METAL WORK EB 80 with IO-Link 64 Output interface User Manual

Contents

METAL WORK EB 80 with IO-Link 64 Output interface

INTENDED USE

The IO-Link electrical connection can be used to connect the EB80 system to an IO-Link Master. It offers diagnostics functions in compliance with IO-Link specifications. The system is available in the configuration up to 32 outputs for solenoid pilots, 32 digital inputs and 6 Proportional Pressure Regulators. The system allows a maximum of 16 bytes of input and 16 bytes of output. The IO-Link connection supports COM3 communication, according to specification V1.1.

WARNING

- The EB 80 IO-Link must only be used as follows:
- as designated in industrial applications.;
- in systems fully assembled and in perfect working order;
- in compliance with the maximum values specified for electrical ratings, pressures and temperatures.
- Only use power supply complying with IEC 742/EN60742/VDE0551 with at least 4kV insulation resistance (PELV).

TARGET GROUP

This manual is intended exclusively for technicians qualified in control and automation technology, who have acquired experience in installing, commissioning, programming and diagnosing programmable logic controllers (PLC) and Fieldbus systems.

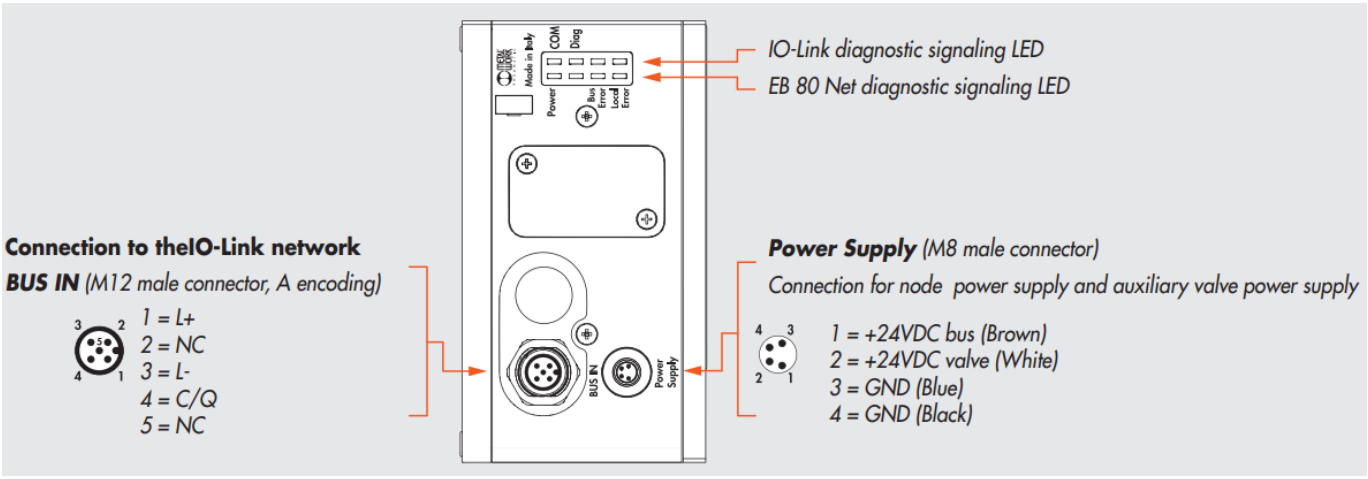
INSTALLATION

GENERAL INSTRUCTIONS FOR INSTALLATION

Before carrying out any installation or maintenance work, switch off the following:

- compressed air supply;
- the operating power supply to solenoid valve / output control electronics.

ELECTRICAL CONNECTION AND DISPLAY ELEMENTS



ELECTRICAL CONNECTIONS: PIN ASSIGNMENT OF CONNECTOR

M8 connector for node and output power supply

- 1 = +24VDC Connector for node IO-Link and input power supply
- 2 = +24VDC Auxiliary valve power supply
- 3 = GND
- 4 = GND

The EB 80 must be earthed using the end plate connection marked with the symbol PE

WARNING
The bus supply system also powers all the Signal modules S that are directly connected to the node; the maximum supplied current is 3.5 A.

WARNING
Failure to make the earth connection may cause faults and irrevocable damages in the event of electrostatic discharge. In order to guarantee IP65 protection class, any discharge must be conveyed.

M12 connector for connection to the IO-Link network

- 1 = L+
- 2 = NC
- 3 = L-
- 4 = C/Q
- 5 = NC

M12, 5-pin, A-encoded connectors are used for connection to the bus terminal. According to IO-Link specifications, the connection is tested to CLASS A requirements.

POWER SUPPLY
An M8 4-pin female connector is used for the power supply. The auxiliary power supply of the valves is separate from that of the fieldbus, which means that the valves can be powered off while the bus line remains live. The absence of auxiliary power is indicated by the flashing of the Led Power light and simultaneous flashing of all the

solenoid valve Led lights. The fault is relayed to the Master, which provides for adequate management of the alert.

WARNING
Power off the system before plugging or unplugging the connector (risk of functional damage). Use fully assembled valve units only. Only use power packs complying with IEC 742/EN60742/VDE0551 with at least 4kV insulation resistance (PELV).

Supply voltage
The system provides a wide voltage range, from 12VDC -10% to 24VDC +30% (min 10.8, max 31.2).

CA TION!
Voltage greater than 32VDC irrevocably damages the system.

SYSTEM VOLTAGE DROP
Voltage drop depends on the input maximum current drawn by the system and the length of the cable for connection to the system. In a 24VDC-powered system, with cable lengths up to 20 m, voltage drops do not need to be taken into account. In a 12VDC-powered system, there must be enough voltage to ensure correct operation. It is necessary to take into account any voltage drops due to the number of active solenoid valves, the number of valves controlled simultaneously and the cable length. The actual voltage supplied to the solenoid pilots must be at least 10.8VDC. A synthesis of the verification algorithm is shown here below. Maximum current: I max [A] = no. of solenoid pilots controlled simultaneously x 3.2 + no. of active solenoid valves x 0.3

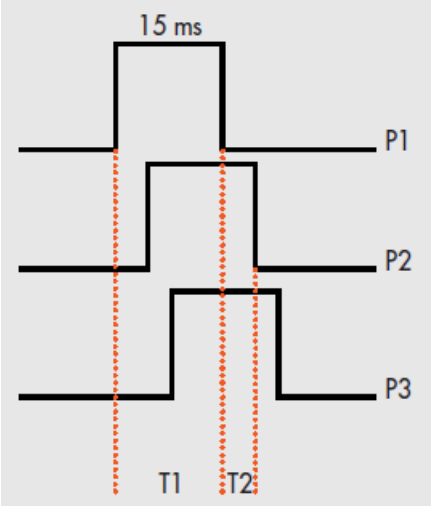
Voltage drop: with a M8 cable: ΔV = Imax [A] x Rs [0.067Ω/m] x 2L [m] Where Rs is the cable resistance and L its length.
The voltage at the cable inlet, Vin must be at least 10.8VDC + ΔV

Example:
12VDC supply voltage, 5 m cable, 3 pilots activate while other 10 are already active:

- I max = 3×3.2 + 10×0.3 = 1.05 A 12
- ΔV = (1.05 x 0.067 x 2×5) = 0.70 VDC

This means that at the power supply voltage greater than or equal to 10.8 + 0.7 = 11.5 VDC is required. Vin =12 VDC > 11.5 –> OK

Input current
Solenoid valves are controlled via an electronic board equipped with a microprocessor. In order to ensure safe operation of the valve and reduce energy consumption, a “speed-up” control is provided, i.e. 3W is supplied to solenoid pilot for 15 milliseconds and then power is gradually reduced to 0.25W. The microprocessor regulates, via a PWM control, the current in the coil, which remains constant regardless of the supply voltage and temperature, thus keeping the magnetic field generated by the solenoid pilot unchanged. For the system power supply to be properly scaled, it is important to take into account the number of valves to be controlled simultaneously* and the number of those already active. By simultaneous control is meant the activation of all solenoid pilots with a time difference less than 15 milliseconds.



- Total current consumption is equal to the power consumed by the solenoid pilots plus the current consumed by the electronics controlling the bases. To simplify the calculation, you can consider 3.2W consumed by each solenoid pilot simultaneously and 0.3W by each active solenoid pilot.
    - I max [A] = No. of simultaneously-controlled solenoid pilots x 3.2 + no. of active solenoid pilots x 0.3

Example:

- No. of simultaneously-controlled solenoid pilots = 10
- No. of active solenoid pilots = 15
- VDC = Supply voltage 24
    - T1 = P1 + P2 + P3 = 3 simultaneously-controlled solenoid pilots
    - T2 = P2 + P3 = 2 simultaneously-controlled solenoid pilots

The input current of 180 mA consumed by the Fieldbus electrical terminal must be added to the resulting current.

Summary table

- The total power consumed during speed-up 3.2 W
- The total power consumed during the holding phase 0.3 W
- Power consumed by the Fieldbus electrical terminal 4 W

The maximum current required to control solenoid valves and supplied by the IO-Link power supply connection terminal is 4A. If the current exceeds the maximum value, an Intermediate module – M with an additional power supply must be added to the system (see subsection 7.1).

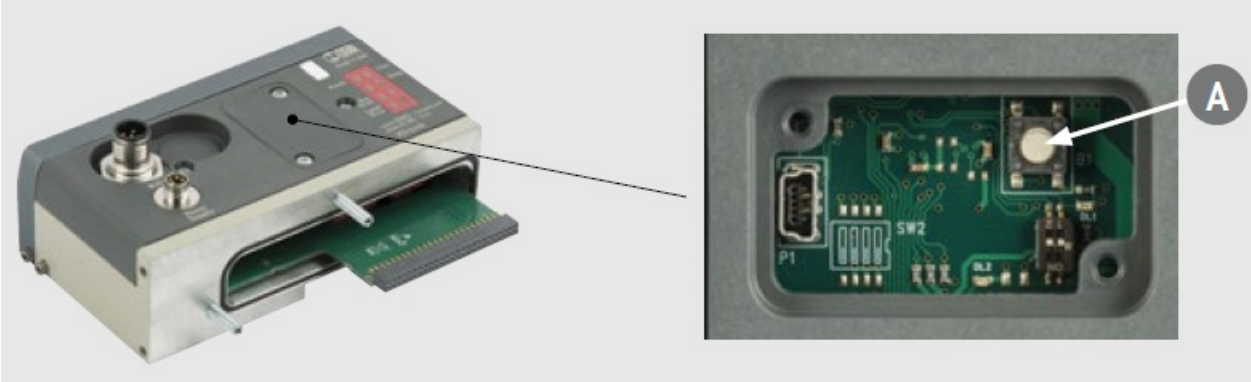
COMMISSIONING

WARNING
Power off the system before plugging or unplugging the connector (risk of functional damage). Connect the device to the earth using a suitable lead. Failure to make the earth connection may cause faults and irrevocable damages in the event of electrostatic discharge. Use fully assembled valve units only.

EB 80 SYSTEM CONFIGURATION
Before using the EB 80 system, it is necessary to configure it through a procedure that reveals its composition. Proceed as follows:

- disconnect the M8 power connector;
- open the door of the module;
- press button “A” and reconnect the M8 power connector, by holding it down until all the indicator lights on the system, valve bases, signal modules and additional islands temporarily flash.

