump type	0-25%	0-50%	0-75%	0-100%	50-0%	100-0%
	t1 [ms]	t2 [ms]	t3 [ms]	t4 [ms]	t5 [ms]	t6 [ms]
PVPC-PE(R)S-3029	30	45	60	75	20	40
PVPC-PE(R)S-4046	40	60	80	100	30	60
PVPC-PE(R)S-5073	50	70	100	125	40	75
PVPC-PE(R)S-5090	60	80	115	140	45	90
PVPC-PE(R)S-6140	85	125	145	170	75	165
PVPC-PE(R)S-6160	95	135	160	185	85	180

17 REMOTE PRESSURE TRANSDUCER SELECTION

The pressure transducer type E-ATR-8 must be ordered separately (see tech table GS465), except for /X and /SX options for which the pressure transducer with output signal $4 \div 20$ mA is integrated to the pump.

Pump code	Pressure transducer code
PVPC-PE(R)S-*/200	E-ATR-8/250
PVPC-PE(R)S-*/250	E-ATR-8/400
PVPC-PE(R)S-*/280	E-ATR-8/400
PVPC-PE(R)S-*/315	E-ATR-8/400
PVPC-PE(R)S-*/350	E-ATR-8/400
PVPC-PE(R)S-*/200*/C	E-ATR-8/250/I
PVPC-PE(R)S-*/250*/C	E-ATR-8/400/I
PVPC-PE(R)S-*/280*/C	E-ATR-8/400/I
PVPC-PE(R)S-*/315*/C	E-ATR-8/400/I
PVPC-PE(R)S-*/350*/C	E-ATR-8/400/I

18 ELECTRONIC OPTIONS - only for PES and PERS

I = This option provides $4 \div 20$ mA current reference and monitor signals, instead of the standard $0 \div 10$ VDC.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 VDC or ± 20 mA.

This option is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

C = This option is available to connect pressure transducers with $4 \div 20$ mA current output signal, instead of the standard $0 \div 10$ VDC.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 VDC or ± 20 mA.

X = This option includes the pressure transducer, with output signal $4 \div 20$ mA, integrated to the pump and factory wired to the pilot valve electronic (see 20.9).

S = Two on-off input signals are available on the main connector to select one of the four pressure PID parameters setting, stored into the driver (see 20.11).

T = This option allows to receive the Bluetooth adapter supplied directly with the valve.

19 COIL VOLTAGE OPTION - only for CZ and LQZ

18 = Optional coil to be used with electronic drivers not supplied by Atos, with power supply 24 VDC and with max current limited to 1A.

20 POWER SUPPLY AND SIGNALS SPECIFICATIONS - only for PES and PERS

Generic electrical output signals of the pump (e.g. fault or monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components- hydraulics, ISO 4413).

20.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/40 V capacitance to three phase rectifiers. In case of separate power supply see 20.2.



A safety fuse is required in series to each power supply: 2.5 A time lag fuse.

20.2 Power supply for driver's logic and communication (VL+ and VL0) - only for /S and /SX options for fieldbus executions

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/40 V capacitance to three phase rectifiers.

The separate power supply for driver's logic on pin 9 and 10, allow to remove solenoid power supply from pin 1 and 2 maintaining active the diagnostics, USB and fieldbus communications.



A safety fuse is required in series to each driver's logic and communication power supply: 500 mA fast fuse.

20.3 Flow reference input signal (Q_INPUT+)

Functionality of Q_INPUT+ signal, is used as reference for the pump's flow.

Reference input signal is factory preset according to selected valve code, defaults are $0 \div 10$ VDC for standard and $4 \div 20$ mA for /I option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 VDC or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly from the machine control unit (fieldbus reference). Analog reference input signal can be used as on-off commands with input range $0 \div 24$ VDC.

20.4 Pressure reference input signal (P_INPUT+)

Functionality of P_INPUT+ signal, is used as reference for the driver pressure closed loop.
Reference input signal is factory preset according to selected valve code, defaults are $0 \div 10\text{VDC}$ for standard and $4 \div 20\text{ mA}$ for /I option.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.
Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).
Analog reference input signal can be used as on-off commands with input range $0 \div 24\text{VDC}$.

20.5 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal proportional to the actual pump swashplate position; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, fieldbus reference, pilot spool position).
Monitor output signal is factory preset according to selected pump code, defaults are $0 \div 10\text{VDC}$ for standard and $4 \div 20\text{ mA}$ for /I option.
Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

20.6 Pressure monitor output signal (P_MONITOR)

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).
Monitor output signal is factory preset according to selected pump code, defaults are $0 \div 10\text{VDC}$ for standard and $4 \div 20\text{ mA}$ for /I option.
Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

20.7 Enable input signal (ENABLE) - only for /S and /SX options

To enable the driver, supply a 24 VDC on pin 3 (EN) is mandatory. The input signal allows to enable/disable the current output supply to the solenoid, without removing the electrical power supply to the driver; it is used to activate the communication and the other driver functions when the main output must be disabled for safety reasons. This condition does not comply with norms IEC 61508 and ISO 13849.
Enable input signal can be used as generic digital input by software selection.

20.8 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuit/not connected, reference signal cable broken for $4 \div 20\text{ mA}$ input, spool position transducer cable broken etc.). Fault presence corresponds to 0 VDC , normal working corresponds to 24 VDC .
Fault status is not affected by the Enable input signal. Fault output signal can be used as digital output by software selection.

20.9 Pressure transducer input signal

Analog pressure transducers can be directly connected to the driver.

Analog input signal is factory preset according to selected pump code, defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 VDC or ± 20 mA.

Standard:

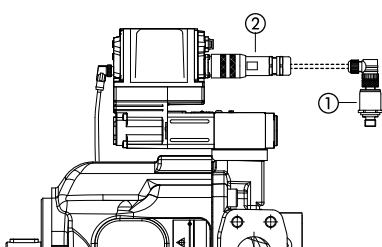
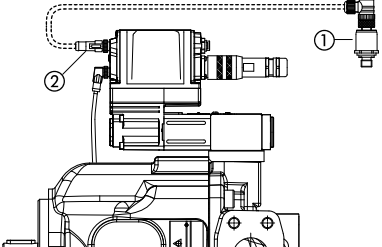
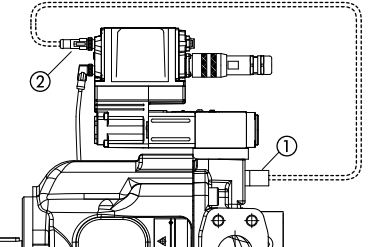
Remote pressure transducer can be directly connected to the driver main connector (see section 21.1)

/S option

Remote pressure transducer can be directly connected to a dedicated M12 connector on the driver (see section 21.6)

/X and /SX options

Pump integrated pressure transducer is directly connected with a dedicated M12 connector and no remote pressure transducer is required; current input signal (4 ÷ 20 mA) of the transducer allows cable break detection functionality

Standard	/S option	/X and /SX options
 ① = remote pressure transducer ② = main connector Note: 1 and 2 to be ordered separately	 ① = remote pressure transducer ② = M12 connector Note: 1 and 2 to be ordered separately	 ① = integrated pressure transducer ② = M12 connector Note: 1 and 2 included

20.10 Logic Input Signal (D_IN) - only for standard and standard with /X option

D_IN on-off input signal can be software set to perform one of the following functions:

- enable and disable the power limitation function; default setting, apply 0Vdc to disable and 24Vdc to enable the power limitation - see 20.12
- enable and disable the driver functioning; apply 0 VDC to disable and 24 VDC to enable the driver - see 20.7
- switch between two pressure PID settings - see 20.11

20.11 Multiple pressure PID (1)

Four sets of pressure PID parameters are stored into the driver: switching in real-time the active pressure PID parameters during machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.). The available commands to switch these PID pressure sets depend on the driver execution:

