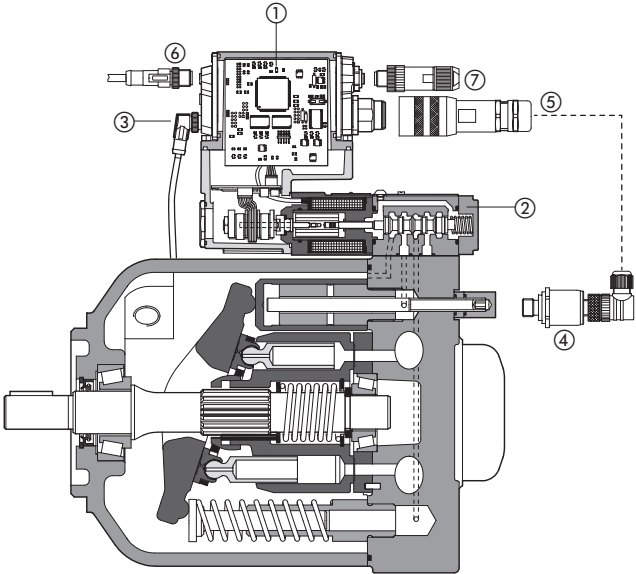# Digital electronic PES drivers with S option

integral-to-valve format, for variable displacement axial piston pumps with alternated P/Q control

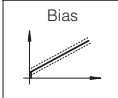CE

PVPC - **PES-SP** -
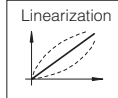
NP Not Present
BC CANopen
BP PROFIBUS DP
EH EtherCAT
EW POWERLINK
EI EtherNet/IP
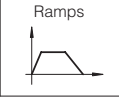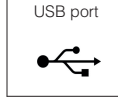
Scale	Bias	Linearization
Ramps	Enhanced Diagnostic	USB port
Hydraulic Power Limitation	Real Time Fieldbus Reference	
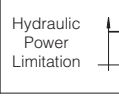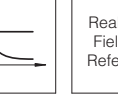
E-SW-FIELDBUS/PQ

E-SW programming software

Transducer ④, connectors ⑤, ⑥, ⑦ not included, to be ordered separately

PES-S

Digital drivers ① are integral to the servoproportional valve ② which pilot the variable displacement of axial piston pumps performing in closed loop, the control of flow and pressure of the pump outlet line according to the two electronic reference input signals.

The P/Q alternated control operates according to the two electronic reference signals by a dedicated algorithm that automatically selects which control will be active time by time. Flow regulation is active when the actual system pressure is lower than the relevant input reference signal - the valve works normally to regulate the flow by controlling in closed-loop the spool/poppet position through the integral LVDT transducer ③.

Pressure control is activated when the actual system pressure, measured by remote transducers ④, grows up to the relevant input reference signal - the driver reduces the pump's flow regulation in order to keep steady the system pressure.

If the pressure tends to decrease under its input reference signal, the flow control returns active.

The dynamic response of pressure control can be adapted to different system's characteristics, by setting the internal PID parameters using Atos PC software.

Up to 4 different PIDs are selectable to optimize the system dynamic response according to different hydraulic working conditions.

Electrical features:
- 12 pin main connector ⑤ for power supply, additional double power supply, enable and fault signals
- 5 pin USB connector ⑥ always present
- 3 leds for diagnostic (see 3.1)
- IN / OUT fieldbus communication connectors ⑦ (see section 5)
- /S option adds two on-off inputs for multiple pressure PID selection (NP execution) or double power supply (fieldbus executions) and dedicated 5 pin connector for remote pressure transducer
- /X option integral pressure transducer with preconfigured pressure settings
- Electrical protection against reverse polarity of power supply
- Operating temperature range -40° ÷ +60°
- IP66 / IP67 protection degree
- Rugged construction
- CE mark according to EMC directive

Software Features:
- Intuitive graphic interface
- Setting of pump's functional parameters: bias, scale, ramps, dither
- Linearization function for the hydraulic regulation
- Setting of PID gains
- Hydraulic power limitation
- Selection of analog IN / OUT range
- Complete diagnostics of driver status
- Internal oscilloscope function
- In field firmware update through USB port

1 PUMPS RANGE

Pumps model	Proportional electrohydraulic control
	PVPC
Data sheet	A170
Driver model	**PES-S**