The EB 80 system is highly flexible and its configuration can be changed at any time by adding, removing or altering the bases for valves, signal modules or additional islands. The configuration must be effected after each change made to the system. In the case of islands with additional electrical connection or M8 modules with 6 digital outputs + power supply, for them to be properly configured, all the modules must be powered.



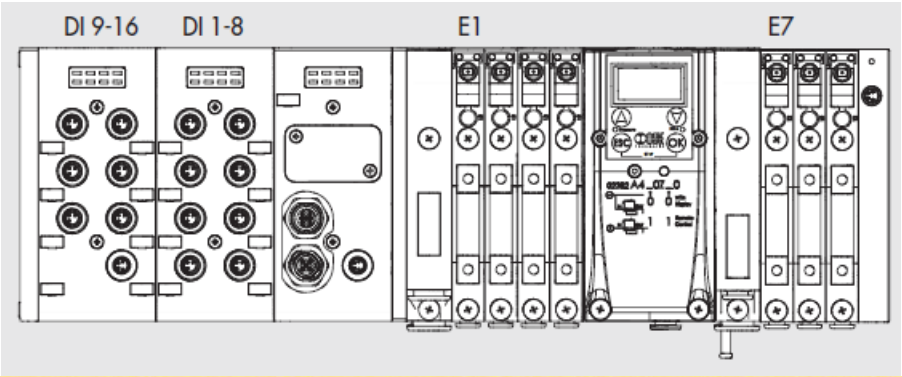
IMPORTANT
If the initial configuration has been changed, some solenoid valve addresses are likely to displace. Address displacement occurs in any of the following cases:

- the addition of valve bases among existing ones;
- the replacement of a valve base with one of a different type;
- the elimination of one or more intermediate valve bases;
- the addition or elimination of islands with Additional Electrical Connection between pre-existing islands. The addition or elimination of additional islands at one end of the system does not entail any address displacement. The new addresses are subsequent to existing ones.

ADDRESSING
The EB 80 system provides a large address size of up to 16 input bytes and up to output 16 bytes, subdivided as follows:

- 4 bytes for valve bases (pneumatic module), maximum 32 solenoid pilots;
- 4 bytes for digital input signal modules, maximum 32 digital inputs;
- 1 byte for diagnostics.
- 1 input bytes for the pressure switch function of all the Proportional Pressure Regulator (bit 0 Unit 1… bit 5 Unit 6)
- 2 input bytes for regulated pressure reading of each Proportional Pressure Regulator.
- 2 output bytes for pressure control of each Proportional Pressure Regulator.

The output bytes for pressure control are subsequent to those of the valves installed even if subsequent to the regulator. The input bytes for reading the regulated pressure are subsequent to those of the status byte and the digital input modules installed. The pressure values are expressed in mbar. The pressure set can be set from 0 to 10000 mbar.



CPU 1500 + EB 80 IO-Link 32+32 - Reg Press ▸ PLC_1 [CPU 1510SP-1 PN] ▸ Watch and forc

	Name	Address	Display format	Monitor value
1	"Pressure Switch REG 1"	%I36.0	Bool	TRUE
2	"Read Pressure REG 1"	%IW37	DEC+/-	2999
3	"Set Pressure REG 1"	%QW43	DEC	3000

Assigning data bits to solenoid valve base outputs

bit 0	***bit 1***	***bit 2***	***bit 3***	***…***	***bit 31***
Out 1	*Out 2*	*Out 3*	*Out 4*	*…*	*Out 32*

Examples of solenoid pilot output addresses
Base for 3- or 4-control valves – Only valves with one solenoid pilot can be installed.

Valve type	***Valve with 1 solenoid pilot***	***Valve with 1 solenoid pilot***	***Dummy or by pass valve***	***Valve with 1 solenoid pilot***	***Dummy or by pass valve***	***Valve with 1 solenoid pilot***
1 solenoid pilot	*14*	*14*	*–*	*14*	*–*	*14*
Output	*Out 1*	*Out 2*	*Out 3*	*Out 4*	*Out 5*	*Out 6*

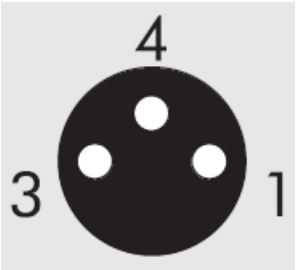
Each base occupies all the positions. The control of non-connected outputs generates an interrupted solenoid pilot alarm.

Valve type	*Valve with 2 solenoid pilots*	*Valve with 1 solenoid pilot*	*Dummy or by pass valve*	*Valve with 1 solenoid pilot*	*Dummy or by pass valve*	*Valve with 2 solenoid pilots*
1 solenoid pilot	*14*	*14*	*–*	*14*	*–*	*14*
2 solenoid pilot	*12*	*–*	*–*	*–*	*–*	*12*
Output	*Out 1*	*Out 3*	*Out 5*	*Out 7*	*Out 9*	*Out 11*
	Out 2	*Out 4*	*Out 6*	*Out 8*	*Out 10*	*Out 12*

M8 MODULE, 8 DIGITAL INPUTS
Each module can handle up to 8 digital inputs. Each input can be configured for either the PNP or the NPN sensor, Normally Open or Normally Closed. With the digital input module, the digital inputs can be read at a switching frequency of up to 1 kHz. High-frequency reading is available for all the inputs, with maximum 2 modules connected to the EB 80 Net network.

Type of inputs and power supply
Two- or three-wire digital PNP or NPN sensors can be connected. The sensors can be supplied by either a IO-Link node or Additional Electrical Connection power supply. In this way the sensors remain active even when the valve auxiliary power supply is switched off.

Electrical connections
Pin assignment of M8 connector



- 1 = +VDC (Sensor power supply)
- 3 = GND (Sensor power supply)
- 4 = Input

PROPORTIONAL PRESSURE REGULATOR

Assigning of input data byte
The input bytes for reading the regulated pressure are subsequent to those of the status byte and the digital input modules installed. Example with 2 digital input modules installed (1 status byte, 2 digital input bytes) and 2 of 8 control valve bases (2 out bytes):

PRESSURE SWITCH FUNCTIONS

bit 0	***bit 1***	***bit 2***	***bit 3***	***bit 4***	***bit 5***
Pressure switch regulator 1	*Pressure switch regulator 2*	*Pressure switch regulator 3*	*Pressure switch regulator 4*	*Pressure switch regulator 5*	*Pressure switch regulator 6*

PRESSURE SET

byte 3 – 4	***byte 5 – 6***	***byte 7 – 8***	***byte 9 – 10***	***byte 11 – 12***	***byte 13 – 14***
Pressure setting regulator 1	*Pressure setting regulator 2*	*Pressure setting regulator 3*	*Pressure setting regulator 4*	*Pressure setting regulator 5*	*Pressure setting regulator 6*

PRESSURE READING

byte 5 – 6	***byte 7 – 8***	***byte 9 – 10***	***byte 11 – 12***	***byte 13 – 14***	***byte 15 – 16***
Pressure readin g regulator 1	*Pressure readin g regulator 2*	*Pressure readin g regulator 3*	*Pressure readin g regulator 4*	*Pressure readin g regulator 5*	*Pressure readin g regulator 6*

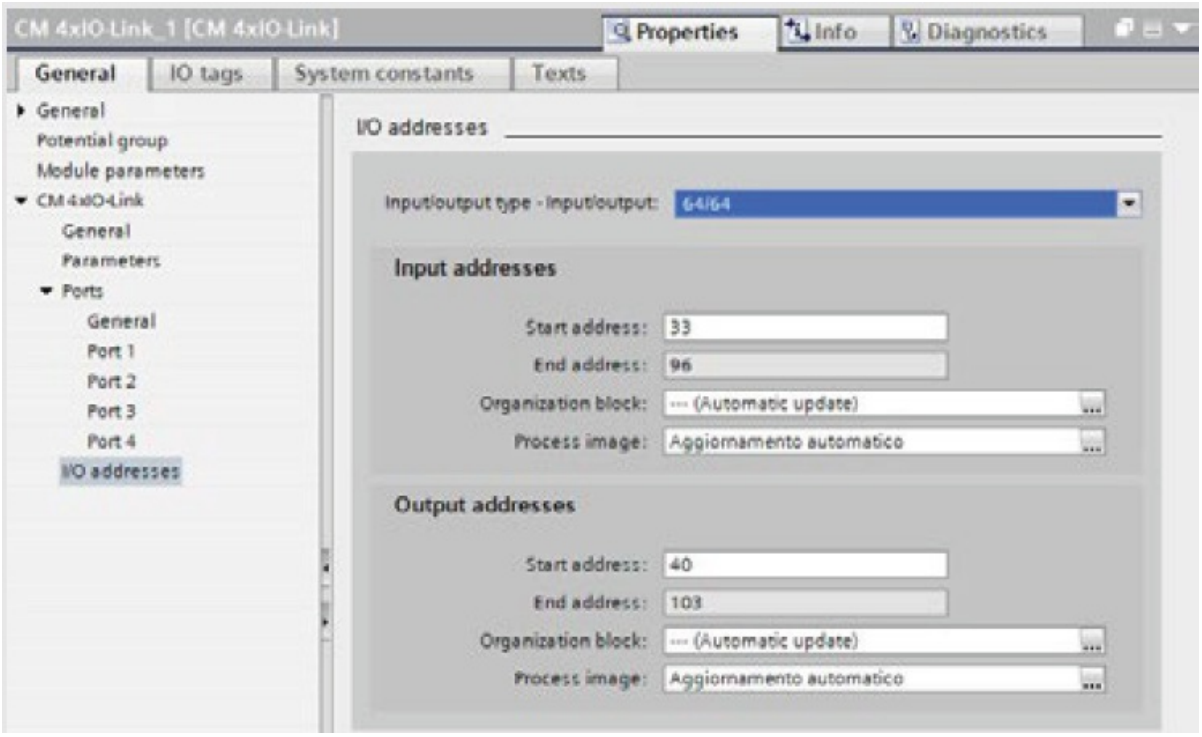
CONNECTIONS TO THE EB 80 IO-Link SYSTEM

- Connect the device to the earth.
- Connect the BUS IN connector to the IO-Link Master.
- Connect the connector to the power mains. The power supply of fieldbus supply is separate from that of the valves.
- The valves can be powered off keeping the communication with IO-Link Master active.

