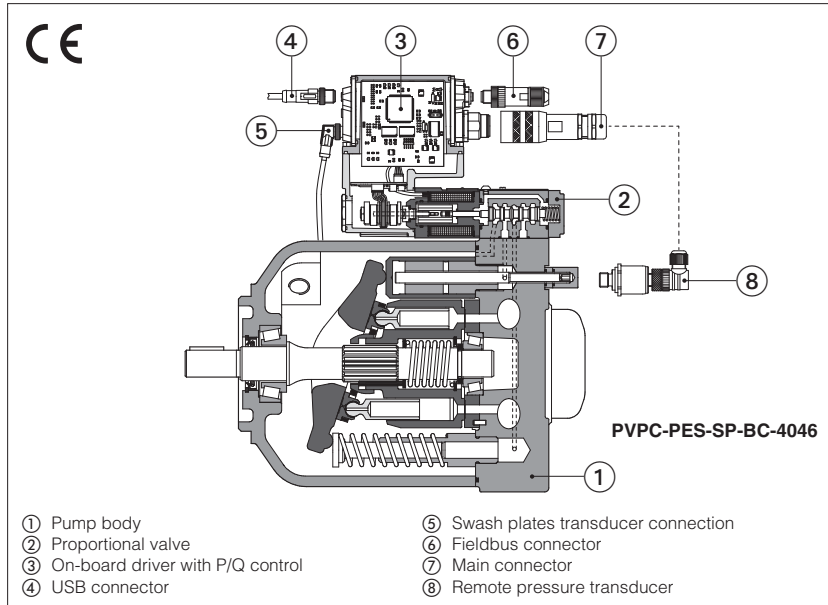


# Proportional controls for axial piston pumps

pressure, flow or P/Q controls



## PVPC

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

PES performs alternate closed loop controls of pressure, flow and max power limitation. It is also available with optional sequence module (PERS versions) that allows to reduce close to zero the pressure to the delivery line. 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

For technical characteristics and features, see tech table A160.

## 1 MODEL CODE

<b>PVPC</b>	<b>X2E</b>	<b>- PERS-SP</b>	<b>- BC</b>	<b>- 4046</b>	<b>/ * / 1</b>	<b>D / * * / *</b>	<b>*</b>
<p>Variable displacement axial piston pump</p> <p><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)</p> <p>Additional suffix for double pumps:  <b>X2E</b> = with a fixed displacement pump type PFE (see tech table A005)</p> <p><b>Type of control</b>, see section 10 and 11:  <b>CZ</b> = proportional pressure control (1)  <b>LQZ</b> = proportional flow control (load sensing) (1)  <b>PES-SP</b> = closed loop integral digital P/Q driver  <b>PERS-SP</b> = as PES plus sequence module</p> <p><b>Fieldbus interfaces</b>, USB port always present (2):  <b>NP</b> = Not present  <b>BC</b> = CANopen      <b>EW</b> = POWERLINK  <b>BP</b> = PROFIBUS DP      <b>EI</b> = EtherNet/IP  <b>EH</b> = EtherCAT      <b>EP</b> = PROFINET RT/IRT</p> <p><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 090 cm<sup>3</sup>/rev  <b>6140</b> = size 6 - displacement 140 cm<sup>3</sup>/rev</p> <p><b>Pressure setting</b>, only for PERS: <b>200</b> = 200 bar    <b>250</b> = 250 bar    <b>280</b> = 280 bar</p>	<p style="text-align: center;"><b>Seals material</b>, see section 9:</p> <p style="text-align: center;">- = NBR PE = FKM</p> <p style="text-align: center;">Series number</p> <p><b>Coil voltage</b>, for CZ, LQZ - see section 15:  <b>18</b> = optional coil for low current drivers</p> <p><b>Electronics options</b>, for PES and PERS (4):  <b>C</b> = current feedback for pressure transducer 4±20 mA (omit for std voltage ±10VDC)  <b>I</b> = current reference input and monitor 4±20 mA (omit for std voltage ±10VDC)  <b>X</b> = on-board pressure transducer with pre-configured pressure settings (only for PERS)  <b>S</b> = 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</p> <p><b>Direction of rotation</b>, viewed at the shaft end:  <b>D</b> = clockwise      <b>S</b> = counterclockwise</p> <p><b>Shaft</b>, SAE Standard (5):  <b>1</b> = keyed      <b>5</b> = splined</p>						

(1) Not available for PVPC-\*6140  
 (2) Only for PES and PERS  
 (3) Optional intermediate displacements 35 and 53 cm<sup>3</sup>/rev are available on request  
 (4) For possible combined options, see section 14  
 (5) Pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

## 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		
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		
Data sheet	G010		G020		G030		GS050

## 3 GENERAL NOTES

Atos digital proportionals pumps 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-\* programming software.

## 4 PUMP SETTINGS AND PROGRAMMING TOOLS

Pump's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **FS900**). For fieldbus versions, the software permits pump's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

The software is available in different versions according to the driver's options (see table **GS500**):

**E-SW-BASIC** support: NP (USB) PS (Serial) IR (Infrared)  
**E-SW-FIELDBUS** support: BC (CANopen) BP (PROFIBUS DP) EH (EtherCAT)  
 EW (POWERLINK) EI (EtherNet/IP) EP (PROFINET)  
**E-SW-\*/PQ** support: valves with SP, SF, SL alternated control (e.g. E-SW-BASIC/PQ)