2 MAIN CHARACTERISTICS

Power supplies (see 4.1, 4.4)	Nominal : +24 V_{DC} Rectified and filtered : V_{RMS} = 20 ÷ 32 V_{MAX} (ripple max 10 % V_{PP})
Max power consumption	50 W
Reference input signals (see 4.2)	Voltage: range ±10 V_{DC} (24 V_{MAX} tollerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω
Monitor outputs (see 4.3)	Output range: voltage ±10 V_{DC} @ max 5 mA current ±20 mA @ max 500 Ω load resistance
Enable input (see 4.8)	Range: 0 ÷ 5 V_{DC} (OFF state), 9 ÷ 24 V_{DC} (ON state), 5 ÷ 9 V_{DC} (not accepted); Input impedance: Ri > 10 kΩ
Fault output (see 4.7)	Output range: 0 ÷ 24 V_{DC} (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 50 mA; external negative voltage not allowed (e.g. due to inductive loads)
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions
Pressure transducers power supply	+24 V_{DC} @ max 100 mA
Format	Sealed box on the valve; IP66 / IP67 protection degree with mating connectors
Tropicalization	Tropical coating on electronics PCB
Operating temperature	-40 ÷ +60 °C (storage -40 ÷ +70 °C)
Mass	Approx. 510 g
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
Electromagnetic compatibility (EMC)	According to Directive 2014/30/UE (Immunity: EN 61000-2; Emission: EN 61000-3)
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS EN50170-2/IEC61158	EtherCAT, POWERLINK, EtherNet/IP IEC 61158
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet 100 Base TX
Recommended wiring cable (see 9)	LiYCY shielded cables			

Note: a minimum booting time between 400 and 800 ms has be considered from the driver energizing with the 24 V_{DC} power supply before the valve has been ready to operate. During this time the current to the valve coils is switched to zero

3 CONNECTIONS AND LEDS

Note: connectors front view
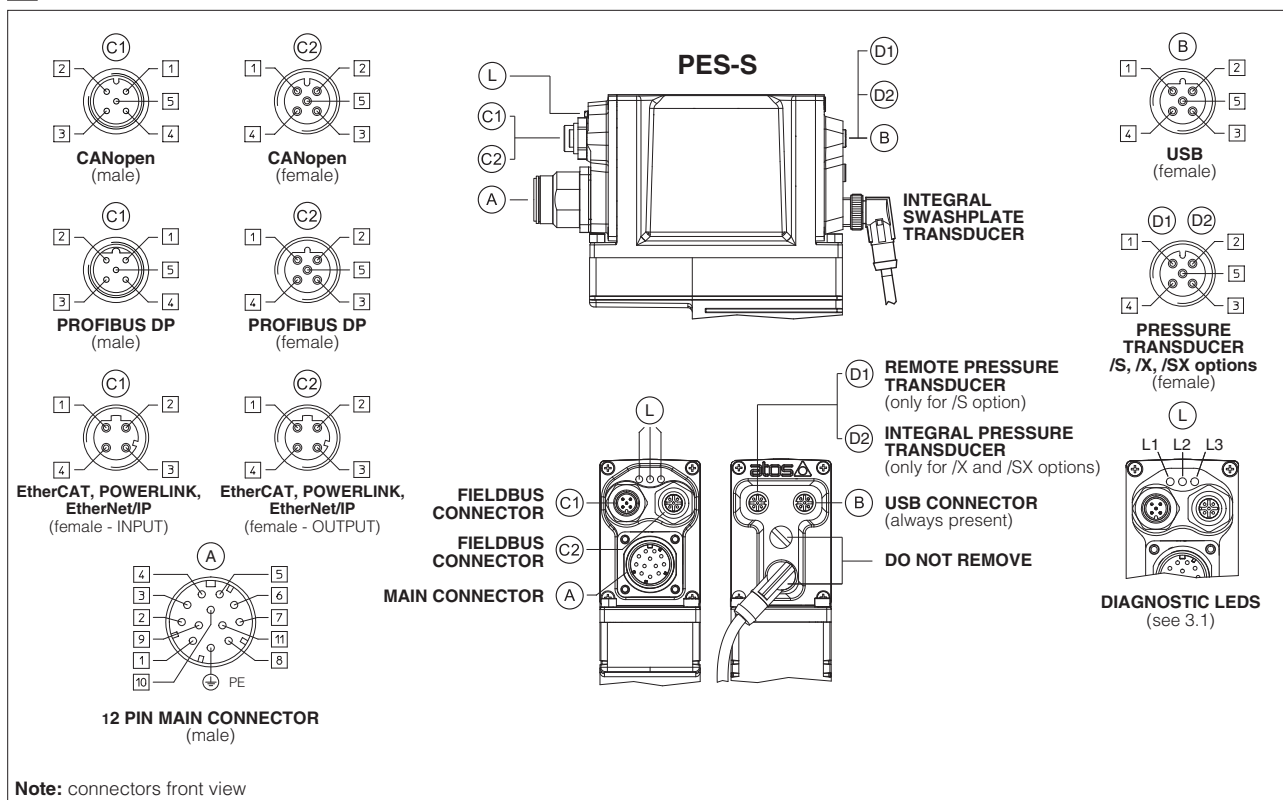
3.1 DIAGNOSTIC LEDS (L)