Fieldbus	Driver	Commands
NP	Standard and Standard with /X option	1 on-off input on main connector allow to switch the 2 PID parameters set (apply 0 VDC to select SET1 pressure PID and 24 VDC to select SET2)
NP	/S and /SX options	2 on-off inputs on main connector allow to switch the 4 PID parameters set (SET1.. SET4 - see the table for PID set selection)
BC, BP EH, EW EI, EP	All versions	real-time fieldbus communication can switch between the 4 PID parameters set (SET1 - SET4 - see driver manuals)

PID SET SELECTION				
PIN	SET 1	SET 2	SET 3	SET 4
9	0	24 VDC	0	24 VDC
10	0	0	24 VDC	24 VDC

20.12 Power Limitation (1)

A limit to the maximum pump hydraulic power can be software set into the driver in order to limit the pump power consumption to the coupled electrical motor. When the actual hydraulic power $p \times Q$ (pressure transducer feedback • flow reference value) reaches the set power limit, the driver automatically reduces the pump flow regulation. The higher is the pressure feedback, the lower is the pumps regulated flow:

$$\text{Regulated Flow} = \text{Min} \left(\frac{\text{Set power Limit [kW]}}{\text{Pressure Feedback [bar]}} \cdot \frac{1}{\text{Flow Full Scale [l/min]}} ; \text{Flow Reference} \right)$$

The hydraulic power limitation, disabled as default, can be enabled via E-SW-SETUP programming software or via fieldbus communication, if available. Standard and standard with /X option allow also to enable and disable this function during the machine cycle, using the D_IN on-off input available on the main connector (section 20.10)

(1) The sections 20.11 and 20.12 are a brief description of the settings and features of digital drivers with alternated p/Q control. For a detailed descriptions of available settings, wirings and installation procedures, please refer to the user manual included in the E-SW-SETUP programming software: **E-MAN-RI-PES** - user manual for **PES-S** digital drivers

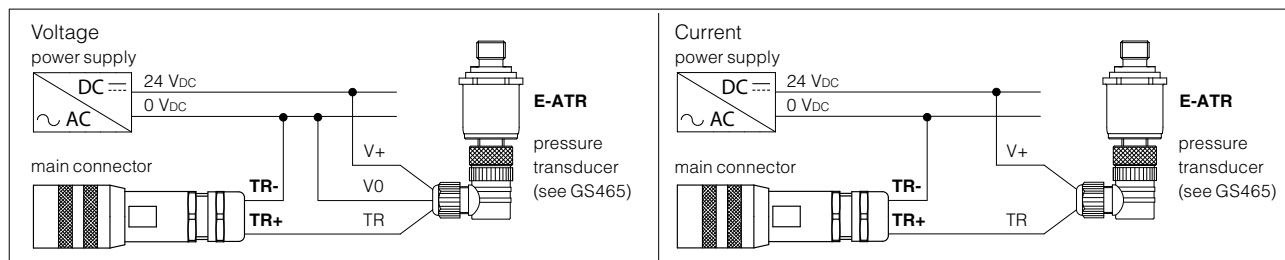
21 ELECTRONIC CONNECTIONS

21.1 Main connector signals - 12 pin Standard - for PES and PERS

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC	Input - power supply
2	V0	Power supply 0 VDC	Gnd - power supply
3	FAULT	Fault (0 VDC) or normal working (24 VDC), referred to V0	Output - on/off signal
4	INPUT-	Negative reference input signal for Q_INPUT+ and P_INPUT+	Gnd - analog signal
5	Q_INPUT+	Flow reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal Software selectable
6	Q_MONITOR	Flow monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option. Referred to V0	Output - analog signal Software selectable
7	P_INPUT+	Pressure reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal Software selectable
8	P_MONITOR	Pressure monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option. Referred to V0	Output - analog signal Software selectable
9	D_IN	Function software selectable between: power limitation enable (default), pump enable (24 VDC) / disable (0 VDC) or multiple pressure PID selection. Referred to V0	Input - on/off signal
10	TR+	Remote pressure transducer input signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /C option	Input - analog signal Software selectable
11	TR-	Negative pressure transducer input signal for TR+	Input - analog signal
PE	EARTH	Internally connected to the driver housing	-

Note: these connections are the same of Rexroth A10VSO axial piston pumps, model SYDFEE and SYDFEC

Remote pressure transducer connections - only for Standard



21.2 Main connector signals - 12 pin Standard with /X option - for PES and PERS

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC	Input - power supply
2	V0	Power supply 0 VDC	Gnd - power supply
3	FAULT	Fault (0 VDC) or normal working (24 VDC), referred to V0	Output - on/off signal
4	INPUT-	Negative reference input signal for Q_INPUT+ and P_INPUT+	Gnd - analog signal
5	Q_INPUT+	Flow reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal Software selectable
6	Q_MONITOR	Flow monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option. Referred to V0	Output - analog signal Software selectable
7	P_INPUT+	Pressure reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal Software selectable
8	P_MONITOR	Pressure monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option. Referred to V0	Output - analog signal Software selectable
9	D_IN	Function software selectable between: power limitation enable (default), pump enable (24 VDC) / disable (0 VDC) or multiple pressure PID selection. Referred to V0	Input - on/off signal
10	NC	Do not connect	-
11	NC	Do not connect	-
PE	EARTH	Internally connected to the driver housing	-

Note: these connections are the same of Rexroth A10VSO axial piston pumps, model SYDFEE and SYDFEC

21.3 Main connector signals - 12 pin/S and /SX option - for PES and PERS NP

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC	Input - power supply
2	V0	Power supply 0 VDC	Gnd - power supply
3	ENABLE	Enable (24 VDC) or disable (0 VDC) the valve, referred to V0	Input - on/off signal
4	Q_INPUT+	Flow reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are ± 10 VDC for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
5	INPUT-	Negative reference input signal for Q_INPUT+ and F_INPUT+	Input - analog signal
6	Q_MONITOR	Flow monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are ± 10 VDC for standard and $4 \div 20$ mA for /I option. Referred to V0	Output - analog signal Software selectable
7	P_INPUT+	Pressure reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are $0 \div 10$ VDC for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
8	P_MONITOR	Pressure monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are $0 \div 10$ VDC for standard and $4 \div 20$ mA for /I option. Referred to V0	Output - analog signal Software selectable
9	D_IN0	Function software selectable between: multiple pressure PID 0 selection (default) or power limitation enable. Referred to V0	Input - on/off signal
10	D_IN1	Function software selectable between: multiple pressure PID 1 selection (default) or power limitation enable. Referred to V0	Input - on/off signal
11	FAULT	Fault (0 VDC) or normal working (24 VDC), referred to V0	Output - on/off signal
PE	EARTH	Internally connected to the driver housing	-

Note: these connections are the same of Moog radial piston pumps, model RKP-D

21.4 Main connector signals - 12 pin/S and /SX option - for PES and PERS Fieldbus

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC	Input - power supply
2	V0	Power supply 0 VDC	Gnd - power supply
3	ENABLE	Enable (24 VDC) or disable (0 VDC) the valve, referred to VL0	Input - on/off signal
4	Q_INPUT+	Flow reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are ± 10 VDC for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
5	INPUT-	Negative reference input signal for Q_INPUT+ and F_INPUT+	Input - analog signal
6	Q_MONITOR	Flow monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are ± 10 VDC for standard and $4 \div 20$ mA for /I option. Referred to VL0	Output - analog signal Software selectable
7	P_INPUT+	Pressure reference input signal: ± 10 VDC / ± 20 mA maximum range Defaults are $0 \div 10$ VDC for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
8	P_MONITOR	Pressure monitor output signal: ± 10 VDC / ± 20 mA maximum range Defaults are $0 \div 10$ VDC for standard and $4 \div 20$ mA for /I option. Referred to VL0	Output - analog signal Software selectable
9	VL+	Power supply 24 VDC for driver's logic and communication	Input - power supply
10	VL0	Power supply 0 VDC for driver's logic and communication	Gnd - power supply
11	FAULT	Fault (0 VDC) or normal working (24 VDC), referred to VL0	Output - on/off signal
PE	EARTH	Internally connected to the driver housing	-