INSTALLATION OF THE EB 80 SYSTEM TO AN IO-Link NETWORK

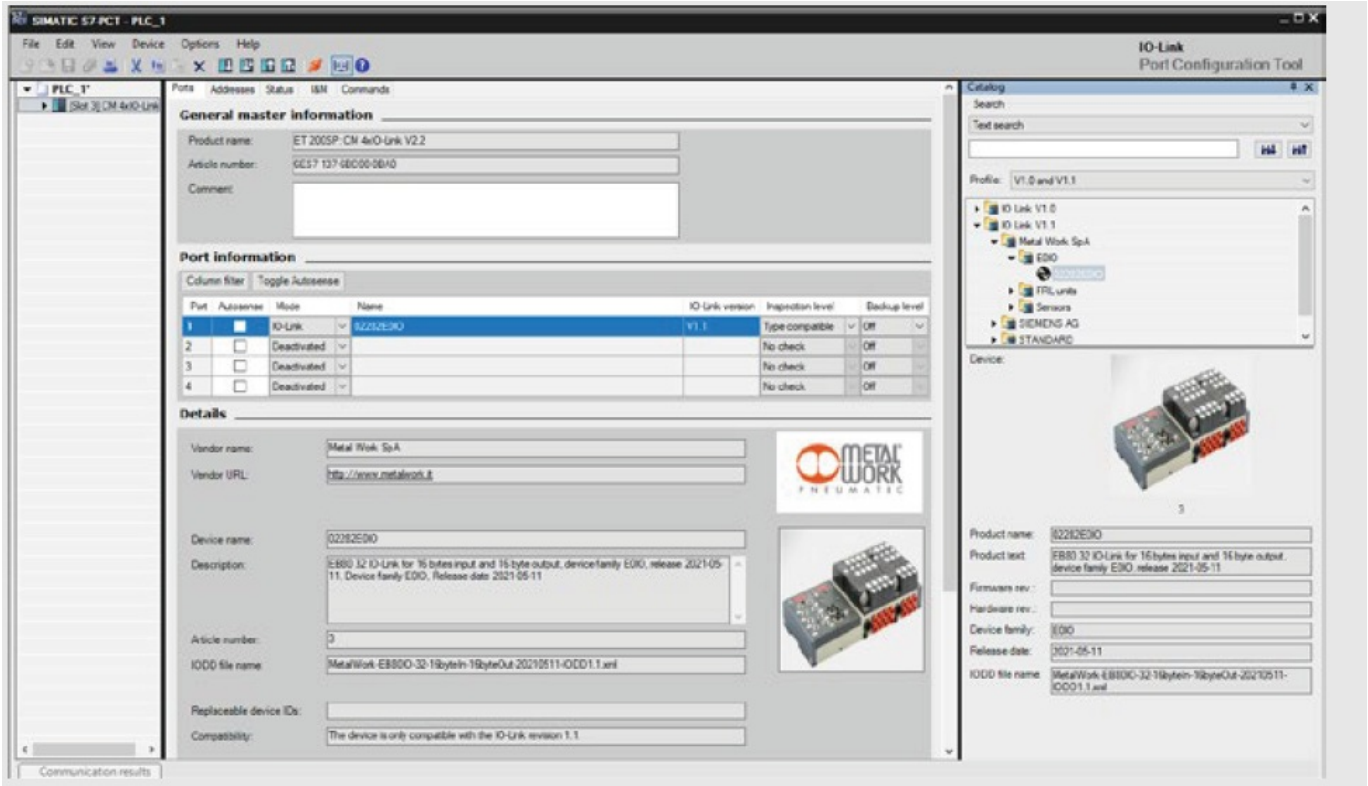
- Example of configuration with TIA Portal

EB 80 IO Link can be used to control up to 32 solenoid pilots, 6 Proportional pressure regulators, 32 digital inputs and one byte for diagnostics, using maximum 16 byte output and 16 byte input. The system operates properly if an equal or a higher number of bytes is set.

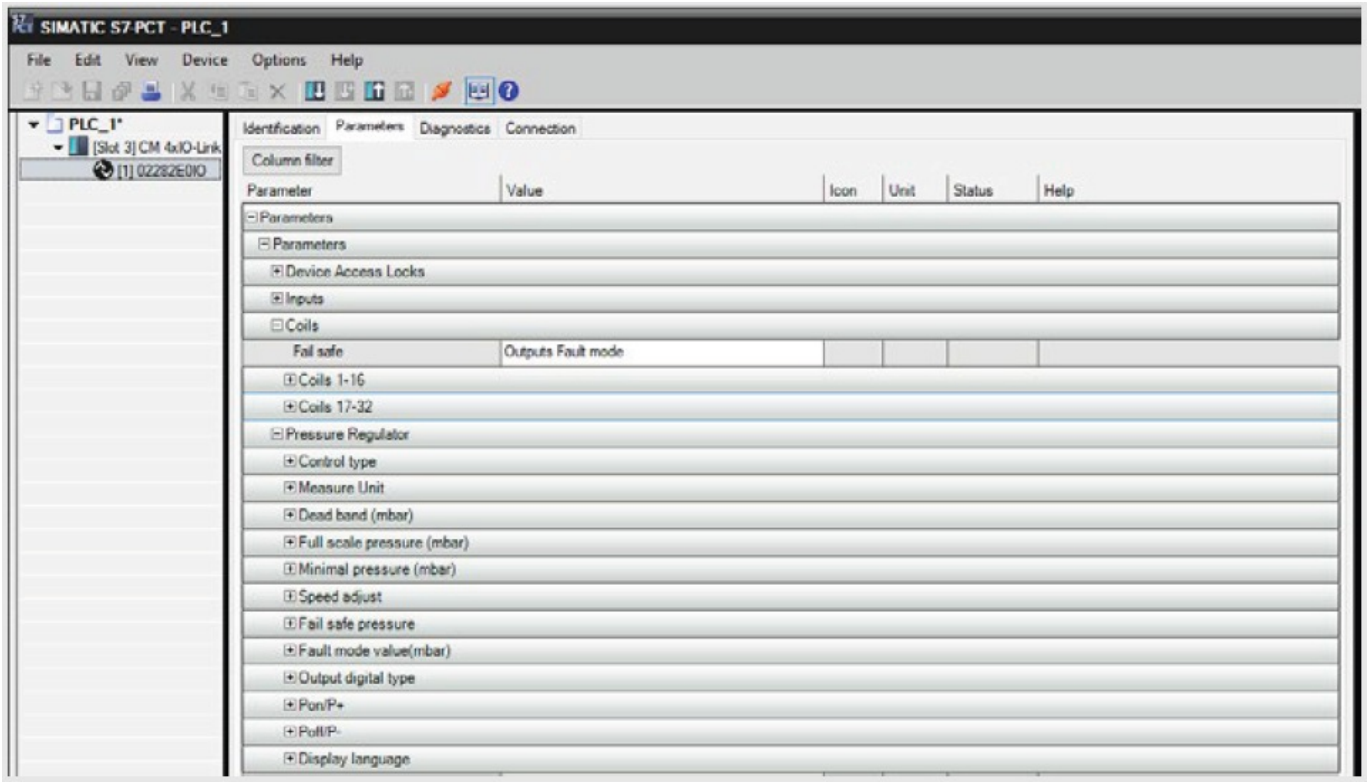


S7 PCT configuration

Upload the EB 80 IODD file to the catalogue. Select the 02282E0IO file from the IO Link V1.1/ Metal Work SpA/E0IO folder and install it in the designated port.



Parameter configuration



Fail-Safe Output
This function allows you to determine the state of the solenoid pilots and of the Proportional pressure regulators, in the event of interrupted communication with the Master.

Three different modes are possible:

- Output Reset (default), all the solenoid pilots are disabled.
- Hold Last State, all the solenoid pilots maintain their pre-interruption state with the Master communication.
- The Proportional Pressure Regulators remain at the state they found themselves when communication with the Controller was interrupted.
- Output Fault mode, Three different modes can be selected:
- Output Reset (default), all the solenoid pilots are disabled.
- Hold Last State, all the solenoid pilots maintain their pre-interruption state with the Master communication.
- Output Set, on the interruption of the communication with the Master, the solenoid pilot is Enabled.
- Output Fault mode, the Proportional Pressure Regulator regulates the pressure at the value set on the field “Fault mode value”.
- When the communication is restored the status of the solenoid pilots is resumed by the Master. The Master must control the event properly, in order to avoid uncontrolled movements.

Digital inputs configuration

Polarity

The polarity of each input can be selected as follows:

- PNP, the signal is active when the signal pin is connected to +VDC
- NPN, the signal is active when the signal pin is connected to 0VDC. The signal LED light is ON when the input

is active.

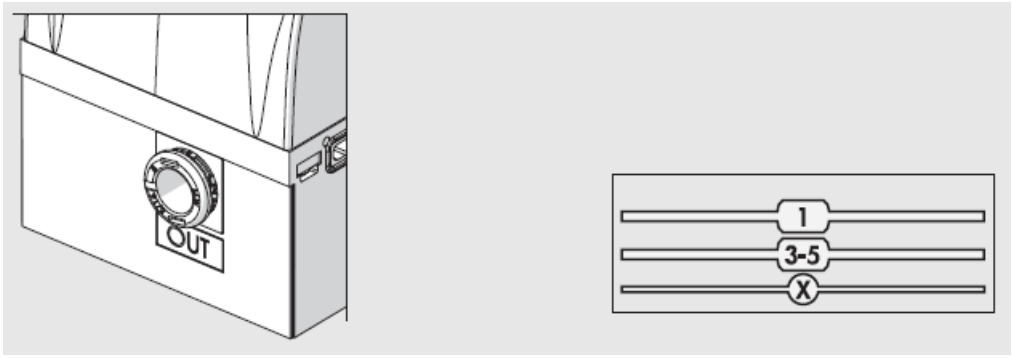
Operating state
The operating state of each input can be selected as follows:

- Normally Open, the signal is ON when the sensor is enabled. The LED light is on when the sensor is enabled.
- Normally Closed, the signal is ON when the sensor is disabled. The LED light is on when the sensor is disabled.

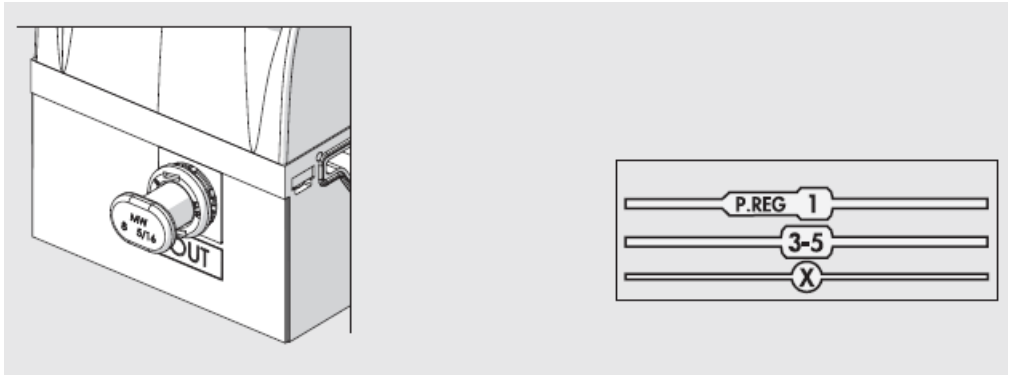
FEATURES OF PROPORTIONAL PRESSURE REGULATOR

- Preset pressure range 0.05-10 bar with possible full scale and minimum pressure regulation.
- 10-300 mbar adjustable deadband.
- The supply pressure must be at least 1 bar higher than the full-scale value, 10 bar max (in case of a regulated pressure of 10 bar is needed, is allowed a supply pressure of 10.5 bar)

PNEUMATIC CONNECTION
Pneumatic connection is via the Compressed air supply – P module. It is important not to exceed 10 bar max (10.5 bar in case of a regulated pressure of 10 bar is needed) and the compressed air to be filtered at 10 µm and dried, to prevent impurities or excessive condensate from causing a malfunction. The supply pressure must always be higher than the preset pressure. The regulator pressure must be at least 1 bar higher than the full scale value.
versions are available:
Local output, the air flow ducts of the base are the full flow type, the regulated pressure is available on the port of the Pressure Regulator base. The subsequent bases maintain supply pressure.