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

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

3.2 Main connector signals - 12 pin - standard and standard with /X option (A) - see 9.1

PIN	Standard	/X	TECHNICAL SPECIFICATIONS	NOTES
1	V+		Power supply 24 V_{DC} (see 4.1)	Input - power supply
2	V0		Power supply 0 V_{DC} (see 4.1)	Gnd - power supply
3	FAULT		Fault (0 V_{DC}) or normal working (24 V_{DC}), referred to V0 (see 4.7)	Output - on/off signal
4	INPUT-		Negative reference input signal for Q_INPUT+ and P_INPUT+	Input - analog signal
5	Q_INPUT+		Flow reference input signal: ±10 V_{DC} / ±20 mA maximum range (see 4.2)	Input - analog signal **Software selectable**
6	Q_MONITOR		Flow monitor output signal: ±10 V_{DC} / ±20 mA maximum range, referred to V0 (see 4.4)	Output - analog signal **Software selectable**
7	P_INPUT+		Pressure reference input signal: ±10 V_{DC} / ±20 mA maximum range (see 4.3)	Input - analog signal **Software selectable**
8	P_MONITOR		Pressure monitor output signal: ±10 V_{DC} / ±20 mA maximum range, referred to V0 (see 4.5)	Output - analog signal **Software selectable**
9	D_IN		Function software selectable between: power limitation enable (default), multiple pressure PID selection or pump Enable (24 V_{DC}) / disable (0 V_{DC}). Referred to V0 (see 4.10)	Input - on/off signal
10	TR+		Remote pressure transducer input signal: ±10 V_{DC} / ±20 mA maximum range (see 4.9) Differential mode input	Input - analog signal **Software selectable**
		NC	Do not connect	
11	TR-		Negative pressure transducer input signal for TR+ Differential mode input	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
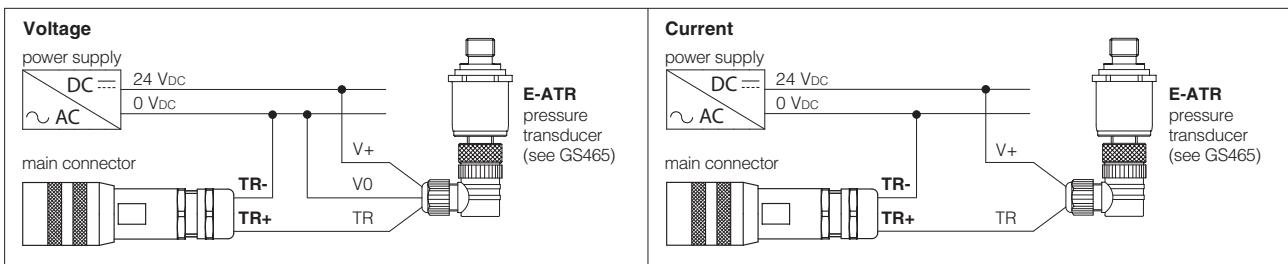
3.3. Main connector signals - 12 pin - /S and /SX option (A) - see 9.1