Notes: these connections are the same of Moog radial piston pumps, model RKP-D; do not disconnect VL0 before VL+ when the driver is connected to PC USB port

21.5 Communications connectors (B) - (C) for PES and PERS - shield connection on connector housing is recommended

(B) USB - M12 - 5 pin - always present		
PIN	SIGNAL	TECHNICAL SPECIFICATIONS
1	+5V_USB	Power supply
2	ID	Identification
3	GND_USB	Signal zero data line
4	D-	Data line -
5	D+	Data line +

(C1) (C2) BC fieldbus execution - M12 - 5 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATIONS
1	CAN_SHLD	Shield
2	not used	(C1) - (C2) pass-through connection (1)
3	CAN_GND	Signal zero data line
4	CAN_H	Bus line (high)
5	CAN_L	Bus line (low)

(1) Pin 2 can be fed with external +5V supply of CAN interface

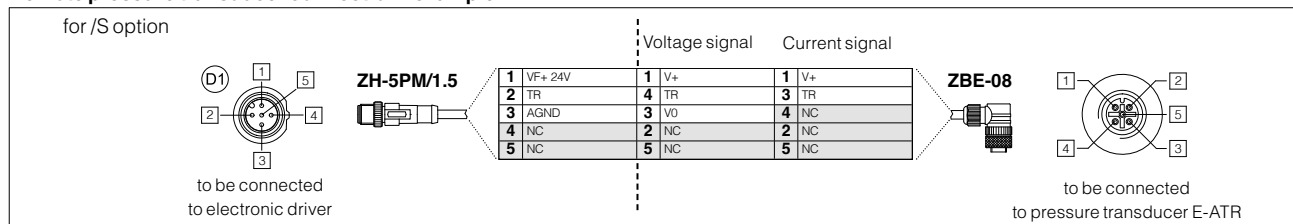
(C1) (C2) BP fieldbus execution, connector - M12 - 5 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATIONS
1	+5V	Termination supply signal
2	LINE-A	Bus line (high)
3	DGND	Data line and termination signal zero
4	LINE-B	Bus line (low)
5	SHIELD	-

(C1) (C2) EH, EW, EI, EP fieldbus execution- M12 - 4 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATIONS
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
-	SHIELD	(connect on connector housing)

21.6 Remote pressure transducer connector - M12 - 5 pin - for PES and PERS with for /S option

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	Voltage	Current
1	VF +24V	Power supply +24VDC	Output - power supply	Connect	Connect
2	TR1	Signal transducer: ± 10 VDC / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect
3	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/
4	NC	Not connect		/	/
5	NC	Not connect		/	/

Remote pressure transducer connection - example



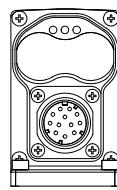
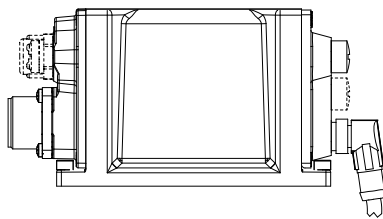
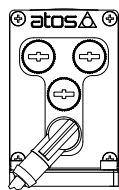
Note: pin layout referred to connector view

21.7 Solenoid connection - for CZ and LQZ

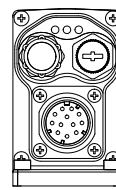
PIN	SIGNAL	TECHNICAL SPECIFICATIONS	Connector code 666
1	COIL	Power supply	
2	COIL	Power supply	
3	GND	Ground	

21.8 PES and PERS connections layout

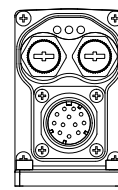
DRIVER OVERVIEW



NP

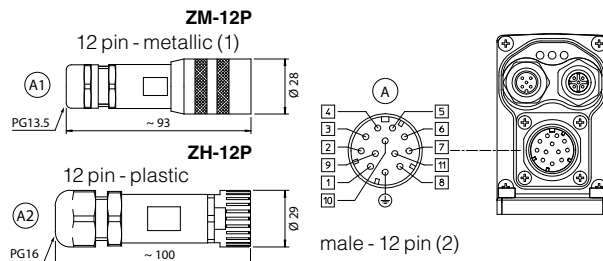


BC, BP

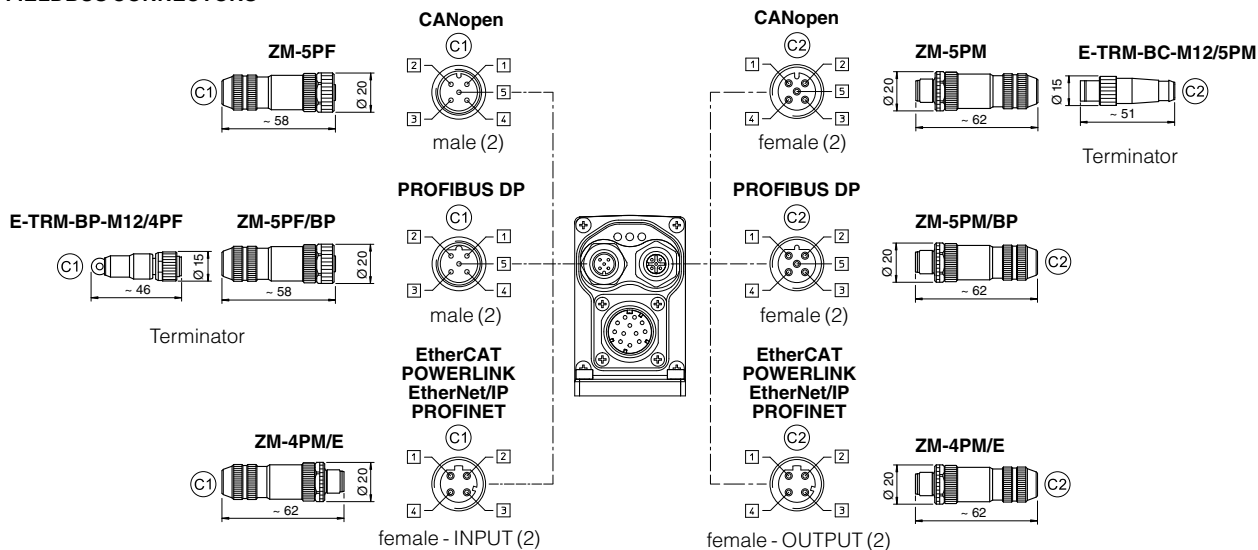


EH, EW, EI, EP

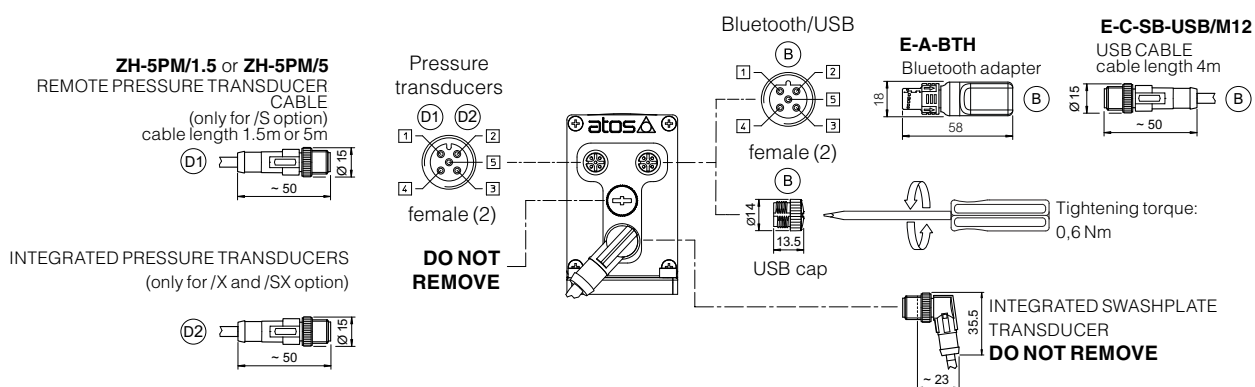
MAIN CONNECTORS



FIELD BUS CONNECTORS



TRANSDUCERS CONNECTORS - BLUETOOTH ADAPTER AND USB CONNECTOR

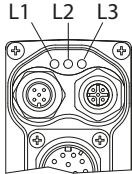


(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements

(2) Pin layout always referred to driver's view

21.9 Diagnostic LEDs - only for PES and PERS

Three leds show driver operative conditions for immediate basic diagnostics. Please refer to the driver user manual for detailed information.