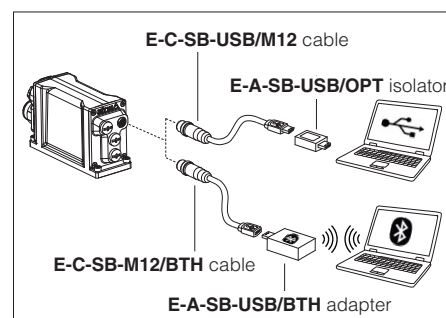


**WARNING: drivers USB port is not isolated!** For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



**WARNING:** see tech table **GS500** for the list of countries where the Bluetooth adapter has been approved

### USB or Bluetooth connection



## 5 FIELDBUS - 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.

## 6 GENERAL CHARACTERISTICS

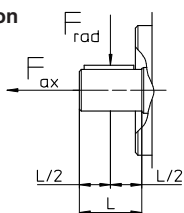
Assembly position	Any position. The drain port must be on the top of the pump. Drain line must be separated and unrestricted to the reservoir and extended below the oil level as far from the inlet as possible. Suggested maximum line length is 3 m.
Subplate surface finishing to ISO 4401	Acceptable roughness index: Ra ≤ 0,8, recommended Ra 0,4 – Flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	<b>CZ,LQZ: Standard</b> = -25°C ÷ +60°C / <b>PE</b> option = -15°C ÷ +80°C <b>PES, PERS: Standard</b> = -20°C ÷ +60°C / <b>PE</b> option = -20°C ÷ +60°C
Storage temperature range	<b>CZ,LQZ: Standard</b> = -20°C ÷ +80°C / <b>PE</b> option = -20°C ÷ +80°C <b>PES, PERS: Standard</b> = -20°C ÷ +70°C / <b>PE</b> option = -20°C ÷ +70°C
Surface protection (pump body)	Black painting RAL 9005
Surface protection (pilot valve)	Zinc coating with black passivation, galvanic treatment (driver housing for AEB and AES)
Corrosion resistance (pilot valve)	Salt spray test (EN ISO 9227) > 200 h
Compliance (proportional pilot valve)	CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

VPVC 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 working pressure / 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 first shaft (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 1000	Type 5 2340
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 (peak) after detailed analysis of the application and of the pump working cycle

**External load position**



F<sub>ax</sub> = axial load  
F<sub>rad</sub> = radial load

**Notes:**

For speeds over 1800 rpm the inlet port must be under oil level with adequate pipes.  
Maximum pressure for all models with water glycol fluid is 160 bar, with /PE options is 190 bar.  
Max speed with /PE options and water glycol fluid is 2000/1900/1600/1500 rpm respectively for the four sizes.

**8 ELECTRICAL CHARACTERISTICS**

Power supplies	Nominal : +24 VDC Rectified and filtered : V <sub>RMS</sub> = 20 ÷ 32 V <sub>MAX</sub> (ripple max 10 % V <sub>PP</sub> )			
Max power consumption	<b>CZ, LQZ</b> = 35 Watt; <b>PES, PERS</b> = 50 Watt			
Max. solenoid current	2,6 A for standard <b>12 Vdc</b> coil; 1,5 A for standard <b>18 Vdc</b> coil (only for CZ, LQZ)			
Coil resistance R at 20°C	<b>Size 3:</b> 3 ÷ 3,3 Ω for standard <b>12 Vdc</b> coil; 13 ÷ 13,4 Ω for <b>18 Vdc</b> coil (only for version CZ, LQZ)			
	<b>Size 4, 5:</b> 3,8 ÷ 4,1 Ω for standard <b>12 Vdc</b> coil; 12 ÷ 12,5 Ω for <b>18 Vdc</b> coil (only for version CZ, LQZ)			
Analog input signals	Voltage: range ±10 VDC (24 V <sub>MAX</sub> tollerant) Current: range ±20 mA		Input impedance: R <sub>i</sub> > 50 kΩ Input impedance: R <sub>i</sub> = 500 Ω	
Monitor outputs	Output range: voltage ±10 VDC @ max 5 mA current ±20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 ÷ 5 VDC (OFF state), 9 ÷ 24 VDC (ON state), 5 ÷ 9 VDC (not accepted); Input impedance: R <sub>i</sub> > 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 <b>GS465</b> )			
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	<b>CZ, LQZ</b> = IP65; <b>PES, PERS</b> = 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			
Communication interface	USB	CANopen	PROFIBUS DP	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158
	Atos ASCII coding	EN50325-4 + DS408	EN50170-2/IEC61158	
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet, insulated 100 Base TX
Recommended wiring cable	LiYCY shielded cables, see section <a href="#">20</a>			

**Note:** a maximum time of 800 ms (depending on communication type) have 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.

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

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	20 ÷ 100 mm <sup>2</sup> /s - max allowed range 15 ÷ 380 mm <sup>2</sup> /s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at <a href="http://www.atos.com">www.atos.com</a> or KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR <b>(1)</b>	ISO 12922
Flame resistant with water	NBR, HNBR	HFC <b>(1)</b>	

**(1)** Max working pressure must be reduced to: 180 bar (working) / 210 bar (peak) for HFC fluid  
200 bar (working) / 240 bar (peak) for HFDU and HFDR fluid

**10 OPEN LOOP ELECTROHYDRAULIC CONTROLS**

**CZ Proportional pressure control**

Open loop control of the pump max pressure. The pump displacement, and thus the flow, remains constant as far as the pressure in the circuit reaches the value set on the proportional pilot valve (1), then the flow is reduced to maintain the circuit pressure to the value set by the electronic reference signal to the proportional valve. In this condition the pressure in the circuit can be continuously modulated by means of the reference signal. Proportional pressure setting range: see below pressure control diagram. Compensator setting range (2): 20 ÷ 350 bar (315 bar for 090). Compensator factory setting (2): 280 bar (250 bar for 090).

Hysteresis and pressure increase: max 4 bar

**LQZ Proportional flow (load-sensing)**

Open loop control of the pump flow independent to the circuit load. The pump displacement is self-adjusted to maintain a constant pressure drop across the proportional flow control valve (1). The pump flow can be continuously regulated by modulating the proportional valve (1).

**Diagrams for CZ, LQZ**

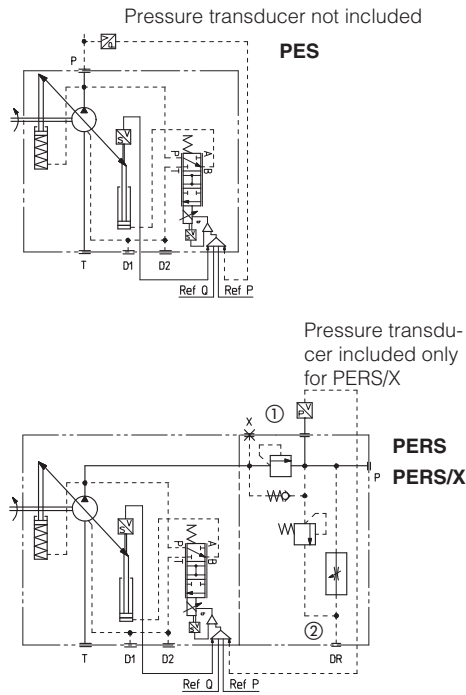
**Regulation diagrams**

**1** = Flow control  
**2** = Pressure control

(1) for standard 12 V<sub>DC</sub> coil  
(2) for 18 V<sub>DC</sub> coil

**Pump size**  
**88 73 46 29 cm<sup>3</sup>/rev**

## 11 P/Q CONTROL



P/Q control integrates the alternate pressure and flow regulation with the electronic max power limitation.