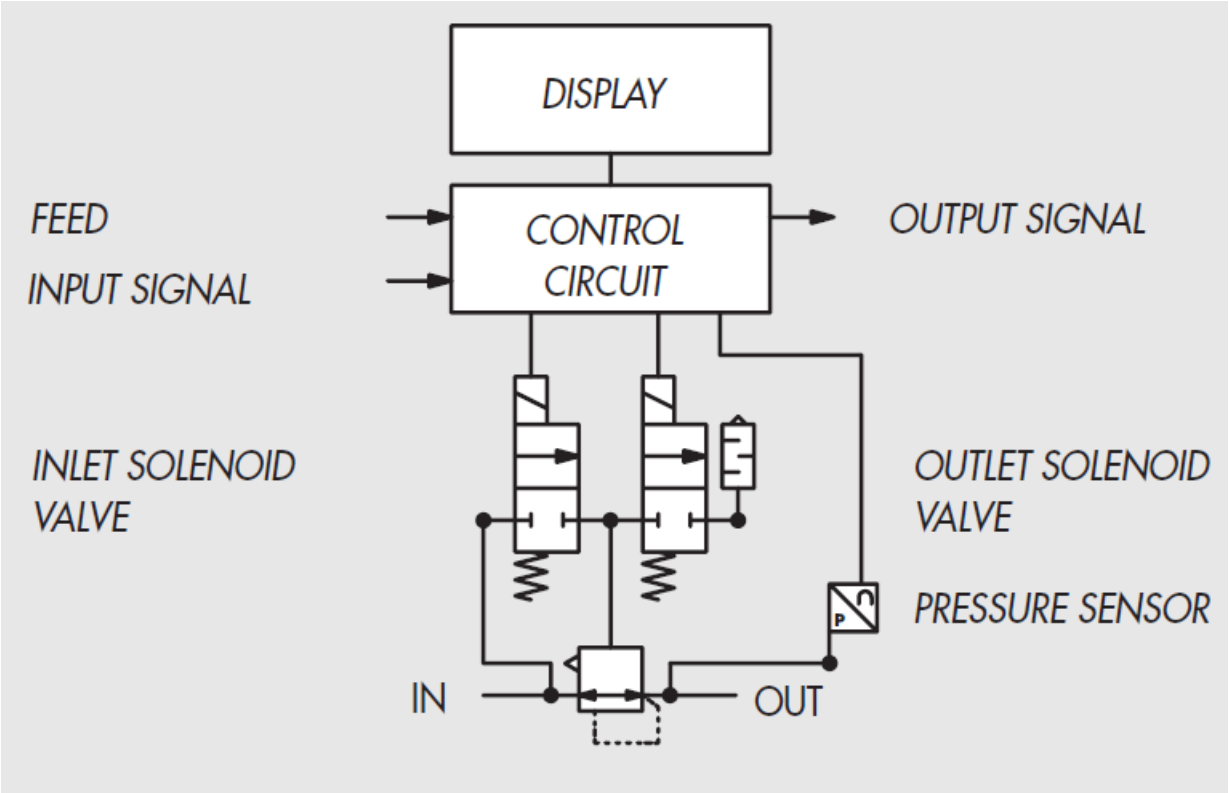
- Regulation in series, the pressure of the subsequent bases is regulated by the pressure regulator, the same pressure is also available on the port of the Pressure Regulator base.
- By applying a silencer on the exhaust port it is possible that the flow rates and response times may change. Periodically check the clogging of the silencer and replace it if necessary.



OPERATING PRINCIPLE
Using a software algorythm, the control circuit compares the input signal with the output pressure measured by the pressure sensor. When there is a change, it activates the inlet and outlet solenoid valves to re-establish an equilibrium. This gives an output pressure that is proportional to the input signal.

N.B.: removing the power supply, the outlet pressure doesn't get discharged.

Function diagram



SETTING

NB: the changes to the parameters can be made via the IO-Link Master or from the keyboard. The keyboard settings are temporary, when the system is restarted, the settings of the Master are restored.

Settings from the keyboard
In the version with the display, Press OK and ESC together to access the setting menu. Select the parameter using the arrow keys. Press ESC to return to the previous page. During setting, pressure regulation is NOT active.

DISPLAY

LANGUAGE

- Italiano
- English
- Deutsch
- Español
- Français

UNIT OF MEAS

- bar
- psi
- MPa

N.B.: Pressure settings, like pressure regulated, dead band, full scale and minimum pressure, when set by the Master IO-Link, are always defined in mbar.

CONTRAST – The function is only available from the keyboard

- Manual display contrast adjustment.
- Select CONTRAST using the arrow keys, then press OK.
- Select the value using the arrow keys, then press OK.
- Compensation as a function of temperature is automatic.

ORIENTATION
Allows you to rotate the display 180 °

- Select ORIENTATION.
- Press OK to rotate the diplsay

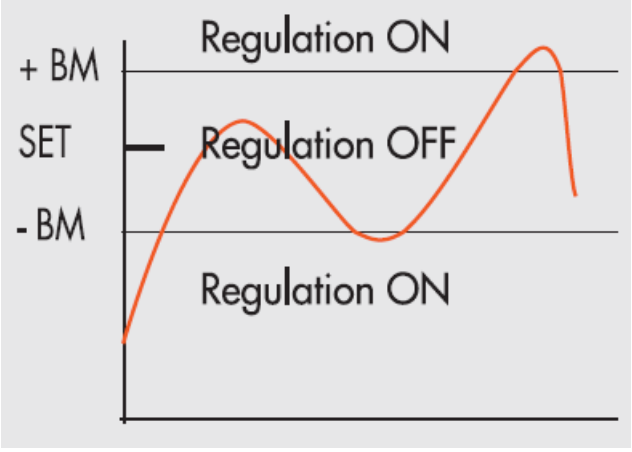
SET UP

INPUT

- BUS
- Keypad
    - For the type of keypad input, set the pressure value using the arrow keys. When you press the display buttons, the set pressure appears; when you release them, the preset pressure is displayed.

DEAD BAND

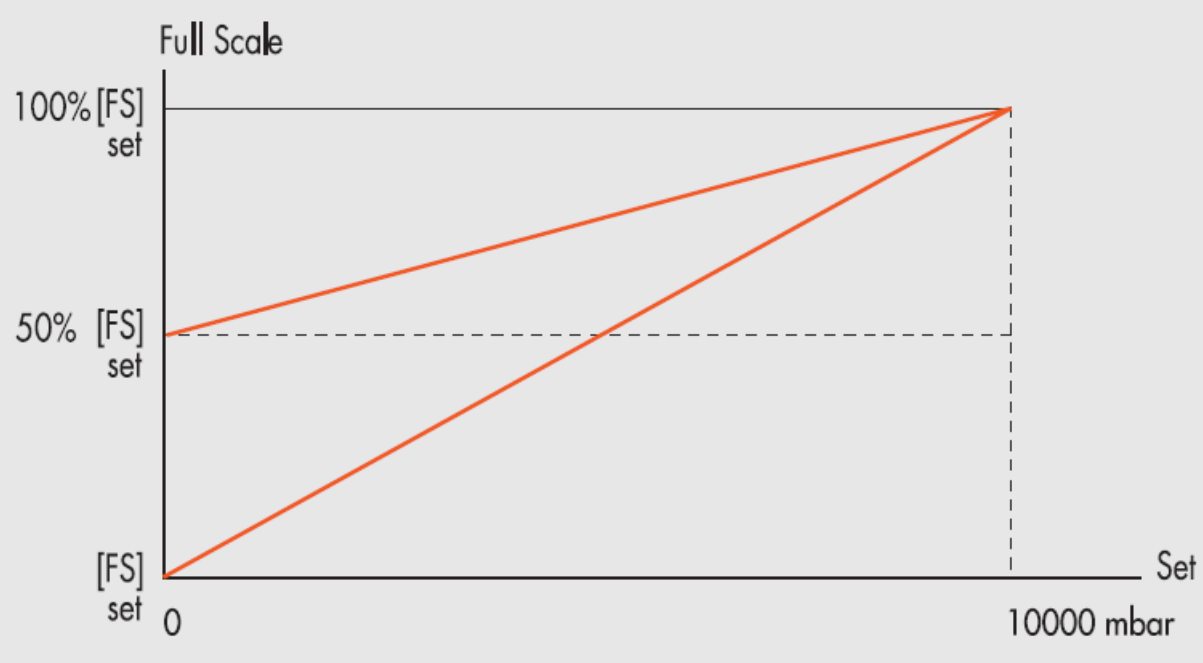
This indicates the pressure range in proximity to the set pressure, within which regulation is active. The deadband is + and – the set value. It is expressed in mbar, the minimum settable value is10 mbar, the maximum value is 300 mbar. It is advisable to enter low values, 10 or 15 mbar, only if high regulation accuracy is required. High accuracy involves more work for the solenoid valves.



FULL SCALE

This indicates the maximum preset pressure. The value is expressed in mbar, the maximum settable value is 10000 mbar. For optimal regulation, the supply pressure must be equal to FS (Full Scale) + 1 bar.

MINIMUM PRESSURE
Indicates the minimum regulated pressure with set 0. Its value must be less than the full scale set.



The minimum value which can be set with Keyboard Set is the Minimum Pressure value.

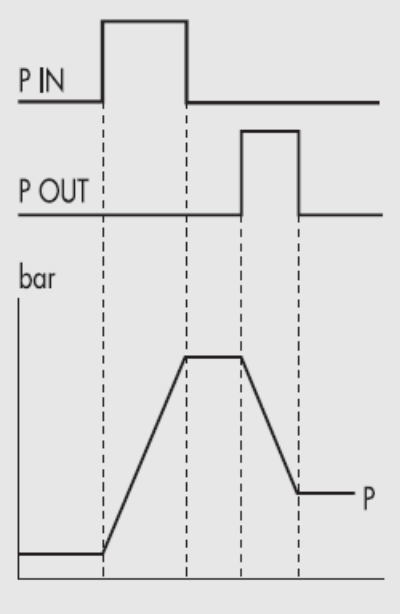
SPEED REGULATION CONTROL
Can be used to change the regulator response speed, can be set from 1 to 10.

ZERO SETTING (TEMPERATURE COMPENSATION) – The function is only available from the keyboard
The instrument is calibrated at an ambient temperature of 20°C. The pressure value measured by the internal transducer can vary with the ambient temperature and it may be necessary to reset the reading. The value read can be reset through the reset function. The function is only active if the pressure displayed is less than 150 mbar. Upon zero resetting, the temperature compensation activates and the consequent change in pressure is automatically compensated.

CAUTION: the resetting has an effect on the calibration of the instrument. Before making it, make sure the supply pressure has been removed and the output circuit is disconnected.