LED	NP Not Present	BC CANopen	BP PROFIBUS DP	EH EtherCAT	EW POWERLINK	EI EtherNet/IP	EP PROFINET	
L1	VALVE STATUS			LINK/ACT				
L2	NETWORK STATUS							
L3	SOLENOID STATUS			LINK/ACT				

22 CONNECTOR CHARACTERISTICS - to be ordered separately

22.1 Main connectors

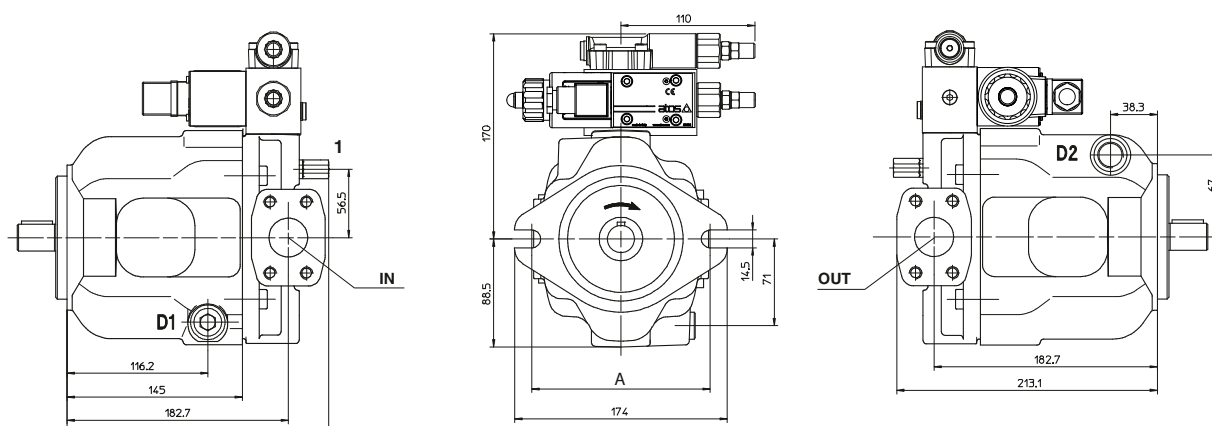
CONNECTOR TYPE	POWER SUPPLY AND SIGNALS	POWER SUPPLY AND SIGNALS
CODE	Ⓐ2 ZM-12P	Ⓐ4 ZH-12P
Type	12pin female straight circular	12pin female straight circular
Standard	DIN 43651	DIN 43651
Material	Metallic	Plastic reinforced with fiber glass
Cable gland	PG13,5	PG16
Recommended cable	LiYCY 12 x 0,75 mm ² max 20 m (logic and power supply)	LiYCY 10 x 0,14mm ² max 40 m (logic) LiYY 3 x 1mm ² max 40 m (power supply)
Conductor size	0,5 mm ² to 1,5 mm ² - available for 12 wires	0,14 mm ² to 0,5 mm ² - available for 9 wires 0,5 mm ² to 1,5 mm ² - available for 3 wires
Connection type	to crimp	to crimp
Protection (EN 60529)	IP 67	IP 67

22.2 Fieldbus communication connectors

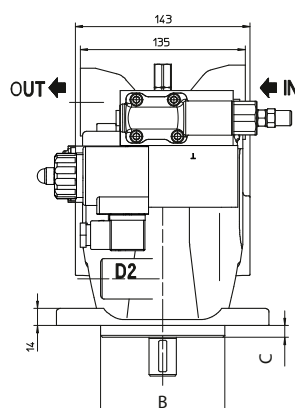
CONNECTOR TYPE	BC CANopen (1)		BP PROFIBUS DP (1)		EH EtherCAT, EW POWERLINK, EI EtherNet/IP, EP PROFINET (2)
CODE	Ⓒ1 ZM-5PF	Ⓒ2 ZM-5PM	Ⓒ1 ZM-5PF/BP	Ⓒ2 ZM-5PM/BP	Ⓒ1 Ⓒ2 ZM-4PM/E
Type	5pin female straight circular	5pin male straight circular	5pin female straight circular	5pin male straight circular	4 pin male straight circular
Standard	M12 coding A – IEC 61076-2-101		M12 coding B – IEC 61076-2-101		M12 coding D – IEC 61076-2-101
Material	Metallic				
Cable gland	Pressure nut - cable diameter 6÷8 mm				Pressure nut - cable diameter 4÷8 mm
Recommended cable	CANbus Standard (DR 303-1)		PROFIBUS DP Standard		Ethernet standard CAT-5
Connection type	screw terminal				terminal block
Protection (EN 60529)	IP 67				

22.3 Remote pressure transducer connectors

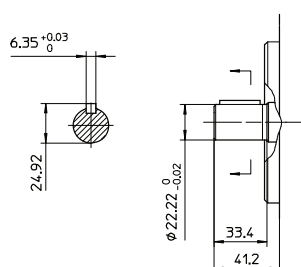
CONNECTOR TYPE	PRESSURE TRANSDUCER	
CODE	Ⓓ1 ZH-5PM/1.5	Ⓓ1 ZH-5PM/5
Type	5 pin male straight circular	
Standard	M12 coding A – IEC 61076-2-101	
Material	Plastic	
Cable gland	Connector moulded on cables 1,5 m length	Connector moulded on cables 5 m length
Recommended cable	5 x 0,25 mm ²	
Connection type	molded cable	
Protection (EN 60529)	IP 67	



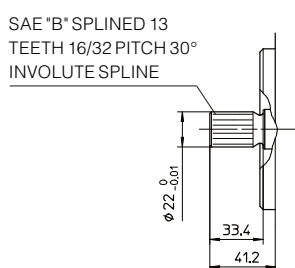
1 = Screw for max displacement limiter.
Not available for version PVPCXB



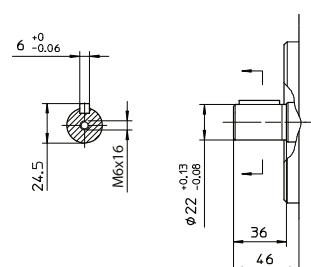
SHAFT TYPE "1"



SHAFT TYPE "5"

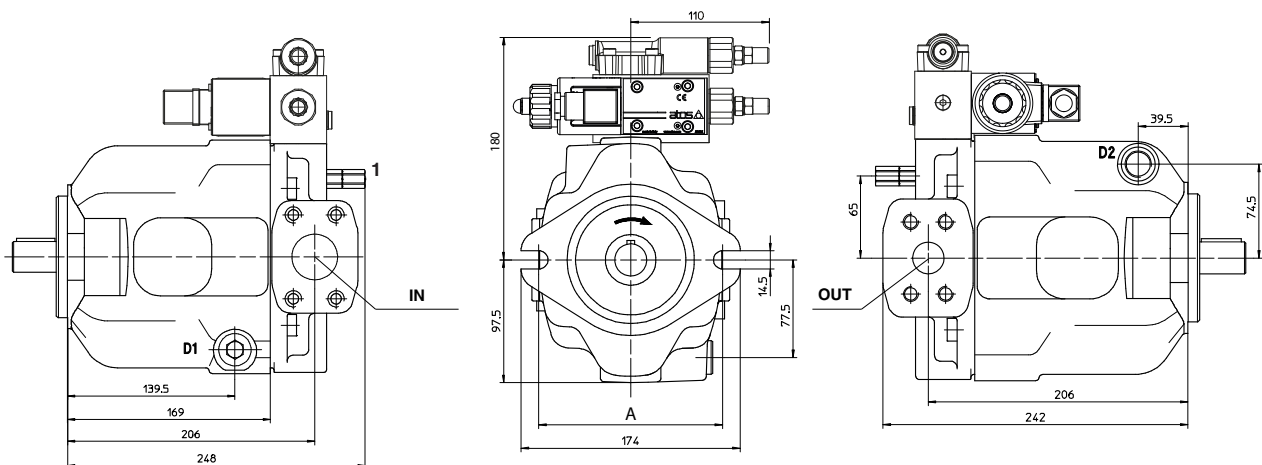


SHAFT TYPE "1/M"