A remote pressure transducer must be installed on the system and its feedback has to be interfaced to the pump on-board digital driver.

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). This option allows to realize accurate dynamic pressure profiles.

Following fieldbus interfaces are available:

- BC - CANopen interface
- BP - PROFIBUS DP interface
- EH - EtherCAT interface
- EW - POWRELINK interface
- EI - EtherNet/IP interface
- EP - PROFINET RT/IRT interface

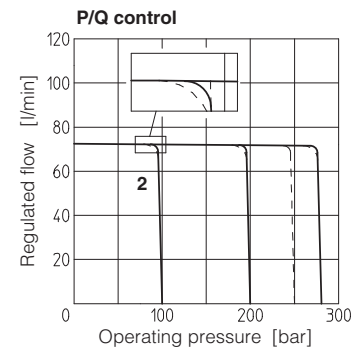
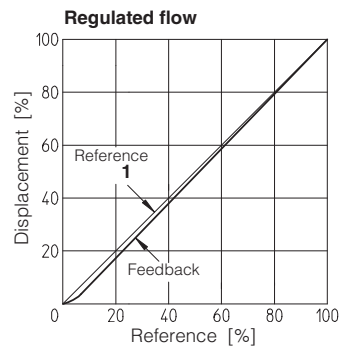
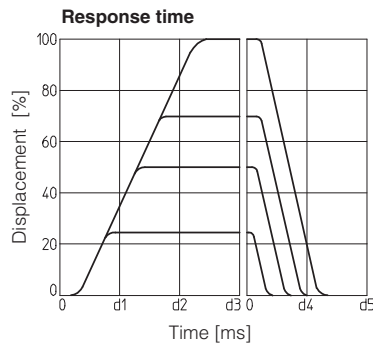
The pumps with BC, BP, EH, EW, EI and EP interfaces can be integrated into a fieldbus communication network and thus digitally operated by the machine control unit.

The digital control ensures high performances as flow and pressure linearity (see diagram 1), better flow knee (see diagram 2), internal leakage compensation (controlled flow independent to the load variations).

**PVPC-PES** basic version, without sequence module and without pressure transducer, which has to be installed on the main line and wired to the 12 poles connector of the pump on-board digital driver.

**PVPC-PERS** version with sequence module RESC ② which grant a minimum piloting pressure (18 bar) when the actual pressure falls below that value. Without pressure transducer.

**PVPC-PERS/X** as PERS version plus integral pressure transducer, with output signal 4÷20 mA, factory wired to the pump on-board digital driver through a cable gland.



Type pump	d1	d2	d3	d4	d5
	[ms]				
PVPC-PE(R)S-3029	30	60	90	30	60
PVPC-PE(R)S-4046	40	80	120	40	80
PVPC-PE(R)S-5073	50	100	150	50	100
PVPC-PE(R)S-5090	60	120	170	60	120
PVPC-PE(R)S-6140	90	180	200	90	180

Response time of displacement variation for a step change of the electronic reference signal.

## 12 PRESSURE TRANSDUCER SELECTION

The pressure transducer type E-ATR-8 must be ordered separately (see tech table **GS465**)  
For /X option the pressure transducer with output signal 4 ÷ 20 mA is on-board to the pump.

### Pump code:

PVPC-PE(R)S-\*/200  
PVPC-PE(R)S-\*/250  
PVPC-PE(R)S-\*/280  
PVPC-PE(R)S-\*/200/\*C  
PVPC-PE(R)S-\*/250/\*C  
PVPC-PE(R)S-\*/280/\*C

### Pressure transducer code:

E-ATR-8/250  
E-ATR-8/400  
E-ATR-8/400  
E-ATR-8/250/I  
E-ATR-8/400/I  
E-ATR-8/400/I

### 13 ELECTRONICS OPTIONS - only for PES and PERS

- I** = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard ±10 Vdc.  
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 Vdc or ±20 mA.  
It 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 ÷ 20 mA current output signal, instead of the standard ±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 providing the presence of the pressure transducer, with output signal 4÷20 mA, integral to the pump and factory wired to the PES electronics through a cable gland (see 16.10).
- 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 16.11).

### 14 POSSIBLE COMBINED OPTIONS

for <b>PES</b> :	for <b>PERS</b> :
/CI, /CS, /IS, /CIS	/CI, /CS, /IS, /IX, /SX, /CIS, /ISX

### 15 COIL VOLTAGE OPTION - only for CZ and LQZ


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

### 16 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).

#### 16.1 Power supply (V+ and V0)


The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers. In case of separate power supply see 16.2.

 A safety fuse is required in series to each power supply: 2,5 A time lag fuse.

#### 16.2 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 µF/40 V capacitance to single phase rectifiers or a 4700 µF/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.

#### 16.3 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 ±10 Vdc for standard and 4 ÷ 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 ÷ 24Vdc.

#### 16.4 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 ±10 Vdc for standard and 4 ÷ 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 by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 ÷ 24Vdc.

#### 16.5 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 ±10 Vdc for standard and 4 ÷ 20 mA for /I option.

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

#### 16.6 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 ±10 Vdc for standard and 4 ÷ 20 mA for /I option.

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

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

To enable the driver, supply a 24 Vdc on pin 3 (pin C): Enable input signal allows to enable/disable the current 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 valve 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.

#### 16.8 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4 ÷ 20 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.



### 16.9 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 ±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.  
 Refer to the pump technical table to transducer characteristics to select the transducer's maximum pressure.