DEBUG – The function is only available from the keyboard

- Utility used for checking correct operation of the two solenoid valves.



- Select DEBUG, and press OK.
- Select PIN and press OK. The in solenoid valve activates and the pressure increases..
- Press OK. The in solenoid valve deactivates and pressure stabilizes.
- Select POUT and press OK. The out solenoid valve activates and pressure decreases.
- Press OK, the out solenoid valve deactivates and pressure stabilizes.

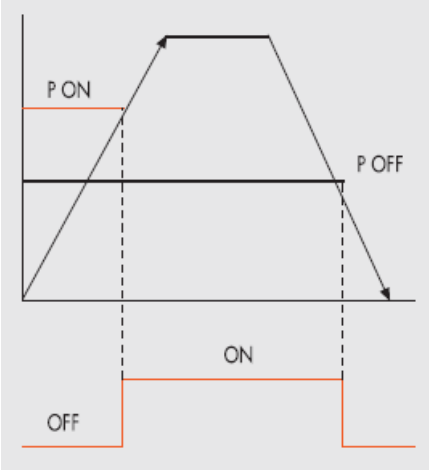
PASSWORD – The function is only available from the keyboard
This is a three-digit code used to protect the set configuration.

- Select SET PASSWORDwith the arrow keys and click OK. On the setting page, use the arrow keys to enter the desired value and click OK to confirm. The system then displays the confirmation message “PASSWORD SAVED”.
- Select PASSWORD, and click OK to enable/disable the function. If the password set to ON it prevents access to the configuration menu. When you press OK+ESC together to access the configuration menu, you are prompted to enter the password. Enter the saved password. You can use the arrow keys to change the value or click OK to change the field. If the password is set to OFF, it is not enabled.

If you forget the password, contact the manufacturer to obtain a password reset code.

DIGITAL OUTPUT
A bit is available for the digital pressure switch function with the relative activation / deactivation thresholds, P ON (P +) and P OFF (P-) expressed in mbar.

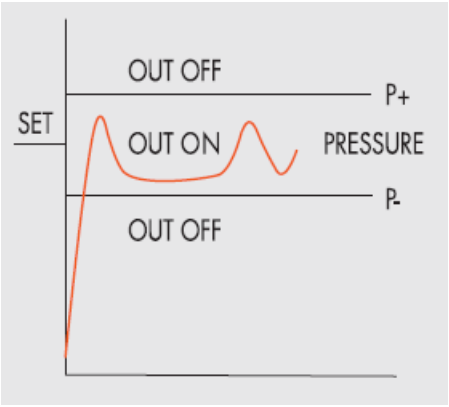
PRESSURE SWITCH CONFIGURATION (P)



Keyboard setting:

- Select OUTPUT using the arrow keys, then press OK.
- Select CONFIGUR. to select the operating mode, then press OK.
- Select PRESSURE SWITCH, then press OK. PRESSURE SWITCH mode, shown with CONFIGUR. P. has been selected.
- Use the arrow keys to select PRESSURE SWITCH and press OK.
- Select P ON and press OK. Enter the desired activation pressure and press OK.
- Select P OFF and press OK. Enter the desired deactivation pressure and press OK.
- Press ESC to exit the menu.

SET (S) REFERENCE
This function can be used to make a “variable” setting for the pressure switch. Out is activated when the preset pressure is reached, with a tolerance defined by P+ and P-.



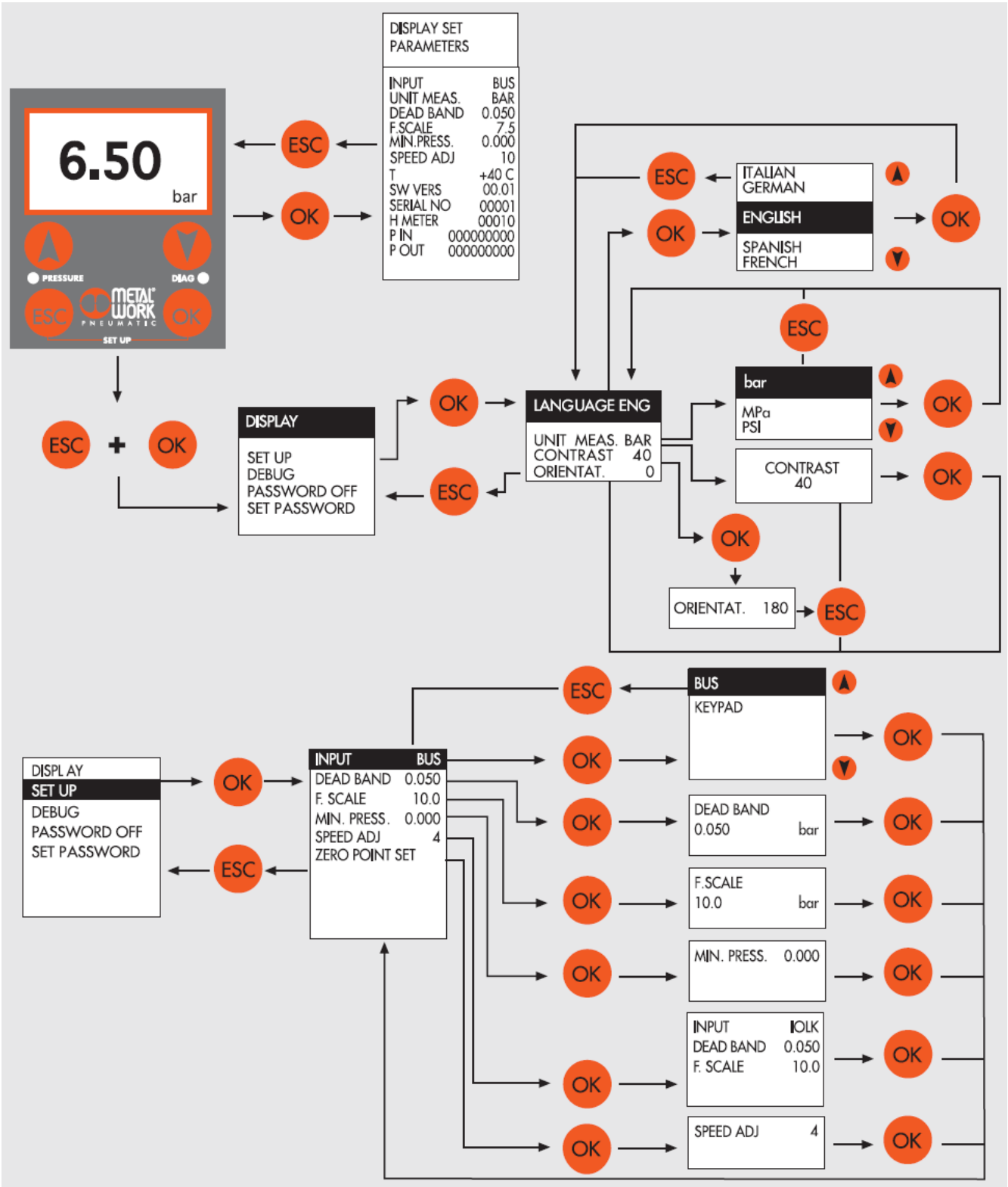
Keyboard setting:

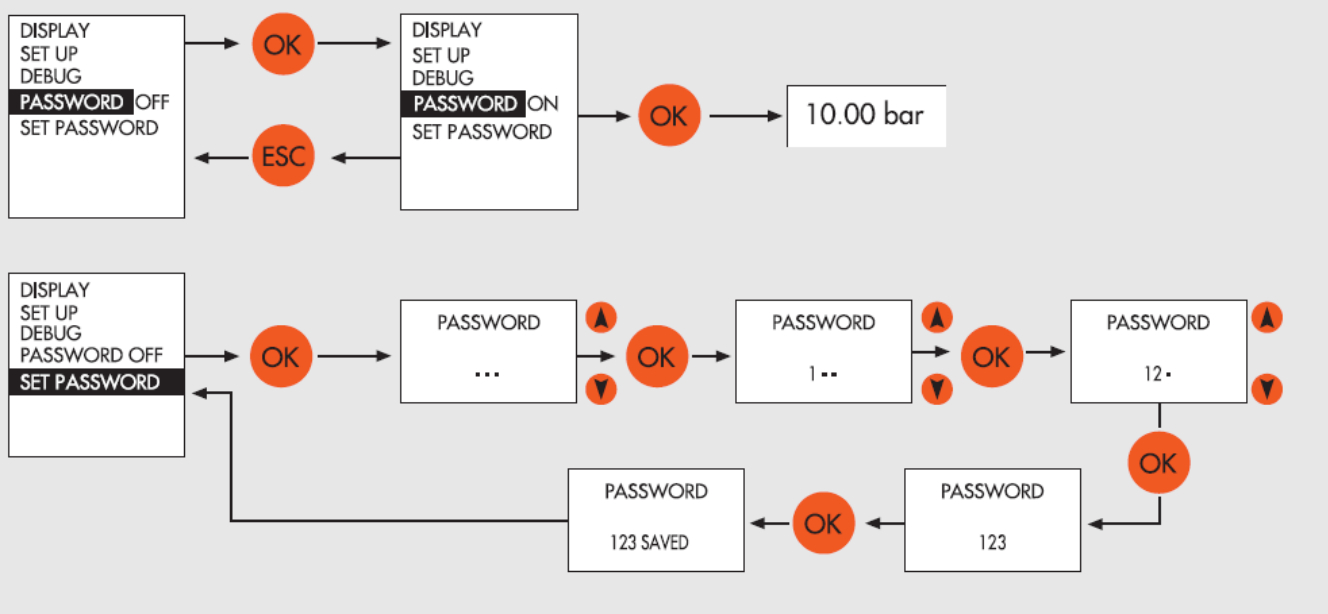
- Select OUTPUT using the arrow keys, then press OK.
- Select CONFIGUR. to select the operating mode, then press OK.
- Select SET. REF and press OK. SET REFERENCE mode, shown with CONFIGUR. S. has been selected.
- Use the arrow keys to select PRESSURE SWITCH and press OK.
- Select SET.REF and press OK.
- Select P+ and press OK.
- Enter the upper tolerance pressure and press OK.
- Select P- and press OK. Enter the lower tolerance pressure and press OK.

- Press ESC to exit the menu.

ACCESS TO THE MENU FROM THE KEYBOARD

- Press OK to display the set parameters.
- Press OK and ESC together to access the parameter setting menu.
- Use the up and down arrows to scroll through the menu and modify the parameters.