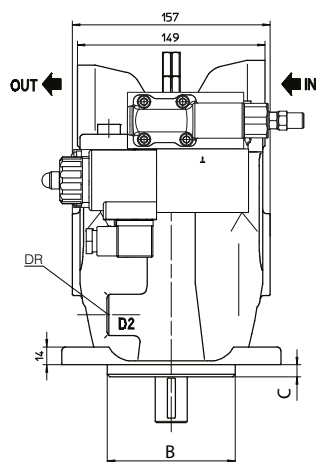


Flange option					IN	OUT	D1, D2	Mass (Kg)
Code	Reference standard	A	B	C	flange SAE 3000 1 1/4" M10x1,5 (20 Nm) deep 28mm	flange SAE 6000 3/4" M10x1,5 (45 Nm) deep 24mm	1/2" BSPP (20 Nm)	18
-	SAE	146	101,6 ^{+0/-0,05}	9.5				
M	ISO	140	100 ^{+0/-0,05}	9				

24 INSTALLATION DIMENSIONS OF PVPC 4046: "CZ" CONTROL - clockwise rotation



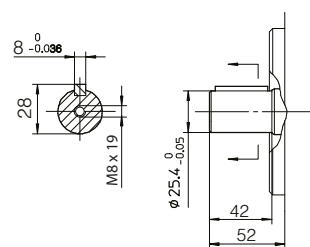
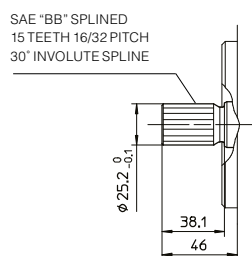
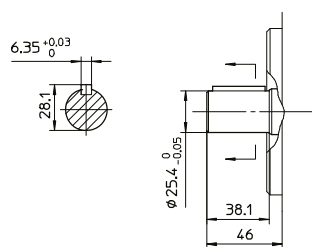
1 = Screw for max displacement limiter.
Not available for version PVPCXB



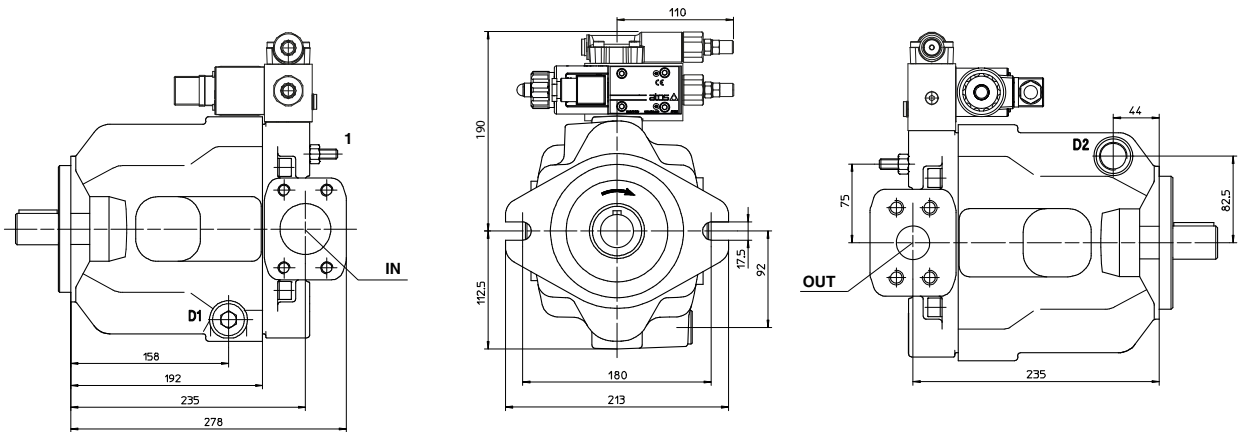
SHAFT TYPE "1"

SHAFT TYPE "5"

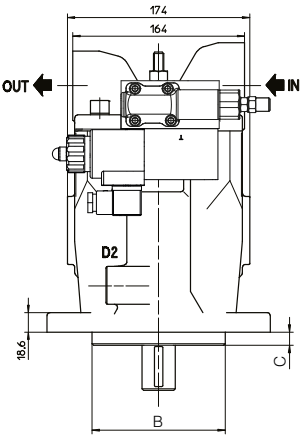
SHAFT TYPE "1/M"



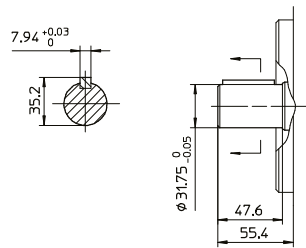
Flange option					IN	OUT	D1, D2	Mass (Kg)
Code	Reference standard	A	B	C	flange SAE 3000 1 1/2" M12x1,75 (30 Nm) deep 26mm	flange SAE 6000 1" M12x1,75 (70 Nm) deep 26mm	1/2" BSPP (20 Nm)	24
-	SAE	146	101,6 ^{+0/-0,05}	9.5				
M	ISO	140	100 ^{+0/-0,05}	9				



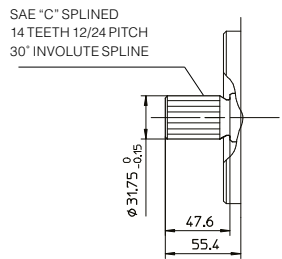
1 = Screw for max displacement limiter.
Not available for PVPCXC



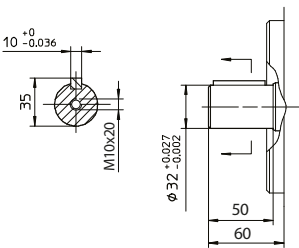
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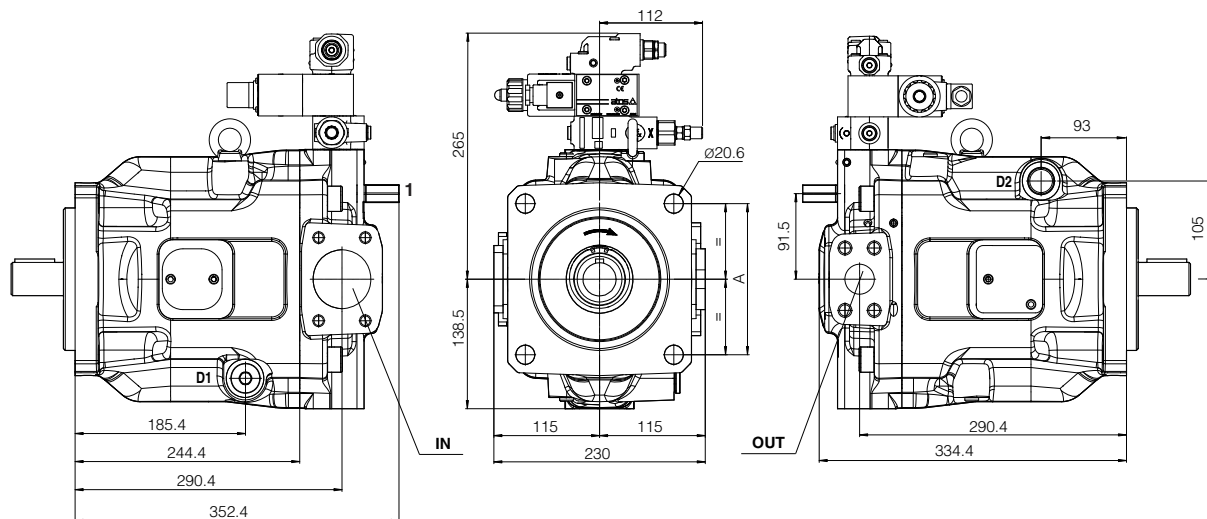
SHAFT TYPE "5"