PIN	/S and /SX NP	/S and /SX Fieldbus	TECHNICAL SPECIFICATIONS	NOTES
1	V+		Power supply 24 V_{DC} (see 4.1)	Input - power supply
2	V0		Power supply 0 V_{DC} (see 4.1)	Gnd - power supply
3	ENABLE referred to: V0	VL0	Enable (24 V_{DC}) or disable (0 V_{DC}) the pump (see 4.8)	Input - on/off signal
4	Q_INPUT+		Flow reference input signal: ±10 V_{DC} / ±20 mA maximum range (see 4.2)	Input - analog signal **Software selectable**
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: ±10 V_{DC} / ±20 mA maximum range (see 4.4)	Output - analog signal **Software selectable**
7	P_INPUT+		Pressure reference input signal: ±10 V_{DC} / ±20 mA maximum range (see 4.3)	Input - analog signal **Software selectable**
8	P_MONITOR referred to: V0	VL0	Pressure monitor output signal: ±10 V_{DC} / ±20 mA maximum range (see 4.5)	Output - analog signal **Software selectable**
9	D_IN0		Function software selectable between: multiple pressure PID selection (default) or power limitation enable. Referred to V0	Input - on/off signal
		VL+	Power supply 24 V_{DC} for driver's logic and communication	Input - power supply
10	D_IN1		Function software selectable between: multiple pressure PID selection (default) or power limitation enable. Referred to V0	Input - on/off signal
		VL0 (1)	Power supply 0 V_{DC} for driver's logic and communication	Gnd - power supply
11	FAULT referred to: V0	VL0	Fault (0 V_{DC}) or normal working (24 V_{DC}) (see 4.7)	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

(1) do not disconnect VL0 before VL+ when the driver is connected to PC USB port

3.4 Communication connectors (B) - (C) - see 9.3

(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)	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)	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**	

(C1) (C2)	EH, EW, EI 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**	

Notes: (1) shield connection on connector's housing is recommended   **(2):** pin 2 can be fed with external +5V supply of CAN interface

3.5 Pressure transducer connector - M12 - 5 pin - only for /S, /X, /SX options (D1) - (D2) - see 9.2

PIN	SIGNAL	TECHNICAL SPECIFICATION	NOTES	Voltage	Current
1	VF +24V	Power supply +24V_{DC}	Output - power supply	Connect	Connect
2	TR	Signal transducer ±10 V_{DC} / ±20 mA maximum range - see 4.9	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
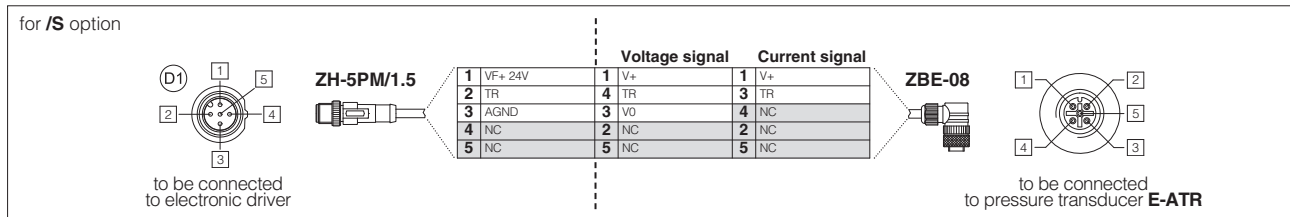
Note: connectors front view

4   SIGNALS SPECIFICATIONS

Atos digital drivers are CE marked according to the applicable directives (e.g. Immunity/Emission EMC Directive).

Installation, wirings and start-up procedures must be performed according to the prescriptions shown in tech table **F003** and in the user manuals included in the E-SW programming software.

The electrical signals of the driver (e.g. 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.

4.1   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 double power supply see 4.6.

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

4.2   Flow reference input signals (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 pump code, defaults are ±10 V_{DC} 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 V_{DC} 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 ÷ 24V_{DC}.

4.3   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 pump code, defaults are ±10 V_{DC} 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 V_{DC} 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 ÷ 24V_{DC}.

4.4   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 V_{DC} 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 V_{DC} or ± 20 mA.

4.5 Pressure monitor output signal (P_MONITOR)

The driver generates an analog output signal proportional to the actual pressure on the pump outlet line; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, pressure reference).