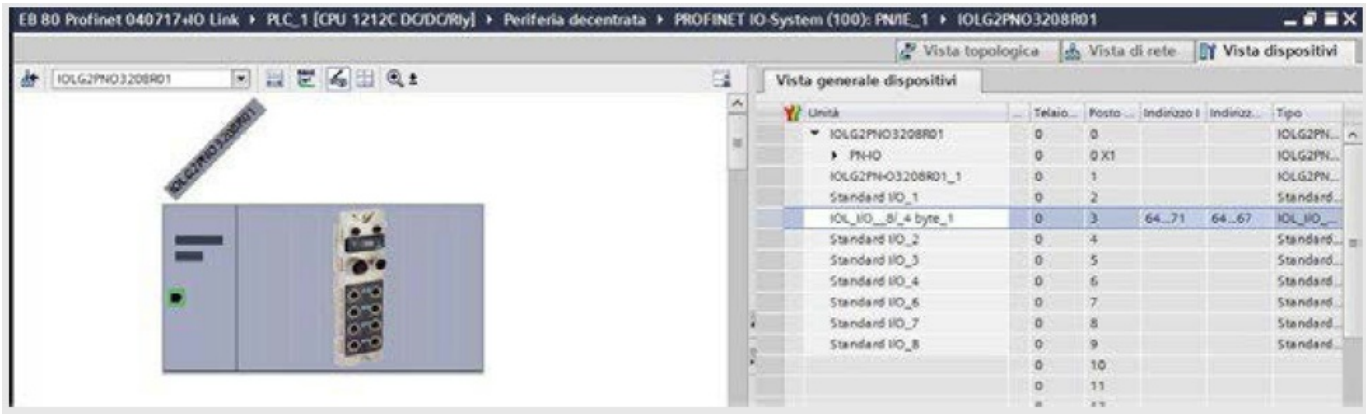
INSTALLATION SYSTEM TO AN IO-Link NETWORK

INSTALLATION WITHOUT USING CONFIGURATION FILE

Some Master modules do not use the IODD file for the configuration of operating parameters. In this case, the device must be configured manually.

EXAMPLE OF CONFIGURATION WITH A SICK GATEWAY PROFINET/ IO-LINK MASTER:

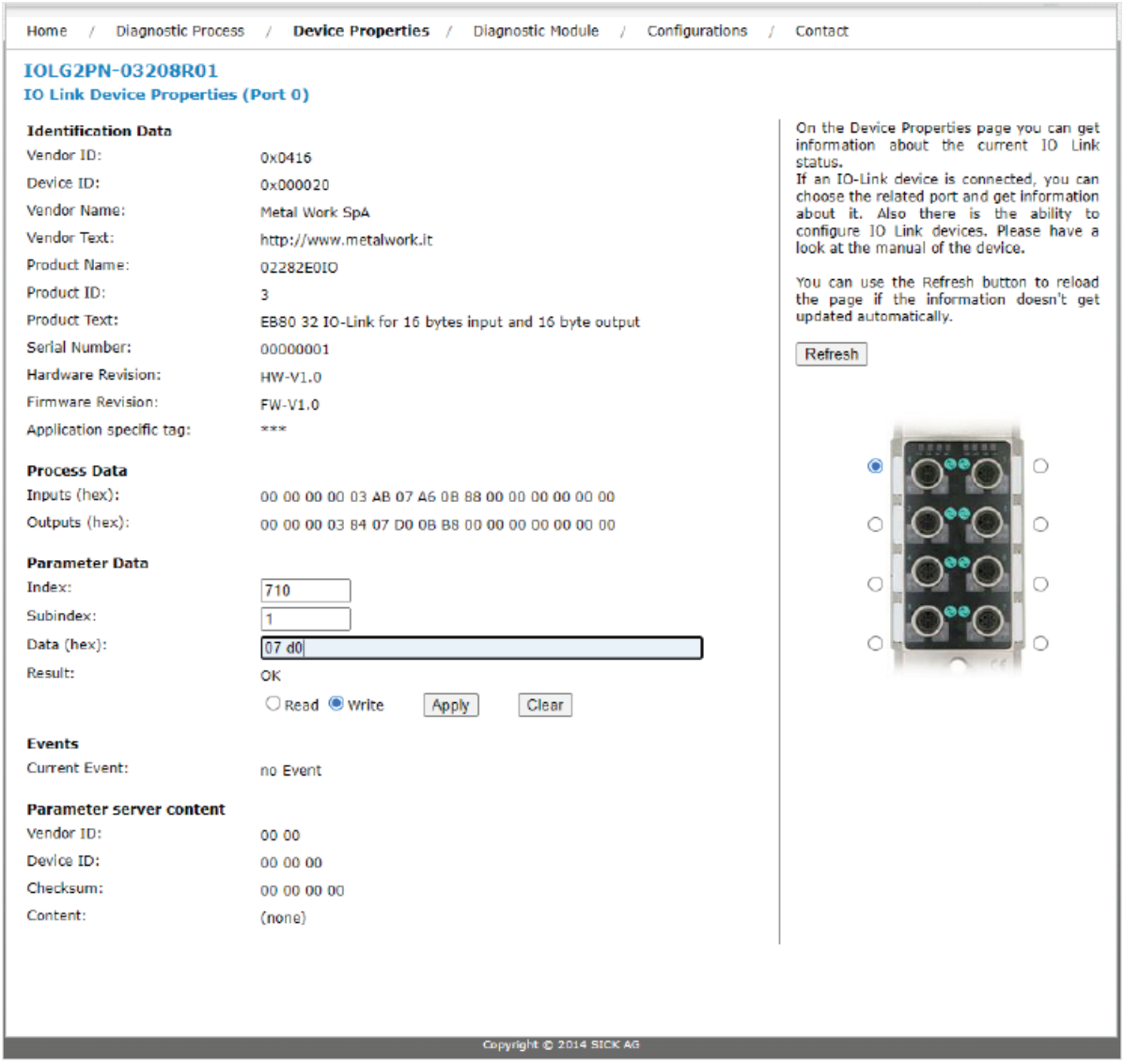
Profinet Device Configuration
Install the Gateway in the Profinet Controller development environment. Configure the designated IO-Link, with 16-byte Inputs and 16-byte Outputs (IOL_I/O_16/16 byte).



- First load the Controller project and connect the EB 80 to the associated IO-Link port.

Parameter Configuration

The parameters of the unit can be configured by accessing the Gateway via a browser, by typing in the IP address in the bar, which can be retrieved in the accompanying documentation together with Login and Password.
Selecting the port to which the EB 80 has been connected will display all the data and parameters stored in the device.



The Process Data area displays the state of Inputs and Outputs. The operating parameters can be entered in the Parameter Data area. The parameters must be entered using the specific index.

The configurable parameters are:

- Fail-Safe Output;
- Digital Input Polarity;
- Digital Input Activation state.
- Operating parameters of proportional pressure regulators. See paragraph 6.3 for details.

List of Parameters valves and digital Input

Parameter		***Index (subindex = 00)***	***Value***
	Fail safe output	65	*0 = Fail safe Reset (default) 1 = Hold Last State* *2 = Fault Mode*
	OUT 1	*66*	
	OUT 2	*67*	

FAIL-SAFE OUTPUT	*OUT 3*	*68*	*0 = Hold Last State* *1 = Out Reset (default) 2 = Out Set*
	OUT 4	*69*	
	OUT 5	*70*	
	OUT 6	*71*	
	OUT 7	*72*	
	OUT 8	*73*	
	OUT 9	*74*	
	OUT 10	*75*	
	OUT 11	*76*	
	OUT 12	*77*	
	OUT 13	*78*	
	OUT 14	*79*	
	OUT 15	*80*	
	OUT 16	*81*	
	OUT 17	*82*	
	OUT 18	*83*	
	OUT 19	*84*	
	OUT 20	*85*	
	OUT 21	*86*	
	OUT 22	*87*	
	OUT 23	*88*	
	OUT 24	*89*	
	OUT 25	*90*	
	OUT 26	*91*	
	OUT 27	*92*	
	OUT 28	*93*	
	OUT 29	*94*	
	OUT 30	*95*	
	OUT 31	*96*	
	OUT 32	*97*	

	Parameter	Index (subindex = 00)	Value
DIGITAL INPUT POLARITY	IN 1	98	
	IN 2	99	
	IN 3	100	
	IN 4	101	
	IN 5	102	
	IN 6	103	
	IN 7	104	
	IN 8	105	
	IN 9	106	
	IN 10	107	
	IN 11	108	
	IN 12	109	
	IN 13	110	
	IN 14	111	
	IN 15	112	
	IN 16	113	0 = Polarity PNP (default) 1 = Polarity NPN
	IN 17	114	
	IN 18	115	
	IN 19	116	
	IN 20	117	
	IN 21	118	
	IN 22	119	
	IN 23	120	
	IN 24	121	
	IN 25	122	
	IN 26	123	
	IN 27	124	
	IN 28	125	
	IN 29	126	
	IN 30	127	
	IN 31	128	
	IN 32	129	

	Parameter	Index (subindex = 00)	Value
DIGITAL INPUT ACTIVATION STATE	IN 1	130	
	IN 2	131	
	IN 3	132	
	IN 4	133	
	IN 5	134	
	IN 6	135	
	IN 7	136	
	IN 8	137	
	IN 9	138	
	IN 10	139	
	IN 11	140	
	IN 12	141	
	IN 13	142	
	IN 14	143	
	IN 15	144	
	IN 16	145	0 = NO (default) 1 = NC
	IN 17	146	
	IN 18	147	
	IN 19	148	
	IN 20	149	
	IN 21	150	
	IN 22	151	
	IN 23	152	
	IN 24	153	
	IN 25	154	
	IN 26	155	
	IN 27	156	
	IN 28	157	
	IN 29	158	
	IN 30	159	
	IN 31	160	
	IN 32	161	

List of Parameter Proportional pressure regulator

Function	***Index***	***Subindex***	***Proportional pressure regulator***	***Value***
Type of control	*701*	*1*	*1*	*0 = PLC (default) 1 = Key pad*
		2	*2*	
		3	*3*	
		4	*4*	
		5	*5*	
		6	*6*	
Unit of measure	*702*	*1*	*1*	*0 = bar (default) 1 = Mpa* *2 = psi*
		2	*2*	
		3	*3*	
		4	*4*	
		5	*5*	
		6	*6*	
		1	*1*	
		2	*2*	

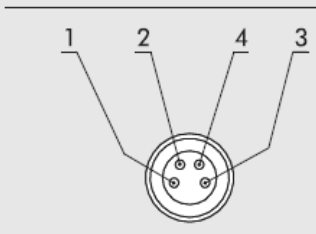
Dead band	*703*	*3*	*3*	*10…300* *(default 50)*
		4	*4*	
		5	*5*	
		6	*6*	
Full scale	*704*	*1*	*1*	*10…10000* *(default 10000)*
		2	*2*	
		3	*3*	
		4	*4*	
		5	*5*	
		6	*6*	
Minimum pressure	*705*	*1*	*1*	*0…5000* *(default 0)*
		2	*2*	
		3	*3*	
		4	*4*	
		5	*5*	
		6	*6*	
Speed regulation control	*706*	*1*	*1*	*1…10* *(default 10)*
		2	*2*	
		3	*3*	
		4	*4*	
		5	*5*	
		6	*6*	