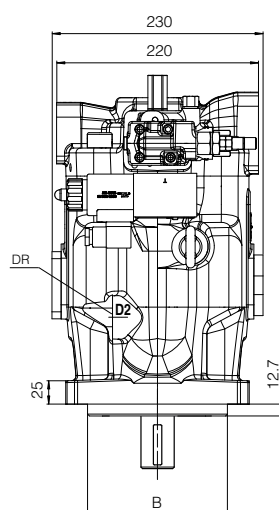
SHAFT TYPE "1/M"



Flange option				IN	OUT	D1, D2	Mass (Kg)
Code	Reference standard	B	C	flange SAE 3000 2" M12x1,75 (30 Nm) deep 25mm	flange SAE 6000 1 1/4" M14x2 (60 Nm) deep 23mm	3/4" BSPP (30 Nm)	33
-	SAE	127 +0/-0,05	12.7				
M	ISO	125 +0/-0,05	9				



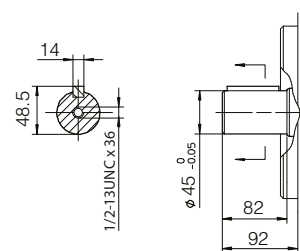
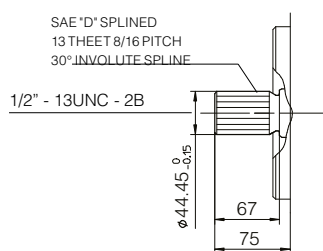
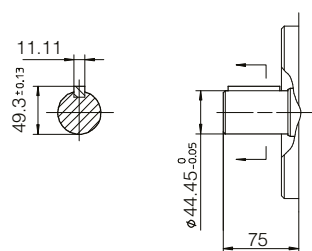
1 = Screw for max displacement limiter



SHAFT TYPE "1"

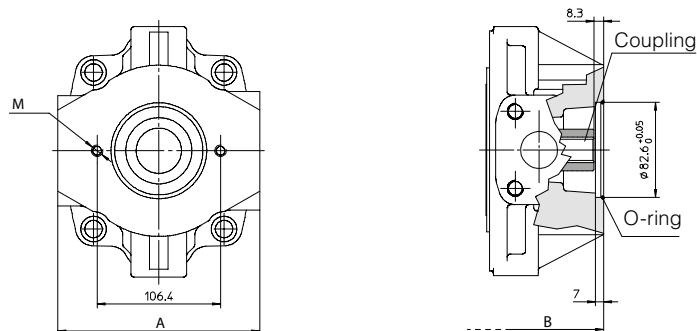
SHAFT TYPE "5"

SHAFT TYPE "1/M"



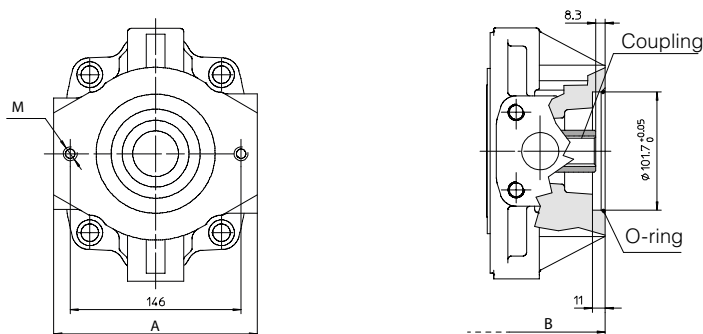
Flange option				IN	OUT	D1, D2	Mass (Kg)
Code	Reference standard	A	B	flange SAE 3000 2 1/2" M12x1,5 (30 Nm) deep 25mm	flange SAE 6000 1 1/4" M10x1,5 (45 Nm) deep 24mm	1 1/16" -12UNF	69
-	SAE	161.6	152,4 ^{+0/-0,05}				
M	ISO	158.4	180 ^{+0/-0,05}				

Code XA intermediate flange SAE A



XA intermediate flange SAE "A"						
Pump size	Dimension			Coupling		O-ring
	A	B (to mounting flange)	M	interface	Max torque (Nm)	
3029	135	222	M10x1,25 depth 15	SAE A splined 9 teeth 16/32	100	OR-2325
4046	167	251				
5073, 5090	174	291				

Code XB intermediate flange SAE B

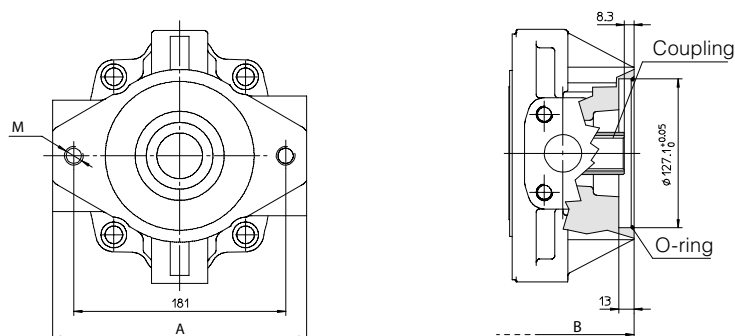


XB intermediate flange SAE "B"						
Pump size	Dimension			Coupling		O-ring
	A	B (to mounting flange)	M	interface	Max torque (Nm)	
3029	170	222	M12x1,75 depth 16	SAE B splined 13 teeth 16/32	100	OR-3400
4046 (1)	167	251			250	
5073, 5090 (2)	174	291			250	

(1) For coupling with PVPC-4046 rear pump, the coupling code G-PVPC-40/46 (SAE BB splined, 15 teeth) max torque 250 Nm, must be ordered separately

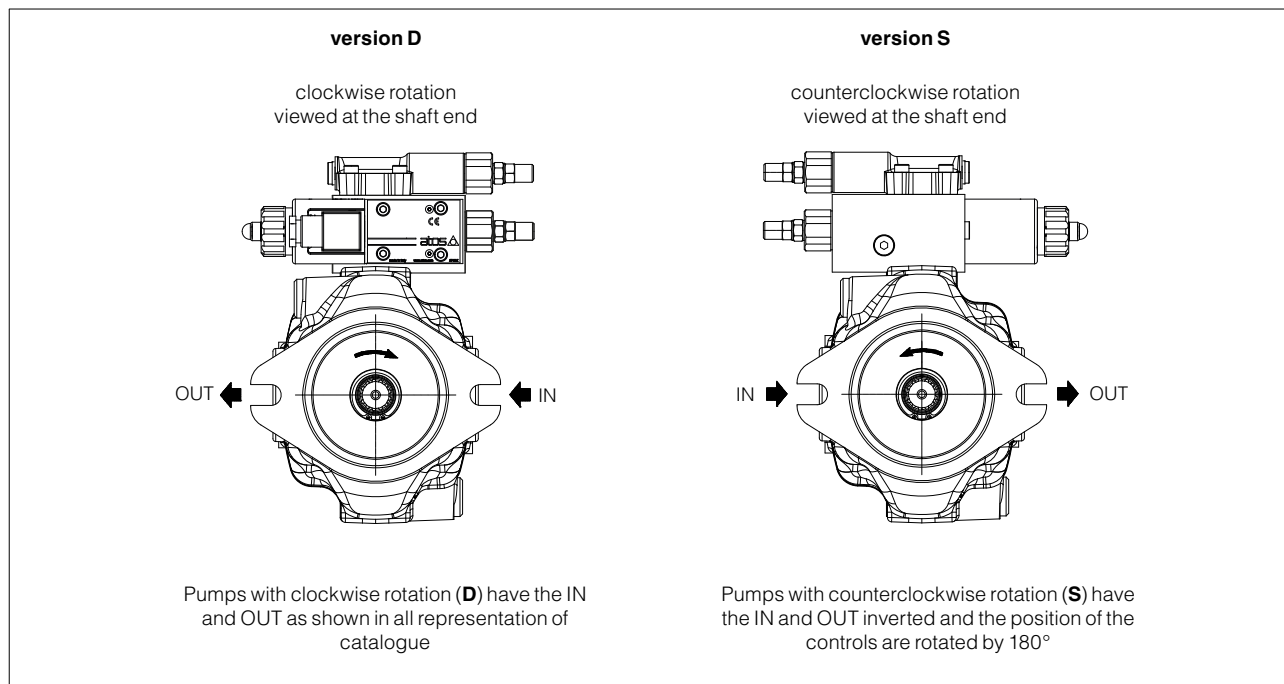
(2) For coupling with PVPC-4046 rear pump, the coupling code G-PVPC-73/46 (SAE BB splined, 15 teeth) max torque 430 Nm, must be ordered separately