**Standard:**

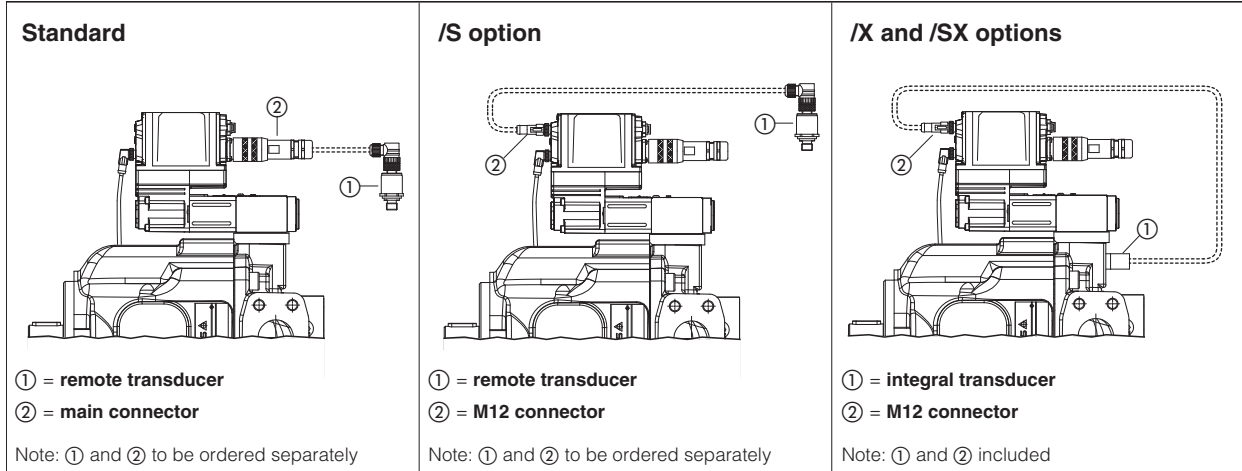
Remote pressure transducer can be directly connected to the main connector on the driver (see 17.1)

**/S option**

Remote pressure transducer can be directly connected to a dedicated M12 connector (see 17.4)

**/X and /SX options**

Integral-to-pump transducer is directly connected with a dedicated M12 connector and no remote transducer is required;  
 current input signal (4 ÷ 20 mA) of the integral transducer allows cable break detection functionality



### 16.10 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 driver functioning; apply 0 Vdc to disable and 24 Vdc to enable the driver - see 16.7
- switch between two pressure PID settings; apply 0 Vdc to select SET1 pressure PID and 24 Vdc to select SET2 - see 16.11
- enable and disable the power limitation function; default setting, apply 0V to disable and 24Vdc to enable the power limitation - see 16.13

### 16.11 Multiple PID selection (D\_IN0 and D\_IN1) - only for /S and /SX options in NP execution

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.

Switching the active setting of pressure PID during the machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.).

Supply a 24 Vdc or a 0 Vdc on pin 9 and/or pin 10, to select one of the PID settings as indicated by binary code table at side. Gray code can be selected by software.

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

### 16.12 Multiple pressure PID (1)

Four sets for 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 (SET1 and SET2, see 4.10)
	/S and /SX options	2 on-off inputs allow to switch the 4 PID parameters set (SET1.. SET4 - see 4.11)
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)

### 16.13 Hydraulic Power Limitation (1)

A limit to the maximum pump's hydraulic power can be software set into the driver thus limiting the electric power consumption of the motor coupled to the pump: when the actual requested hydraulic power  $p \times Q$  (pressure transducer feedback x flow reference value) reaches the max power limit ( $p_1 \times Q_1$ ), the driver automatically reduces the flow pump regulation.

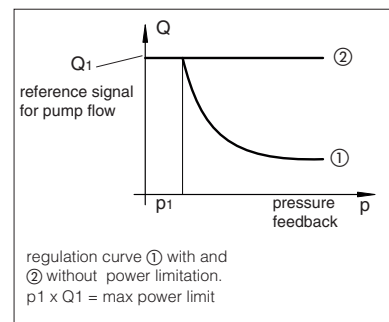
The higher is the pressure feedback the lower is the pumps's regulated flow:

$$\text{Flow regulation} = \text{Min} \left( \frac{\text{PowerLimit [kW]}}{\text{Pressure Feedback [bar]} \times \frac{1}{\text{Flow Full Scale [l/min]}}}; \text{Flow Reference} \right)$$

The hydraulic power limitation, disabled as default, can be enabled using the Atos pc software or the fieldbus communication (fieldbus executions).

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 (see 16.11).

### 16.12 - Hydraulic Power Limitation



(1) The sections 16.12 and 16.13 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 programming software:

**E-MAN-RI-PES** - user manual for **PES-S** digital drivers

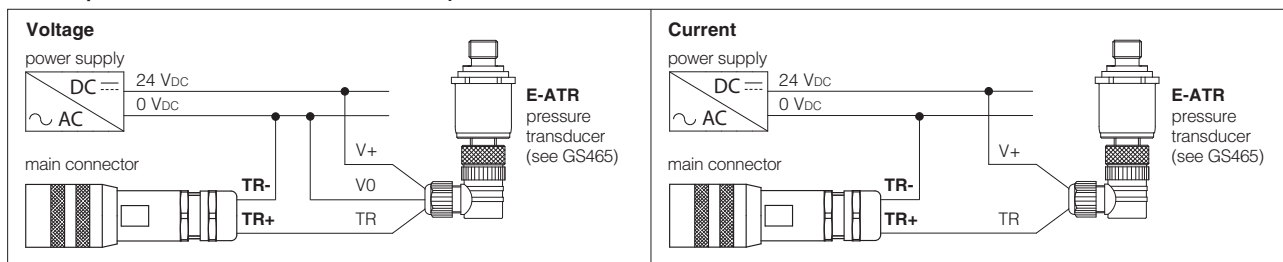
## 17 ELECTRONIC CONNECTIONS

### 17.1 Main connector signals - 12 pin (A) Standard and Standard with /X option - for PES and PERS

PIN	Standard	/X	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: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are $0 \div +10$ Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal <b>Software selectable</b>
6	Q_MONITOR		Flow monitor output signal: $\pm 10$ Vdc / $\pm 20$ 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 <b>Software selectable</b>
7	P_INPUT+		Pressure reference input signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are $0 \div +10$ Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal <b>Software selectable</b>
8	P_MONITOR		Pressure monitor output signal: $\pm 10$ Vdc / $\pm 20$ 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 <b>Software selectable</b>
9	D_IN		Function software selectable between: power limitation enable (default), multiple pressure PID selection or pump enable (24 Vdc) / disable (0 Vdc). Referred to V0	Input - on/off signal
10	TR+		Remote pressure transducer input signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are $0 \div +10$ Vdc for standard and $4 \div 20$ mA for /C option	Input - analog signal <b>Software selectable</b>
		NC	Do not connect	
11	TR-		Negative pressure transducer input signal for TR+	Input - analog signal
		NC	Do not connect	
PE	EARTH		Internally connected to 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