Function	Index	Subindex	Proportional pressure regulator	Value
Fail safe condition	707	1	1	0 = Hold last state 1 = Output Fault mode (default)
		2	2	
		3	3	
		4	4	
		5	5	
		6	6	
Fail safe pressure in the output fault condition	708	1	1	0...10000 (default 0)
		2	2	
		3	3	
		4	4	
		5	5	
		6	6	
Digital OUT	709	1	1	0 = Pressure switch (default) 1 = Set reference
		2	2	
		3	3	
		4	4	
		5	5	
		6	6	
Digital OUT activation threshold (Pon / P +)	710	1	1	0...10000 (default 70000)
		2	2	
		3	3	
		4	4	
		5	5	
		6	6	
Digital OUT deactivation threshold (Poff / P -)	711	1	1	0...10000 (default 5000)
		2	2	
		3	3	
		4	4	
		5	5	
		6	6	
Display language	712	1	1	0 = Italiano 1 = Deutsch 2 = English (default) 3 = Espanol 4 = Francais
		2	2	
		3	3	
		4	4	
		5	5	
		6	6	

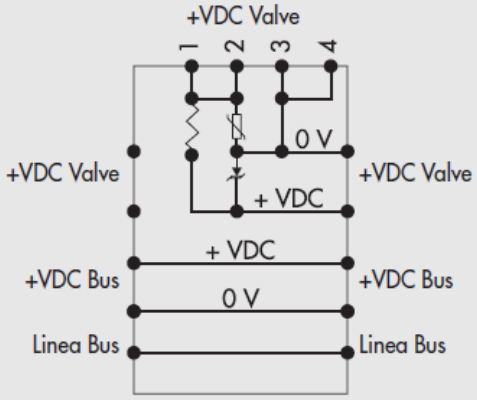
ACCESSORIES

INTERMEDIATE MODULE – M, WITH ADDITIONAL POWER SUPPLY

Intermediate modules with additional power supply can be installed between valve bases. They either provide additional power supply when numerous solenoid pilots are activated at the same time or electrically separate some areas of the valve island from others, e.g. when some solenoid valves need to be powered off when a machine safety guard needs to be opened or an emergency button has been pressed, in which case only the valves downstream the module are powered on. Various types are available with different pneumatic functions. The maximum solenoid valve control current supplied by the intermediate module with additional power supply is 8A.



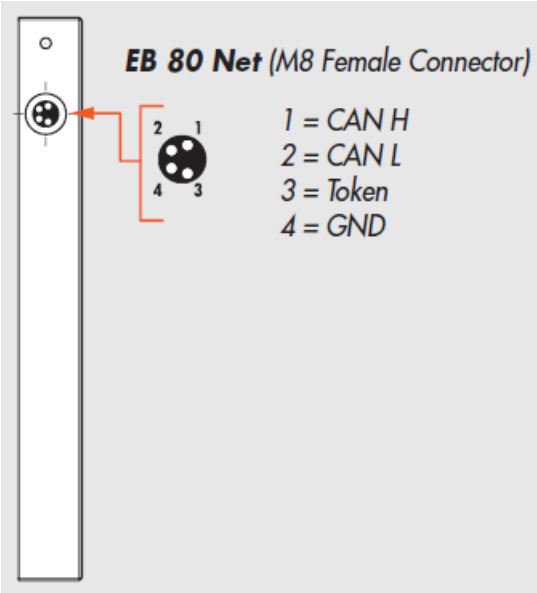
PIN	Colour	Function
1	Brown	+VDC
2	White	+VDC
3	Blue	GND
4	Black	GND



WARNING
It cannot be used as a safety function as it only prevents power supply from turning on. Manual operation or faults can cause involuntary movements. For greater security, relieve all pressure in the compressed air system before carrying out hazardous operations.

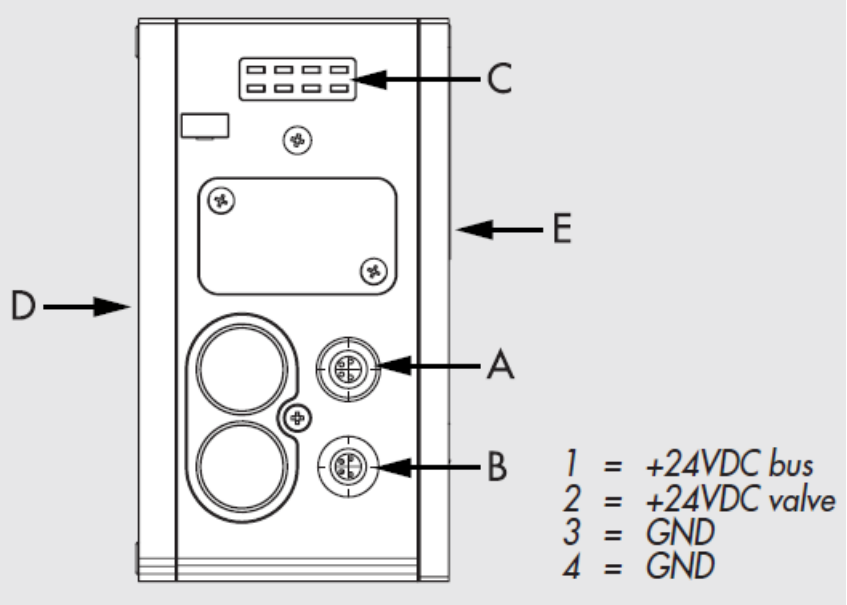
ADDITIONAL ELECTRICAL CONNECTION – E0AD
Additional Electrical Connection – E can be used to connect multiple EB 80 systems to one IO-Link node. To do this, the main island must be equipped with a C3-type blind end plate with an M8 connector. The connection of multiple systems requires all the additional islands to be equipped with C3 blind end plates, except for the last one that must be fitted with a C2 blind end plate with an EB 80 Net serial line termination connector. Optionally, if a provision for subsequent upscale is required, a C3 blind end plate can be installed also on the last-in-line island, in which case it is necessary to add an M8 termination connector code 02282R5000. For proper operation of the entire EB 80 Net system, only use the prewired, shielded and twisted M8-M8 cables shown in Metal Work catalogue.
Additional electrical connection can be used to connect bases for valves and signal modules – S, just like with islands with an IO-Link node.

End plate with intermediate control



Electrical connections and signal display elements

- A Connection to the EB 80 Net network
- B Connection to power the Additional electrical line and the valve auxiliary line
- C EB 80 diagnostic indicator light
- D Connection to Signal modules
- E Valve base connection



Electrical connections: pin assignment of M8 connector for Additional Electrical Connection power supply

- 1 = 24VDC Additional electrical connection power supply and input/output modules
- 2 = 24VDC Valve auxiliary power supply
- 3 = GND
- 4 = GND

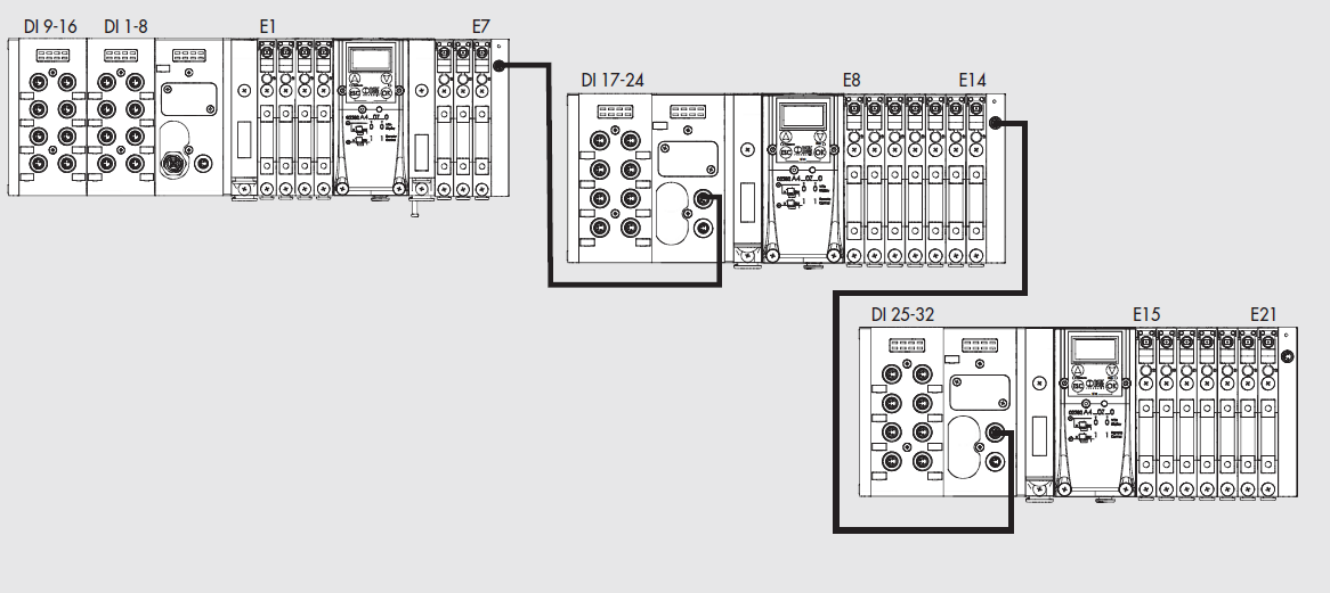
The device must be earthed using the connection of the closing end plate marked with the symbol PE

WARNING
The bus supply system also powers all the Signal modules S that are directly connected to the node; the maximum supplied current is 3.5 A.

WARNING
Failure to make the earth connection may cause faults and irrevocable damages in the event of electrostatic discharge. In order to guarantee IP65 protection class, any discharge must be conveyed.

Addressing the Additional Electrical Connection – E0AD
All the modules are addressed in sequence.

- Addressing valve solenoid pilots – from the first solenoid pilot of the IO-Link node to the last solenoid pilot of the last-in-line additional island.
- Addressing digital input S modules – from the first module connected to the IO-Link node to the last digital input S module of the last-in-line additional island.



DIAGNOSTICS

IO-Link NODE DIAGNOSTIC MODE

The diagnostics of the IO-Link node is determined by the state of the COM and Diag LEDs

COM	Diag	Meaning
OFF ○	OFF ○	IO-Link power supply failure
ON (green) ●	OFF ○	Operating state
GREEN ☼ (flashing)	RED ☼ (flashing)	IO-Link supply error (under-voltage or overvoltage)
OFF ○	ON ●	IO-Link communication error

EB 80 SYSTEM DIAGNOSTIC MODE – ELECTRICAL CONNECTION

Diagnosis of the EB 80 system – Electrical Connection – is defined by the state of Power, Bus Error and Local Error LED lights. Diagnostic functions of the EB 80 system relay the state of the system via error codes in hexadecimal or binary format to the controller, in order of priority. The state byte is interpreted by the controller as an input byte. The table below shows the correct interpretation of the codes.