Code XC intermediate flange SAE C



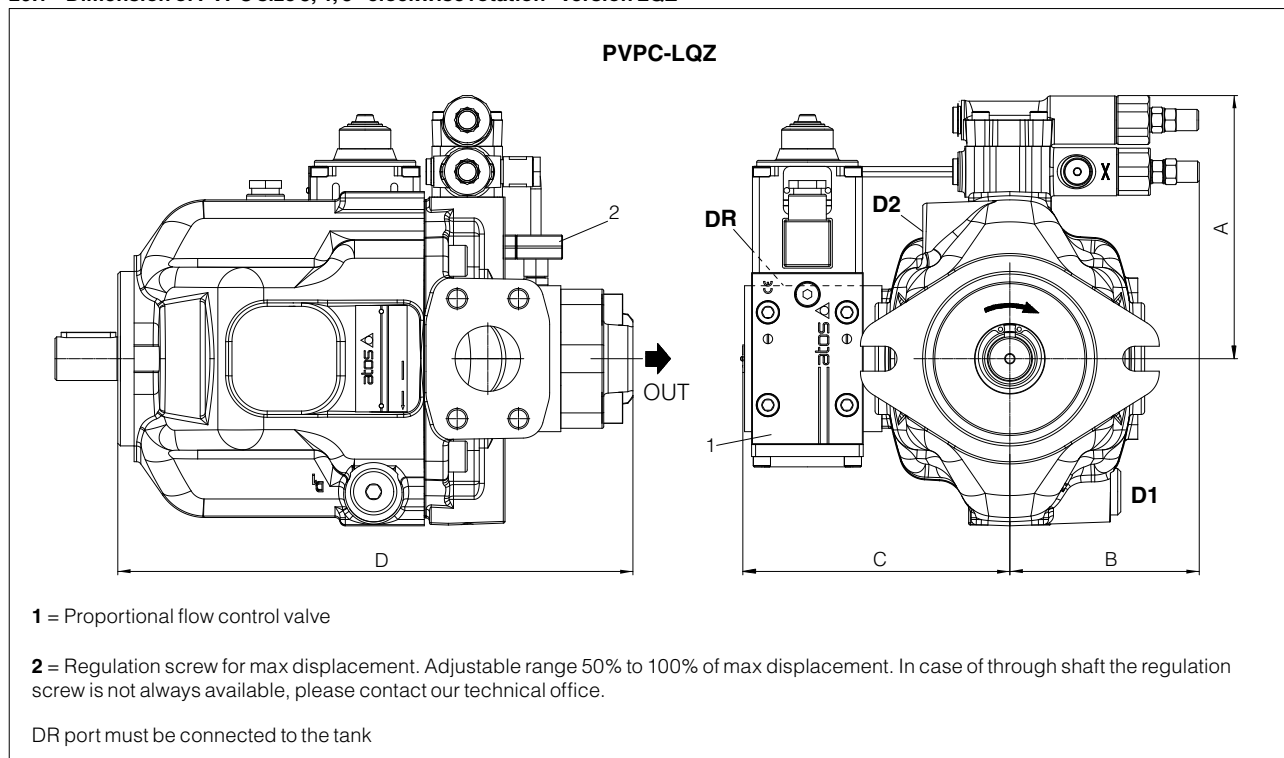
XC intermediate flange SAE "C"						
Pump size	Dimension			Coupling		O-ring
	A	B (to mounting flange)	M	interface	Max torque (Nm)	
5073, 5090	217	296	M16x2 depth 22	SAE B splined 14 teeth 12/24	430	OR-2500

28 DIRECTION OF ROTATION



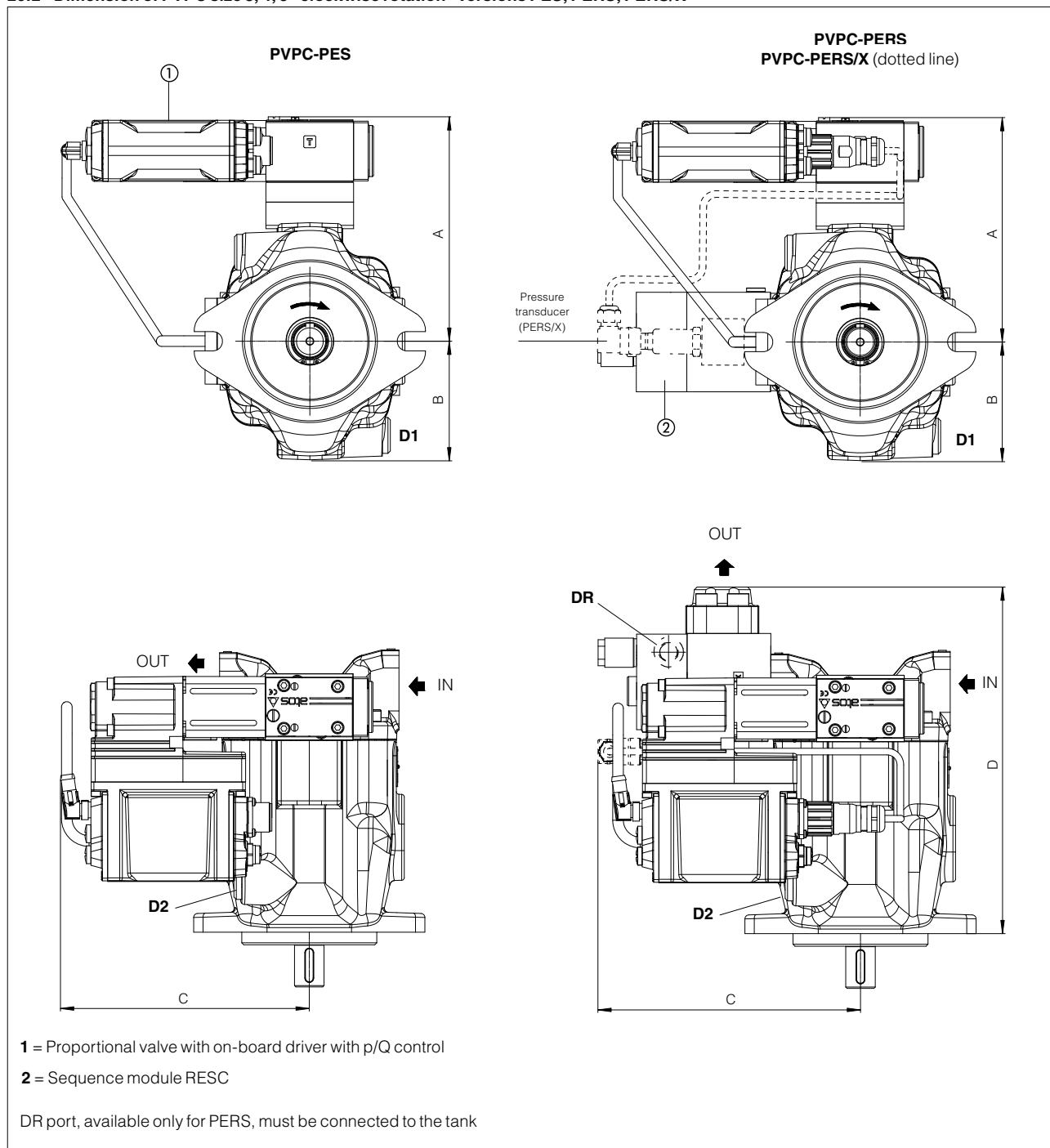
29 INSTALLATION DIMENSION [mm]