Monitor output signal is factory preset according to selected pump code, defaults are ±10 V_{DC} 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 V_{DC} or ± 20 mA.

4.6 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.

4.7 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference or pressure/swashplate/pilot transducer signal cable broken, maximum error exceeded, etc.). Fault presence corresponds to 0 V_{DC}, normal working corresponds to 24 V_{DC}.

Fault status is not affected by the status of the Enable input signal.

Fault output signal can be used as digital output by software selection.

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

To enable the driver, supply 24 V_{DC} on pin 3: 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 active the communication and the other driver functions when the valve must be disabled for safety reasons. This condition does not comply with European Norms EN13849-1 (ex EN954-1).

Enable input signal can be used as digital input by software selection.

4.9 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 V_{DC} 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 V_{DC} or ± 20 mA.

Refer to the pump technical table to transducer characteristics to select the transducer's maximum pressure.
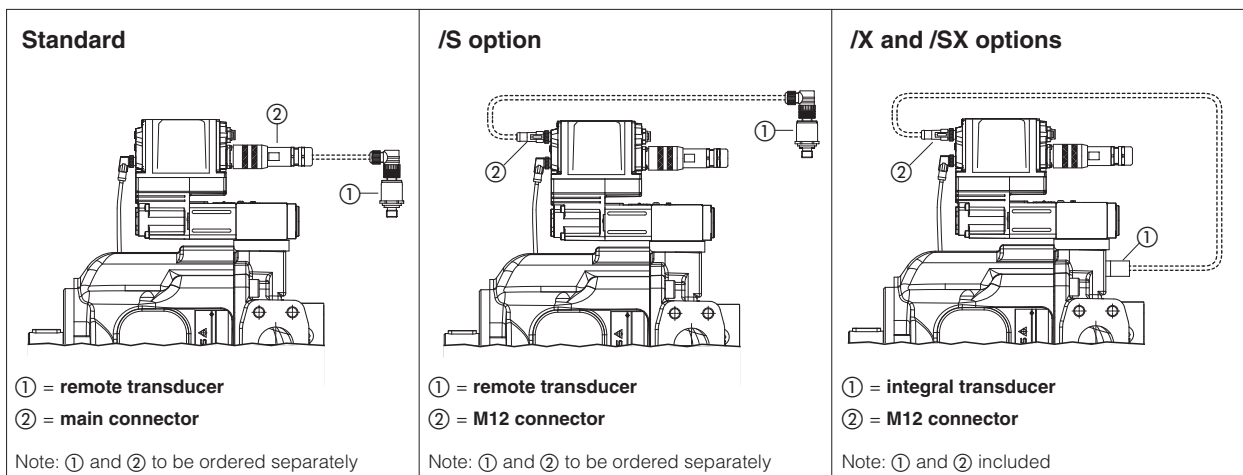
Standard:

Remote pressure transducer can be directly connected to the main connector on the driver (see 3.2)

/S option

Remote pressure transducer can be directly connected to a dedicated M12 connector (see 3.5)

/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

Standard

① = **remote transducer**
② = **main connector**
Note: ① and ② to be ordered separately

/S option

① = **remote transducer**
② = **M12 connector**
Note: ① and ② to be ordered separately

/X and /SX options

① = **integral transducer**
② = **M12 connector**
Note: ① and ② included

4.10 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 V_{DC} to disable and 24 V_{DC} to enable the driver) - see 4.8

- switch between two pressure PID settings (apply 0 V_{DC} to select SET1 pressure PID and 24 V_{DC} to select SET2) - see 4.11

- enable and disable the power limitation function (default setting, apply 0V to disable and 24V_{DC} to enable the power limitation) - see 7.7

4.11 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 V_{DC} or a 0 V_{DC} 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.

PID SET SELECTION				
PIN	SET 1	SET 2	SET 3	SET 4
9	0	24 V_{DC}	0	24 V_{DC}
10	0	0	24 V_{DC}	24 V_{DC}

4.12 Possible combined options: /SX

Two fieldbus communication connectors are always available for digital drivers executions BC, BP, EH, EW, EI. This features 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 and EI execution the external terminators are not required: each connector is internally terminated.