### 17.2 Main connector signals - 12 pin (A) /S and /SX option - for PES and PERS

PIN	/S and /SX		TECHNICAL SPECIFICATIONS	NOTES
	NP	Fieldbus		
1	V+		Power supply 24 Vdc	Input - power supply
2	V0		Power supply 0 Vdc	Gnd - power supply
3	ENABLE referred to: V0	VL0	Enable (24 Vdc) or disable (0 Vdc) the pump	Input - on/off signal
4	Q_INPUT+		Flow reference input signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are $0 \div +10$ Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal <b>Software selectable</b>
5	INPUT-		Negative reference input signal for Q_INPUT+ and P_INPUT+	Input - analog signal
6	Q_MONITOR referred to: V0	VL0	Flow monitor output signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are $0 \div +10$ Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal <b>Software selectable</b>
7	P_INPUT+		Pressure reference input signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are $0 \div +10$ Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal <b>Software selectable</b>
8	P_MONITOR referred to: V0	VL0	Pressure monitor output signal: $\pm 10$ Vdc / $\pm 20$ mA maximum range Defaults are $0 \div +10$ Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal <b>Software selectable</b>
9	D_IN0		Function software selectable between: multiple pressure PID 0 selection (default) or power limitation enable. Referred to V0	Input - on/off signal
		VL+	Power supply 24 Vdc for driver's logic and communication	Input - power supply
10	D_IN1		Function software selectable between: multiple pressure PID 1 selection (default) or power limitation enable. Referred to V0	Input - on/off supply
		VL0	Power supply 0 Vdc for driver's logic and communication	Gnd - power supply
11	FAULT referred to: V0	VL0	Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
PE	EARTH		Internally connected to 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



17.3 Communications connectors - for PES and PERS (B) - (C)

(B) USB connector - M12 - 5 pin always present		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
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) BP fieldbus execution, connector - M12 - 5 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
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	

(1) Shield connection on connector's housing is recommended

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

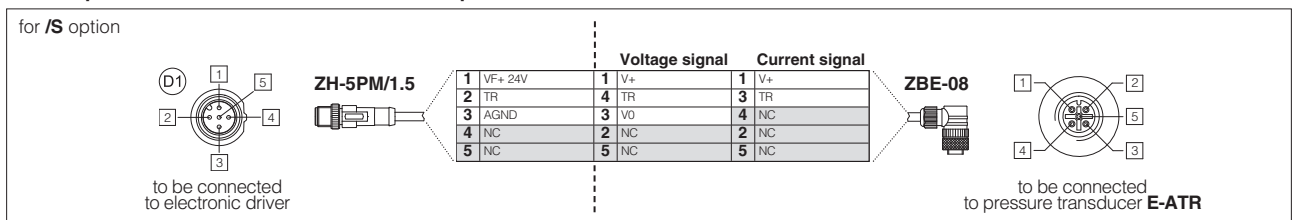
(C1) (C2) EH, EW, EI, EP fieldbus execution, connector - M12 - 4 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
Housing	SHIELD	

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

17.4 Remote pressure/force transducer connector - M12 - 5 pin - for PES and PERS with for /S, /X, /SX options (D1) - (D2)

PIN	SIGNAL	TECHNICAL SPECIFICATION	NOTES	Voltage	Current
1	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect
2	TR1	Signal transducer: $\pm 10$ Vdc / $\pm 20$ 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