29.1 Dimension of PVPC size 3, 4, 5 - clockwise rotation - version LQZ



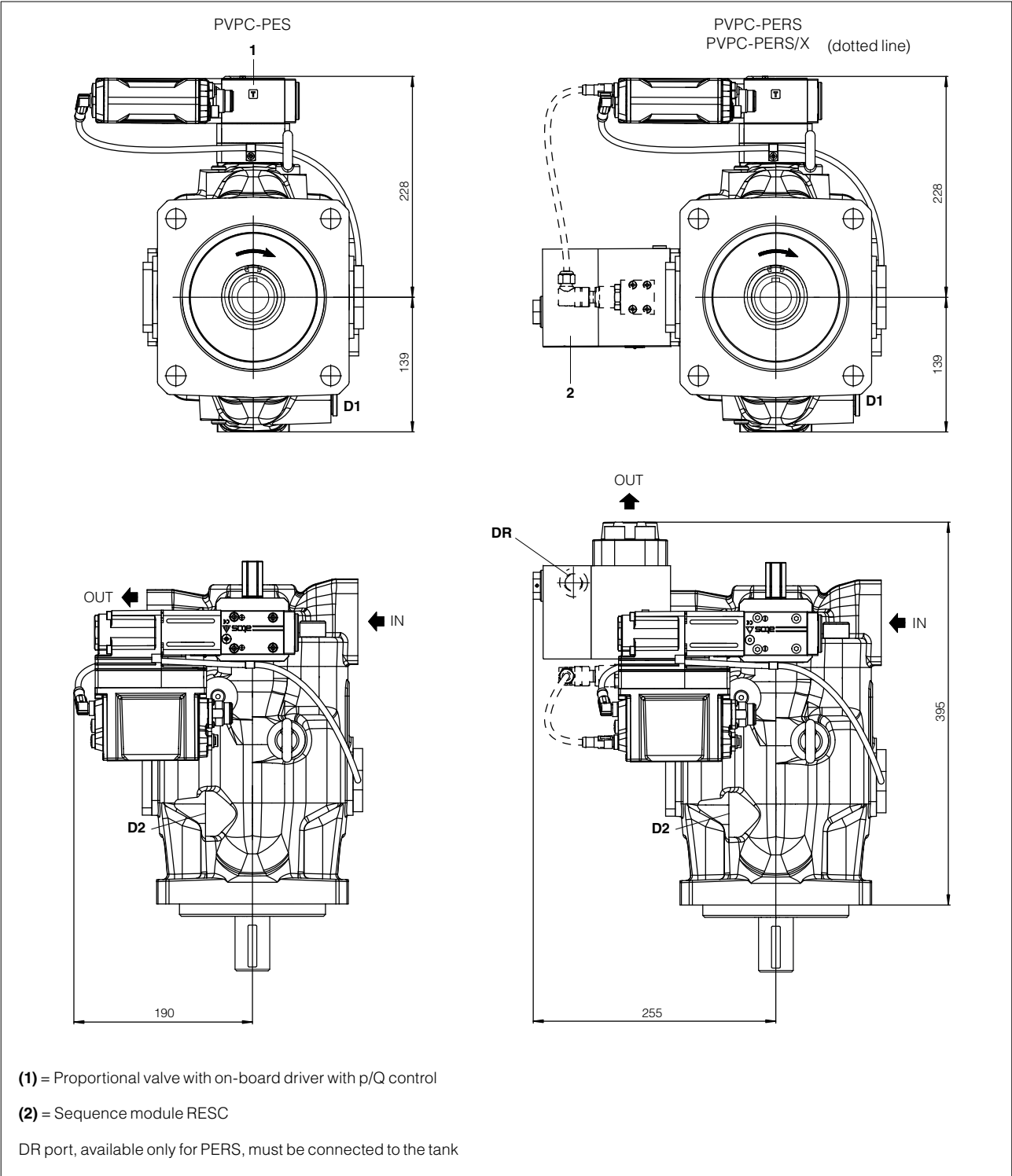
Pump type	A	B	C	D	IN	OUT	D1, D2	DR	Mass (kg)
PVPC-3	144	111	132	257	Flange SAE 3000 1 1/4"	Flange SAE 6000 3/4"	1/2" BSPP	3/8" G	24
PVPC-4	153	111	156	293	Flange SAE 3000 1 1/2"	Flange SAE 6000 1"	1/2" BSPP	3/8" G	33,6
PVPC-5	166	111	163	328	Flange SAE 3000 2"	Flange SAE 6000 1 1/4"	3/4" BSPP	3/4" G	44

29.2 Dimension of PVPC size 3, 4, 5 - clockwise rotation - versions PES, PERS, PERS/X



Pump type	Version	A	B	C	D	IN	OUT	D1, D2	DR	Mass (kg)
PVPC-3	PES	170	103,5	190	-	Flange SAE 3000 1 1/4"	Flange SAE 6000 3/4"	1/2" BSPP	-	21,6
	PERS	170	103,5	200	262,5	Flange SAE 3000 1 1/4"	Flange SAE 6000 3/4"	1/2" BSPP	1/4" G	26
	PERS/X	190	103,5	200	262,5	Flange SAE 3000 1 1/4"	Flange SAE 6000 3/4"	1/2" BSPP	1/4" G	26,4
PVPC-4	PES	178	103,5	190	-	Flange SAE 3000 1 1/2"	Flange SAE 6000 1"	1/2" BSPP	-	27,6
	PERS	178	103,5	220	299	Flange SAE 3000 1 1/2"	Flange SAE 6000 1"	1/2" BSPP	1/4" G	33,7
	PERS/X	178	103,5	220	299	Flange SAE 3000 1 1/2"	Flange SAE 6000 1"	1/2" BSPP	1/4" G	34,1
PVPC-5	PES	190	103,5	190	-	Flange SAE 3000 2"	Flange SAE 6000 1 1/4"	3/4" BSPP	-	36,6
	PERS	190	103,5	230	337	Flange SAE 3000 2"	Flange SAE 6000 1 1/4"	3/4" BSPP	3/4" G	46,7
	PERS/X	190	103,5	230	337	Flange SAE 3000 2"	Flange SAE 6000 1 1/4"	3/4" BSPP	3/4" G	47,1

29.3 Dimension of PVPC size 6 - clockwise rotation - versions PES, PERS, PERS/X



Pump type	Version	IN	OUT	D1, D2	DR	Mass (kg)
PVPC-6	PES	Flange SAE 3000 2 1/2"	Flange SAE 6000 1 1/4"	1 1/16"-12UNF	-	72,7
PVPC-6	PERS	Flange SAE 3000 2 1/2"	Flange SAE 6000 1 1/4"	1 1/16"-12UNF	3/4" G	82,8
PVPC-6	PERS/X	Flange SAE 3000 2 1/2"	Flange SAE 6000 1 1/4"	1 1/16"-12UNF	3/4" G	83,2

30 RELATED DOCUMENTATION

A900 Operating and maintenance information for pumps	G030 E-BM-AS digital driver
AS800 Programming tools	GS050 E-BM-AES digital driver
FS001 Basics for digital electrohydraulics	GS510 Fieldbus
FS500 Digital proportional valves with p/Q control	K800 Electric and electronic connectors
FS900 Operating and maintenance information for proportional valves	P005 Mounting surfaces for electrohydraulic valves
G010 E-MI-AC analog driver	E-MAN-RI-PES PES user manual
G020 E-MI-AS-IR digital driver	