BC and BP pass-through connection
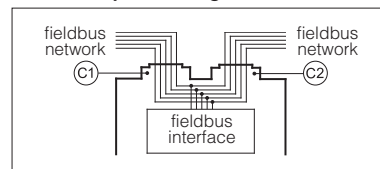
6 PROGRAMMING TOOLS - see tech table **GS500**

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. 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:

USB connection

E-C-SB-USB/M12 cable

E-A-SB-USB/OPT isolator

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)	
E-SW-*/PQ	support:	valves with SP, SF, SL alternated control (e.g. E-SW-BASIC/PQ)		

WARNING: drivers USB port is not isolated!
The use of isolator adapter is highly recommended for PC protection (see table **GS500**)
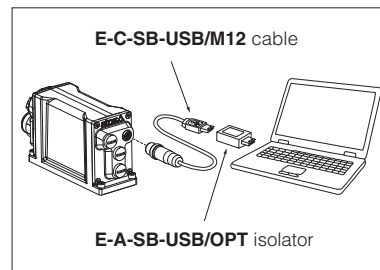
Free programming software, web download:

E-SW-BASIC web download = software can be downloaded upon web registration at www.download.atos.com ; service and DVD not included
Upon web registration user receive via email the Activation Code (software free license) and login data to access Atos Download Area

DVD programming software, to be ordered separately:

E-SW-*/PQ DVD first supply = software has to be activated via web registration at www.download.atos.com ; 1 year service included
Upon web registration user receive via email the Activation Code (software license) and login data to access Atos Download Area

E-SW-*-N/PQ DVD next supplies = only for supplies after the first; service not included, web registration not allowed
Software has to be activated with Activation Code received upon first supply web registration

Atos Download Area: direct access to latest releases of E-SW software, manuals, USB drivers and fieldbus configuration files at www.download.atos.com

USB Adapters, Cables and Terminators, can be ordered separately

7 MAIN SOFTWARE PARAMETER SETTINGS

The following is a brief description of the main 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

7.1 Scale

Scale function allows to set the maximum pump flow and pressure at maximum reference signal value. This regulation allows to reduce the maximum pump regulations in front of maximum reference signal. Two different Scale regulations are available for flow and pressure.

7.2 Bias

The Bias function can be set to limit internally the minimum flow and pressure references indipendently from the external reference value thus optimizing pumps's performances.

Refer to the programming manuals for a detailed description of other software selectable Bias functions.

7.1, 7.2 - Scale, Bias

7.3 Ramps

The ramp generator allows to convert sudden change of electronic reference signal into smooth time-dependent increasing/decreasing of both pump regulations.

Different ramp mode can be set (separately for flow and pressure):
- single ramp for any reference variation
- two ramps for increasing and for decreasing reference variations

Ramp generator is useful for application where smooth hydraulic actuation is necessary to avoid machine vibration and shocks.

If the pump is driven by a closed loop driver, the ramps can lead to unstable behaviour, for these applications ramp function can be software disabled (default setting).

7.3 - Ramps

7.4 Linearization

Linearization function allows to set the relation between the reference input signal and the controlled pump's regulation (separately for flow and pressure).

Linearization is useful for applications where it is required to linearize the pump's regulation in a defined working condition.
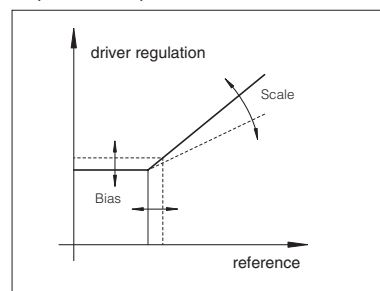
7.5 Dither

The dither is an high frequency modulation added to the pump reference signal (flow and pressure) to reduce the hysteresis of the pump regulations; in fact a small vibration in the pump hydraulic regulation considerably reduces the mechanical friction effects (e.g. due to cylinder seals).

Dither frequency and amplitude are software selectable; the amplitude is automatically reduced at high reference values (high regulated flow) to avoid possible instability.