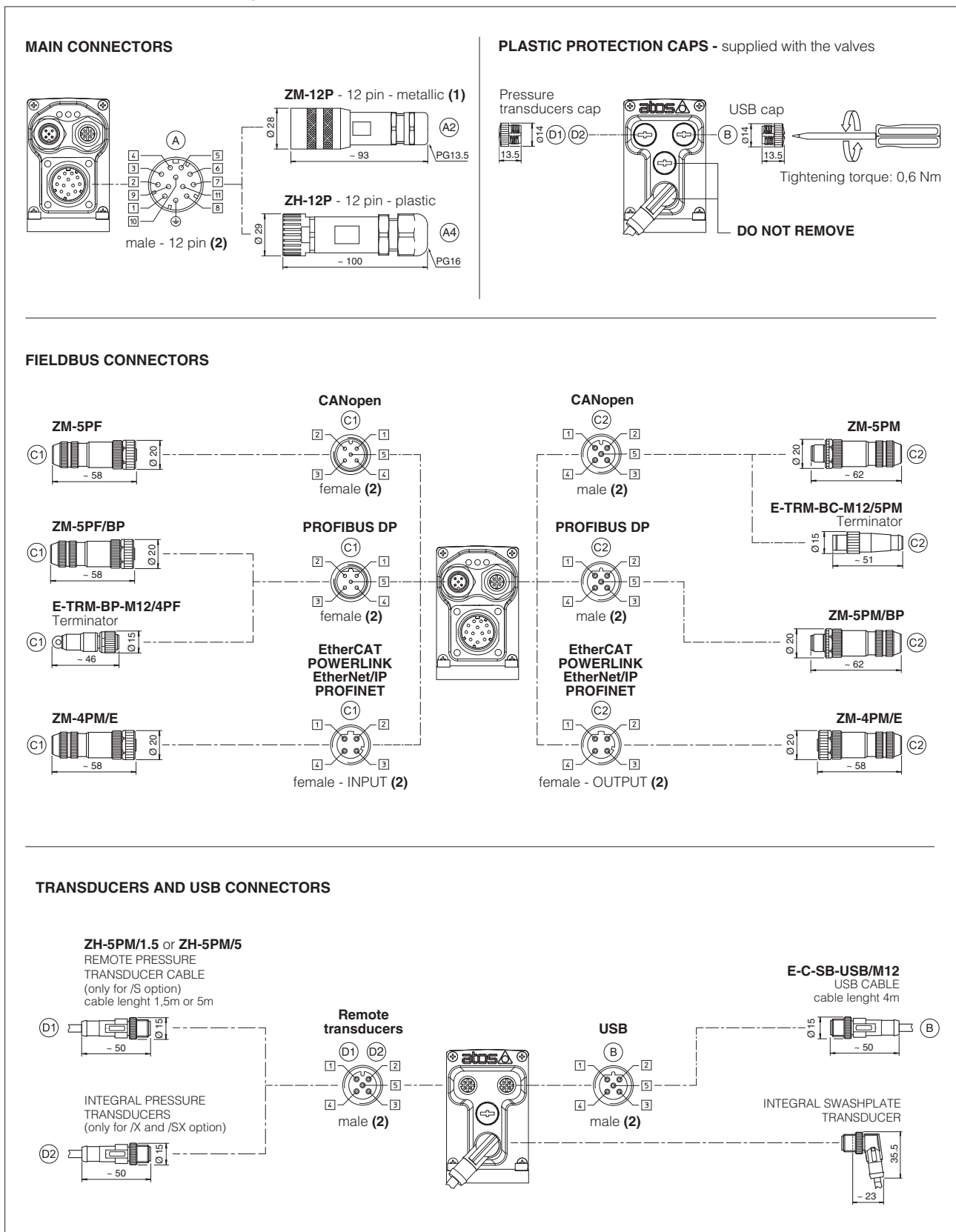


Note: connectors front view

17.5 Solenoid connection - for CZ and LQZ

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

## 17.6 PES and PERS connections layout



(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements (2) Pin layout always referred to driver's view

## 17.7 Diagnostic LEDs (L)

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

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

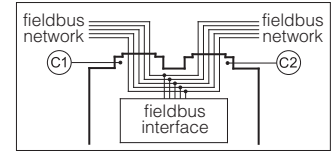
## 18 IN / OUT FIELDBUS COMMUNICATION CONNECTORS

Two fieldbus communication connectors are always available for digital driver 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 execution the external terminators are not required: each connector is internally terminated.

### BC and BP pass-through connection



## 19 CONNECTORS CHARACTERISTICS - to be ordered separately

### 19.1 Main connectors

CONNECTOR TYPE	POWER SUPPLY	POWER SUPPLY
<b>CODE</b>	<b>(A1) ZM-12P</b>	<b>(A2) ZH-12P</b>
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 <sup>2</sup> max 20 m (logic and power supply)	LiYCY 10 x 0,14mm <sup>2</sup> max 40 m (logic) LiYY 3 x 1mm <sup>2</sup> max 40 m (power supply)
Conductor size	0,5 mm <sup>2</sup> to 1,5 mm <sup>2</sup> - available for 12 wires	0,14 mm <sup>2</sup> to 0,5 mm <sup>2</sup> - available for 9 wires 0,5 mm <sup>2</sup> to 1,5 mm <sup>2</sup> - available for 3 wires
Connection type	to crimp	to crimp
Protection (EN 60529)	IP 67	IP 67

### 19.2 Fieldbus communication connectors

CONNECTOR TYPE	BC CANopen (1)		BP PROFIBUS DP (1)		EH EtherCAT, EW POWERLINK, EI EtherNet/IP, EP PROFINET (2)
<b>CODE</b>	<b>(C1) ZM-5PF</b>	<b>(C2) ZM-5PM</b>	<b>(C1) ZM-5PF/BP</b>	<b>(C2) ZM-5PM/BP</b>	<b>(C1) (C2) ZM-4PM/E</b>
Type	5 pin female straight circular	5 pin male straight circular	5 pin female straight circular	5 pin 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		Metallic		Metallic
Cable gland	Pressure nut - cable diameter 6÷8 mm		Pressure nut - cable diameter 6÷8 mm		Pressure nut - cable diameter 4÷8 mm
Cable	CANbus Standard (DR 303-1)		PROFIBUS DP Standard		Ethernet standard CAT-5
Connection type	screw terminal		screw terminal		terminal block
Protection (EN 60529)	IP67		IP 67		IP 67