Lower frequency and higher amplitude reduce hysteresis but also reduce the regulation stability. In some application this can lead to vibration and noise: right setting usually depends on system setup. Dither default setting is disabled.
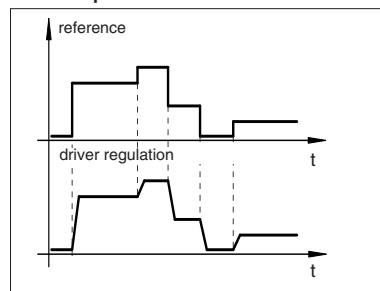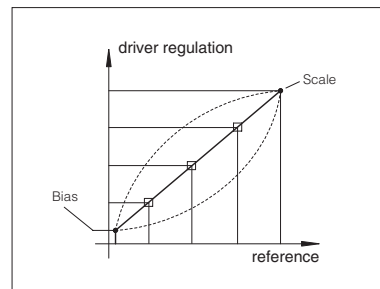
7.4 - Linearization

7.6 Multiple pressure PID

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	All versions	real-time fieldbus communication can switch between the 4 PID parameters set (SET1 - SET4 - see driver manuals)

7.7 Hydraulic Power Limitation

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**x**Q** (pressure transducer feeback x flow reference value) reaches the max power limit (p1xQ1), the driver automatically reduces the flow pump regulation.
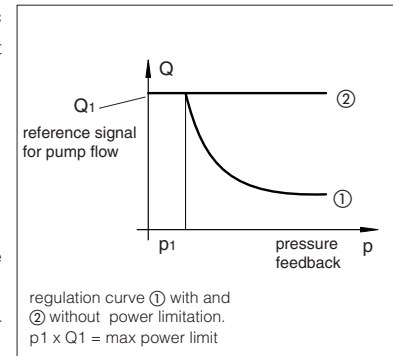
The higher is the pressure feedback the lower is the pumps's regulated flow:

$$\text{Flow regulation} = \text{Min} \left(\frac{\text{PowerLimit [kW]}}{\text{Pressure Feedback [bar]}} \times \frac{1}{\text{Flow Full Scale [l/min]}} ; \text{Flow Reference} \right)$$
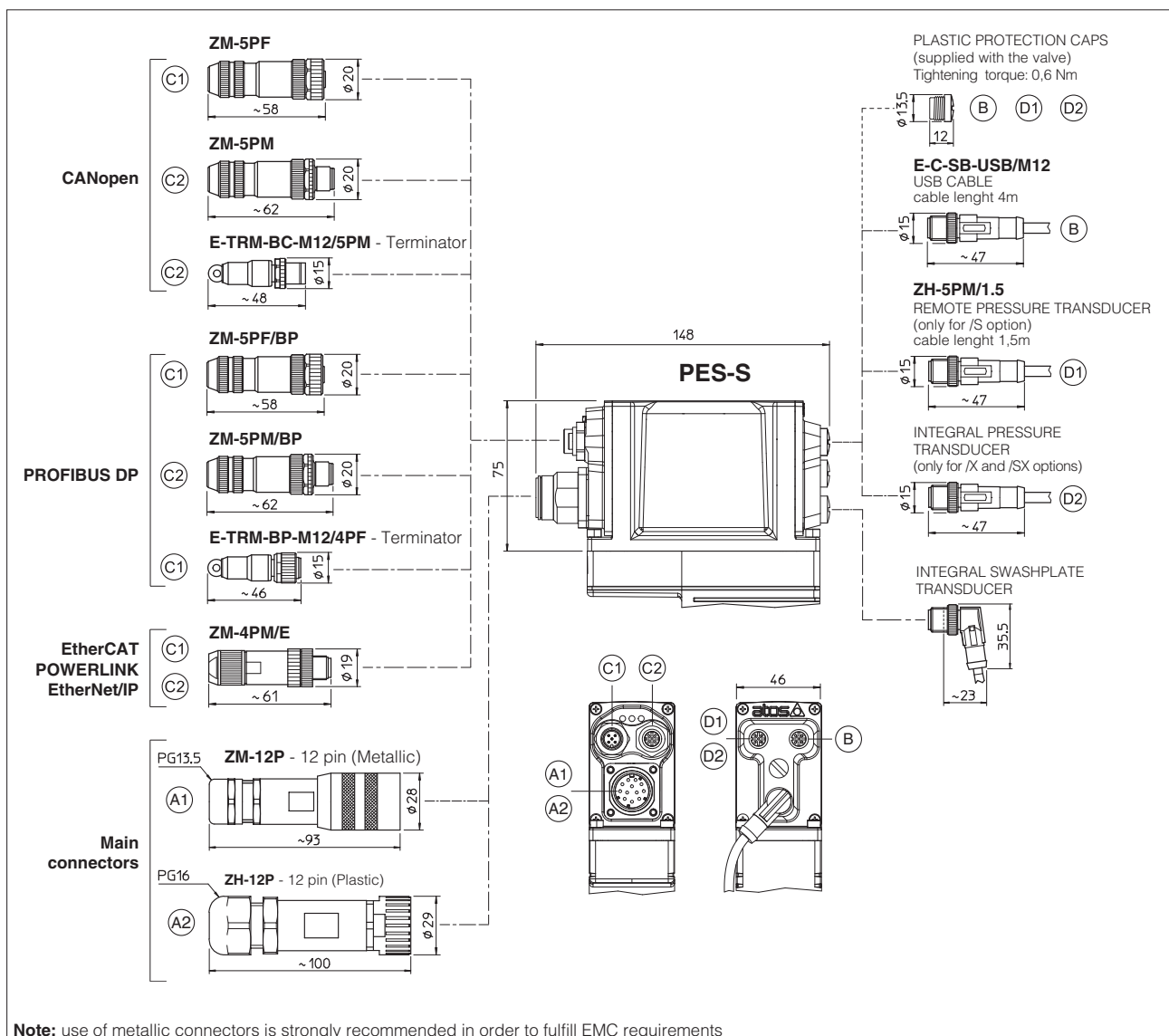
The hydraulic power limitation, disabled as default, can be enabled using the Atos pc software or the fieldbus communication (fieldbus executions).