(1) E-TRM-\*\* terminators can be ordered separately, see tech table **GS500**

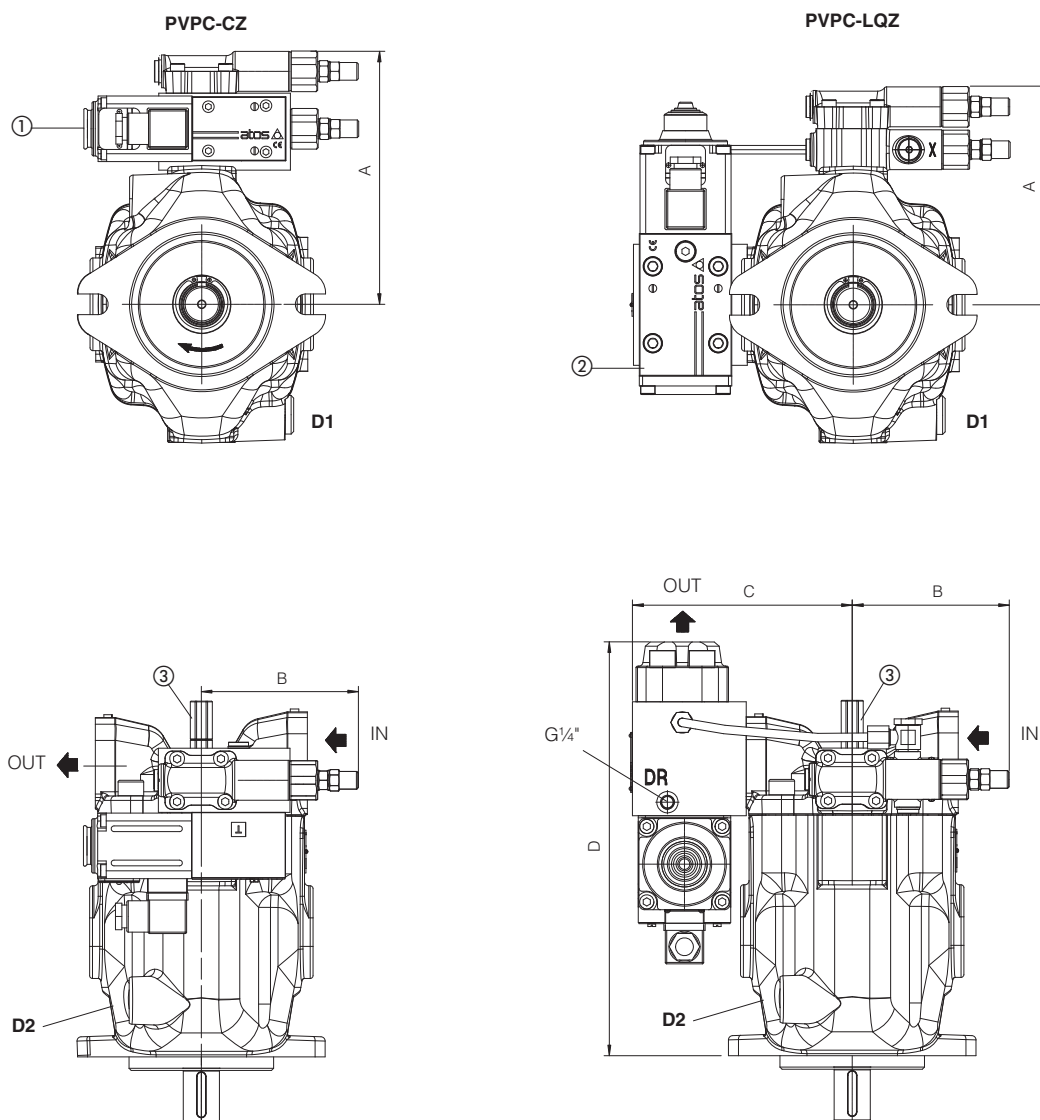
(2) Internally terminated

### 19.3 Remote pressure transducer connectors

CONNECTOR TYPE	PRESSURE TRANSDUCER		SF - Double transducers
<b>CODE</b>	<b>(D1) (D2) ZH-5PM/1.5</b>	<b>(D1) (D2) ZH-5PM/5</b>	<b>(D2) ZH-5PM-2/2</b>
Type	5 pin male straight circular		4 pin male straight circular
Standard	M12 coding A – IEC 61076-2-101		M12 coding A – IEC 61076-2-101
Material	Plastic		Plastic
Cable gland	Connector moulded on cables 1,5 m lenght   5 m lenght		Connector moulded on cables 2 m lenght
Cable	5 x 0,25 mm <sup>2</sup>		3 x 0,25 mm <sup>2</sup> (both cables)
Connection type	molded cable		splitting cable
Protection (EN 60529)	IP 67		IP 67

20 INSTALLATION DIMENSION [mm]

DIMENSIONS OF PVPC size 3, 4 and 5

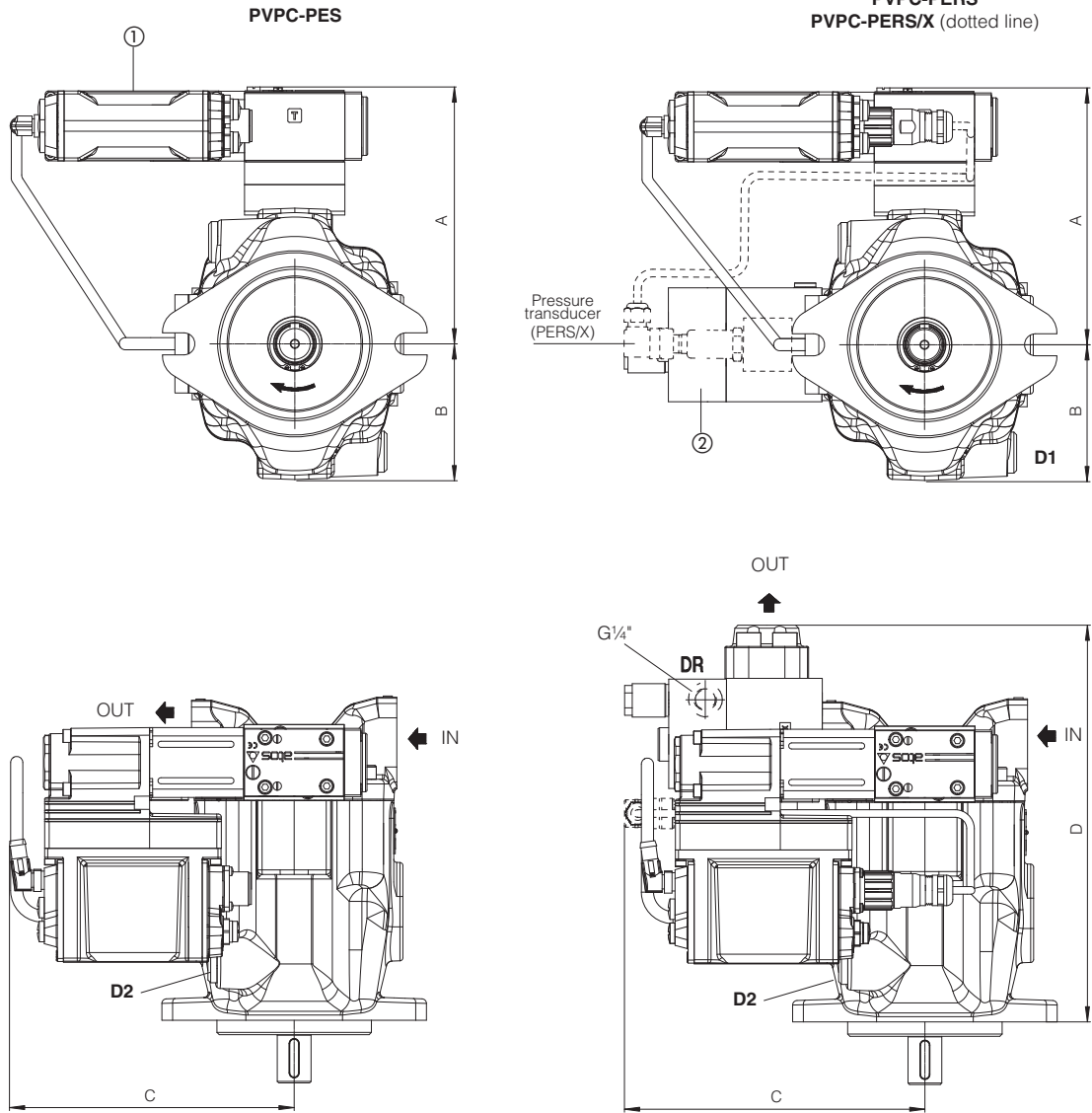


- ① = Proportional pressure control valve
- ② = Proportional flow control valve
- ③ = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement (not available for versions PES, PERS and PERS(X). In case of double pump the regulation screw is not always available, please 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 consequently also the position of the control devices.