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 4.10).

7.7 - Hydraulic Power Limitation

regulation curve ① with and ② without power limitation.
p1 x Q1 = max power limit

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8 OVERALL DIMENSIONS [mm]

Note: use of metallic connectors is strongly recommended in order to fulfill EMC requirements

9.1 Main connectors - 12 pin

CONNECTOR TYPE	POWER SUPPLY	POWER SUPPLY
CODE	(A1) ZM-12P	(A2) 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 mm² max 20 m (logic and power supply)	LiYCY 10 x 0,14mm² max 40 m (logic) LiYY 3 x 1mm² max 40 m (power supply)
Conductor size	0,5 mm² to 1,5 mm² - available for 12 wires	0,14 mm² to 0,5 mm² - available for 9 wires 0,5 mm² to 1,5 mm² - available for 3 wires
Connection type	to crimp	to crimp
Protection (EN 60529)	IP 67	IP 67

9.2 Remote pressure transducer connectors

CONNECTOR TYPE	(D1) PRESSURE TRANSDUCER
CODE	ZH-5PM/1.5
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 lenght
Cable	5 x 0,25 mm²
Connection type	molded cable
Protection (EN 60529)	IP 67

9.3 Fieldbus communication connectors

CONNECTOR TYPE	BC CANopen (1)		BP PROFIBUS DP (1)		EH EtherCAT, EW POWERLINK, EI EtherNet/IP (2)
CODE	(C1) ZM-5PF	(C2) ZM-5PM	(C1) ZM-5PF/BP	(C2) ZM-5PM/BP	(C1) (C2) ZM-4PM/E
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)	IP 67		IP 67		IP 67

Notes: (1) E-TRM-** terminators can be ordered separately - see tech table **GS500**   **(2)** internally terminated

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10 MODEL CODE FOR SPARE PARTS

Integral drivers are available as spare parts only for Atos authorized service centers.

| E-RI | - P | ES | - S | - NP | - 01H | / | * | * | * |

Integral electronic driver

P = closed loop integral digital P/Q driver with1 LVDT angular transducer and1 remoted pressure transducer

ES = full

Alternated P/Q control:
S = closed loop pressure control

Fieldbus interface, USB port always present:
NP = Not Present   **EH** = EtherCAT
BC = CANopen   **EW** = POWERLINK
BP = PROFIBUS DP   **EI** = EtherNet/IP

Options, see section ③ :
- = standard with pressure transducer included on main connector
X = integral pressure transducer with pre-configured pressure settings
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

01H = for single solenoid proportional valves

Series number

Set code **(1)**

(1) set code identifies the corrispondance between the integral driver and the relevant valve; it is assigned by Atos when the driver is ordered as spare part