Pump type	Version	A	B	C	D	IN	OUT	D1, D2	Mass (kg)
PVPC-*-3029	CZ	168	111	-	-	Flange SAE 3000 1 1/4"	Flange SAE 6000 3/4"	1/2" BSPP	22
	LQZ	144	111	132	257				24
PVPC-*-4046	CZ	177	111	-	-	Flange SAE 3000 1 1/2"	Flange SAE 6000 1"	1/2" BSPP	28
	LQZ	153	111	156	293				33,6
PVPC-*-5073 PVPC-*-5090	CZ	190	111	-	-	Flange SAE 3000 2"	Flange SAE 6000 1 1/4"	3/4" BSPP	36,9
	LQZ	166	111	163	328				44

**DIMENSIONS OF PVPC size 3, 4 and 5**

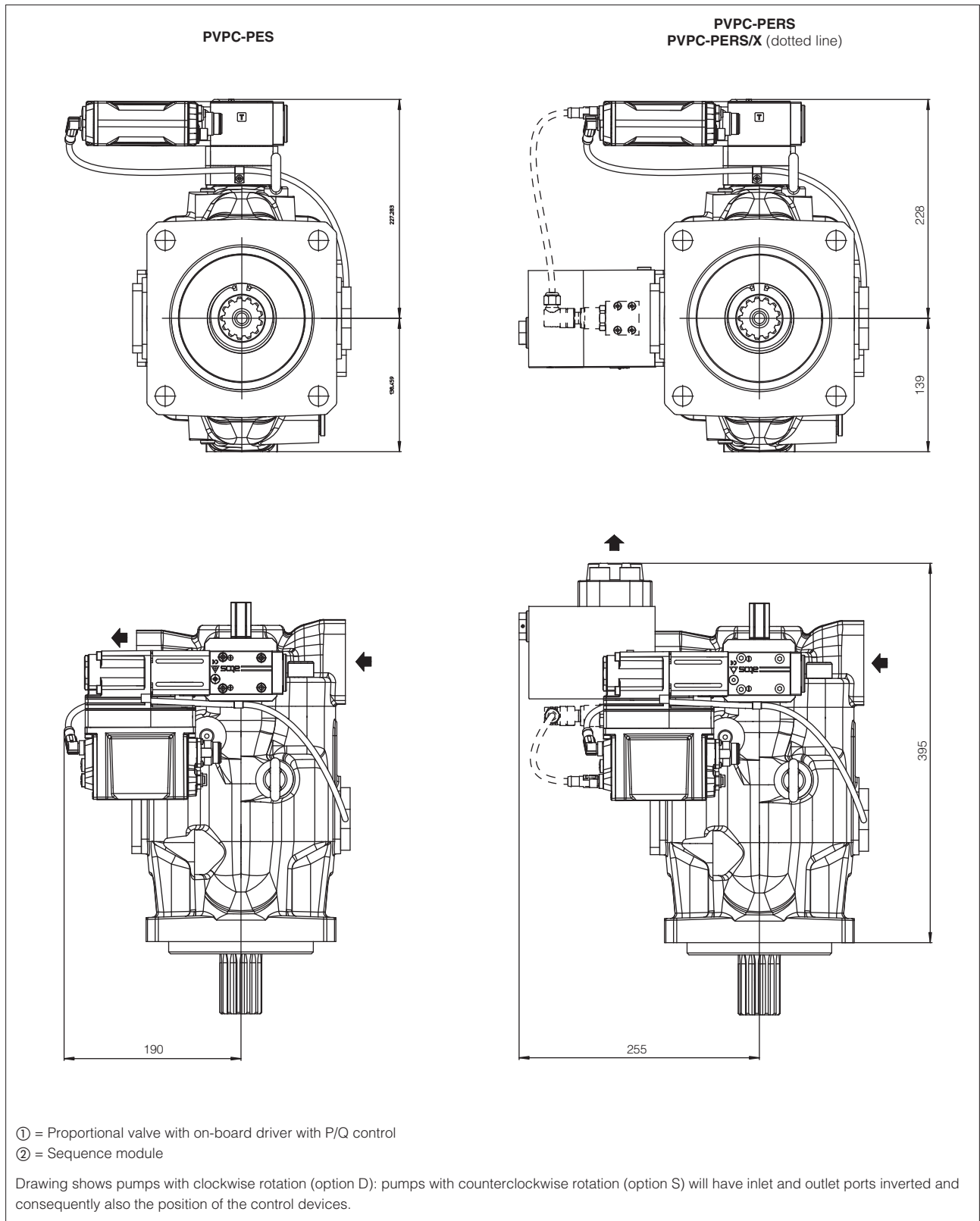


- ① = Proportional valve with on-board driver with P/Q control
- ② = Sequence module

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

Pump type	Version	A	B	C	D	IN	OUT	D1, D2	Mass (kg)
PVPC-*-3029	PES	170	103,5	190	-				21,6
	PERS	170	103,5	200	262,5	Flange SAE 3000 1 1/4"	Flange SAE 6000 3/4"	1/2" BSPP	26
	PERS/X	190	103,5	200	262,5				26,4
PVPC-*-4046	PES	178	103,5	190	-				27,6
	PERS	178	103,5	220	299	Flange SAE 3000 1 1/2"	Flange SAE 6000 1"	1/2" BSPP	33,7
	PERS/X	178	103,5	220	299				34,1
PVPC-*-5073 PVPC-*-5090	PES	190	103,5	190	-				36,6
	PERS	190	103,5	230	337	Flange SAE 3000 2"	Flange SAE 6000 1 1/4"	3/4" BSPP	46,7
	PERS/X	190	103,5	230	337				47,1

**DIMENSIONS OF PVPC size 6**



**21 RELATED DOCUMENTATION**

<b>A900</b>	Operating and maintenance information for pumps	<b>G030</b>	E-BM-AS digital driver
<b>FS001</b>	Basics for digital electrohydraulics	<b>GS050</b>	E-BM-AES digital driver
<b>FS500</b>	Digital proportional valves with P/Q control	<b>GS500</b>	Programming tools
<b>FS900</b>	Operating and maintenance information for proportional valves	<b>GS510</b>	Fieldbus
<b>G010</b>	E-MI-AC analog driver	<b>K800</b>	Electric and electronic connectors
<b>G020</b>	E-MI-AS-IR digital driver	<b>P005</b>	Mounting surfaces for electrohydraulic valves