LED light state			Hex code	Meaning	Notes	Solution
Power	Bus Error	Local Error				
ON (green)	OFF	ON (red)	0xFF	System limits exceeded, comunication line data overflow	Number of I/Os to be checked simultaneously is too high or the control frequency is too high.	Modify the system by reducing the number of I/Os to be checked simultaneously. Contact technical support
ON (green)	OFF	ON (red)	0xDC ÷ 0xEB	Fault with Pressure Regulator module	-	Contact technical support
ON (green)	OFF	OFF	0xA0 ÷ 0xAF	Overcurrent of a digital input	Signalled by one input	Turn off power supply and remove the cause of failure
ON (green)	OFF	ON (red)	0x20 ÷ 0x1F	Valve 1 / 32 faulty **	Solenoid pilot short-circuited, interrupted or not connected	Turn off power supply and remove the cause of failure
GREEN (flashing)	OFF	OFF	0x17	No auxiliary power	-	Insert auxiliary power supply
ON (green)	RED (double flashing)	OFF	0x16	Address / configuration of a valve base or a signal module error	Valve base or signal module faulty	Turn off power supply and remove the cause of failure
GREEN (flashing)	OFF	ON (red)	0x15	Power supply out of range (Under/over-voltage)	-	Power the system with a voltage within the allowed range
ON (green)	RED (flashing singolo)	OFF	0x14	Error in the configuration parameters of a valve base or a signal module	Current configuration not corresponding to the one stored in the device.	Repeat the configuration procedure. If the error persists, replace the faulty component.
ON (green)	ON (red)	OFF	0x10	EB 80 Net internal communication faulty	Additional island configured but not connected. Connection between valve bases faulty or incomplete (blind end plate C is not correct for the fieldbus).	Check the correct connection of the entire system. Make sure the blind end plate is of the type suitable for the fieldbus. When the communication is restored, the alarm rests automatically after 3 seconds.
ON (green)	RED (flashing)	OFF	0x0F	EB 80 Net internal communication disturbed.	Communication is faulty due to electromagnetic disturbances.	Move the power cables away from the signal cables. Check the noise levels with the EB 80 Manager.
ON (green)	OFF	RED (flashing singolo)	0x09	Error in configuring the head parameters.	At least a value is wrong or out-of-range.	-
LED light state			Hex code	Meaning	Notes	Solution
Power	Bus Error	Local Error				
GREEN (flashing)	OFF	RED (flashing)	0x08	Number of solenoid pilots connected to the network greater than 32	-	Restore correct configuration of the valve bases, by removing any excess ones.
ON (green)	OFF	RED (double flashing)	0x07	Mapping error. Number of connected valve bases different from or greater than the max. admissible number. Closing plate on S modules not connected.	Current configuration not matching the one stored in the device. The EB 80 Net network not properly completed.	Turn off power supply. Restore the correct configuration and repeat the configuration procedure. Turn off power supply, install the closing plate using the terminal board provided or insert the termination connector.
ON (green)	OFF	RED (flashing singolo)	0x06	Addressing error: • type of module not allowed; • no valve base or signal module connected.	-	Connect the valve bases or the signal modules of the type allowed.
GREEN (flashing)	OFF	RED (flashing)	0x05	Number of digital inputs connected to the network greater than 32	-	Disconnect excess modules
ON (green)	OFF	OFF	0x00	The system works properly	-	-

- Proceed as follows to identify the position of the faulty valve: Error code HEX – 0x20 = n Convert the n code from hexadecimal to decimal. The resulting number corresponds to the faulty position. The positions where dummy or bypass valves are installed must also be considered in the calculation. Codes are numbered from

zero to 127. Code 0 corresponds to the first valve of the island. For example: error code 0x20 n= 0x20 – 0x20 = 0x00 decimal value = 0 corresponding to the first valve (position) of the island. error code 0x3F n= 0x3F – 0x20 = 1F decimal value = 31 corresponding to the valve (position) 32

EB 80 SYSTEM DIAGNOSTIC MODE – VALVE BASE

The diagnosis of bases for valves is defined by the state of the interface Led lights. The generation of an alarm activates a software electrical connection message with the code associated with the detected error.

Led Green Base	Meaning	FAULT signal output state and storage
OFF ○	The output is not controlled.	FAULT signal output – OFF
●	The output is active and works properly.	FAULT signal output – OFF
ON ☼ (double flashing)	Indication for each output. Solenoid pilot interrupted or missing (dummy valve or valve with a solenoid pilot installed on a base for two solenoid pilots).	FAULT signal output – Active The output resets automatically when the cause of failure is removed. The FAULT signal can only be reset by disconnecting the power supply.
☼ (flashing)	Indication for each solenoid pilot output or base output short-circuited.	FAULT signal output – Active, permanent The output is turned off. It can only be reset by disconnecting the power supply.
☼ (flashing + simultaneously flashing of all Led lights of the base)	Voltage out of range Less than 10.8VDC or greater than 31.2VDC **Caution! Voltage greater than 32VDC irrevocably damages the system.**	FAULT signal output – Active, self-resettable to return within the operating range. The alerts remain on 5 seconds after resetting.

EB 80 SYSTEM DIAGNOSTIC MODE – SIGNAL MODULES – S

The diagnosis of Signal Modules – S is defined by the state of the interface Led lights. The generation of an alarm activates a software electrical connection message with the code associated with the detected error.

Diagnostic mode of Signal Modules – S – Digital Inputs

Led X1..X8	Meaning	Solution
OFF ○	Input not active	-
ON (green) ●	Input active	-
ON (red) ●	Indication for each input. Short-circuited or overloaded input.	Remove the cause of the fault
RED ☼ (flashing + all Led lights flashing simultaneously)	Overall current input too high.	Remove the cause of the fault

EB 80 SYSTEM DIAGNOSTIC MODE – ADDITIONAL ELECTRICAL CONNECTION

The diagnosis of Additional Electrical Connection is defined by the state of the interface Led lights. The generation of an alarm activates a software electrical connection message with the code associated with the detected error.

POWER	BUS ERROR	Meaning	Solution
ON (green) ●	OFF ○	The additional island works properly	-
ON (green) ●	ON (red) ●	Failure. For the correct identification, refer to the error code or local diagnostics.	Turn off power supply and remove the cause of failure

DIAGNOSTICS OF THE PROPORTIONAL PRESSURE REGULATOR

The diagnosis is defined by the state of the interface LED lights and by the status byte.

Led interface

	LED PRESSURE	SOLUTION
☼	Flashing	In regulation
●	ON	Regulation OFF
○	OFF	No power supply
	LED DIAG	**SOLUTION**
●	ON	Pressure switch output ON
○	OFF	Pressure switch output OFF

Troubleshooting

PROBLEM	***POSSIBLE CAUSES***	***SOLUTION***
The display does not come on	*No power supply*	*Check the power supply, make su re it is*
		enough and check the wiring is in accordance
		with the wiring diagram
The unit does not respond or respo nds wrongly to the	*Wrong input signal configuration*	*Configure the appropriate type of input from the menu*
set point		
The unit does not reach the desired pressure	*Setpoint too low*	*Provide a suitable setpoint*
	The full-scale setting is at a lower pressure	*Set the full scale correctly*
	than desired	
	The supply pressure is too low	*Increase the supply pressure*
The display shows an unreal value	*Wrong unit of measurement*	*Check the unit of measurement*
The display is difficult to read	*Poor contrast*	*Adjust the contrast*
The unit adjusts continually	*Air leak in the circuit after the unit*	*Eliminate the leak*
	Continuous variation in volume	*Normal behaviour; the unit has to keep*
		adjusting the maintain the preset pressure
	Deadband too small	*Increase the deadband*
Other problems	*Contact the manufacturer*	

List of allarms

ALARM	***POSSIBLE CAUSES***	***SOLUTION***
Supply voltage alarm too high	*Supply voltage higher 30VDC*	*Increase to a sufficient voltage.*
Supply voltage alarm too low	*Supply voltage below 12VDC*	
Alarm P. INP CORTOC. 0VDC	*Supply solenoid valve has shortci rcuited*	
Alarm P. OUT CORTOC. 0VDC	*Drain solenoid valve has shortcirc uited*	*Switch the unit off and back on ag ain. If the*
P. INP alarm DISCONNECTED	*Fill solenoid valve disconnected*	*alarm persists, contact the manuf acturer.*
P. OUT alarm DISCONNECTED	*Drain solenoid valve disconnected*	
PRESSURE OUT OF RANGE ALAR M	*Downstream pressure exceeds 10200 mbar*	*Check to see if the drain is blocke d. The alarm resets*
		automatically when the pressure drops below the
		threshold.
Pressure sensor disconnected alar m	*Electromagnetic disturbances*	*Move away the cause and switch on the unit*
	Sensor fault.	*Contact the manufacturer.*

CONFIGURATION LIMITS

The EB 80 network can be configured by assembling the islands according to the requirements of the system in which it is mounted. For the system to operate safely and reliably, it is important to keep to the constraints associated with the serial transmission system based on CAN technology and use shielded, twisted cables with controlled impedance, supplied by Metal Work. The system constraints are defined by the following parameters of the assembly:

- the number of valve bases (nodes)
- the number of signal modules (nodes)
- the number of Additional Electrical Connections (nodes)
- the length of connection cables.

A high number of nodes reduces the maximum length of connection cables, and vice versa.

No. of nodes	***Maximum cable length***
70	*30 m*
50	*40 m*
10	*50 m*

No. of nodes Maximum cable length

- **70** 30 m
- **50** 40 m
- **10** 50 m

DIAGNOSTIC

EB 80 IO-Link 32 IN + 32 Out new advanced diagnostic functions, called EB 80 I4.0, provide conventional maintenance with a powerful analysis tool to ensure reliable, safe and long-lasting operation of production units. Maintenance management is rationalized and optimized through the development of predictive maintenance, in order to:

- prevent failures;
- intervene in advance to avoid plant downtimes;
- access to all information on equipment operation in real time;
- monitor the end-of-service life of components;
- optimize the management of spare parts in the warehouse..

All this makes it possible to transform the collected data into concrete actions, using standard EB 80 IO-Link 32 IN + 32 Out units, without the need for additional modules.

Description of EB 80 I4.0 functions
System data

- switch-on counter of the units;
- auxiliary power supply out-of-range alarm counter;
- IO-Link power supply out-of-range alarm counter.

Valve and Pressure Regulator data
Each valve manifold base permanently stores the following data for each solenoid pilot:

- cycle counter;
- total solenoid pilot activation time counter; operating hour meter of the pressure regulator;
- activation of a signal indicating that 60% of the average service life has been exceeded;
- short Circuit Alarm counter;
- open Circuit Alarm counter.

Data in hexadecimal format are available as system variables using the IO-Link tools provided by the master module manufacturers.

List of parameters
Valve and Pressure Regulator data The index of the pressure regulators is subsequent to the last valve installed.

Parameter Data

Index:	**A**	75
Subindex:	**B**	04

	Description	Index
A	Valve 1	69
	Valve 2	70
	Valve 3	71
	Valve 4	72
	Valve 5	73
	…	…
	Valve 64	132

	Description	Index
A	Valve 1 log file	133
	Valve 2 log file	134
	Valve 3 log file	135
	Valve 4 log file	136
	Valve 5 log file	137
	…	…
	Valve 64 log file	196

	Description	Sub Index	Format
B	60% of pilot 1 average service life exceeded	01	byte
	Pilot 1 Short Circuit Alarm counter	02	byte
	Pilot 1 Open Circuit Alarm counter	03	byte
	Pilot 1 cycle counter	04	Dword
	Pilot 1 total activation time / operating hour meter of the pressure regulator	05	Dword
	60% of pilot 2 average service life exceeded	06	byte
	Pilot 2 Short Circuit Alarm counter	07	byte
	Pilot 2 Open Circuit Alarm counter	08	byte
	Pilot 2 cycle counter	09	Dword
	Pilot 2 total activation time	10	Dword

System data

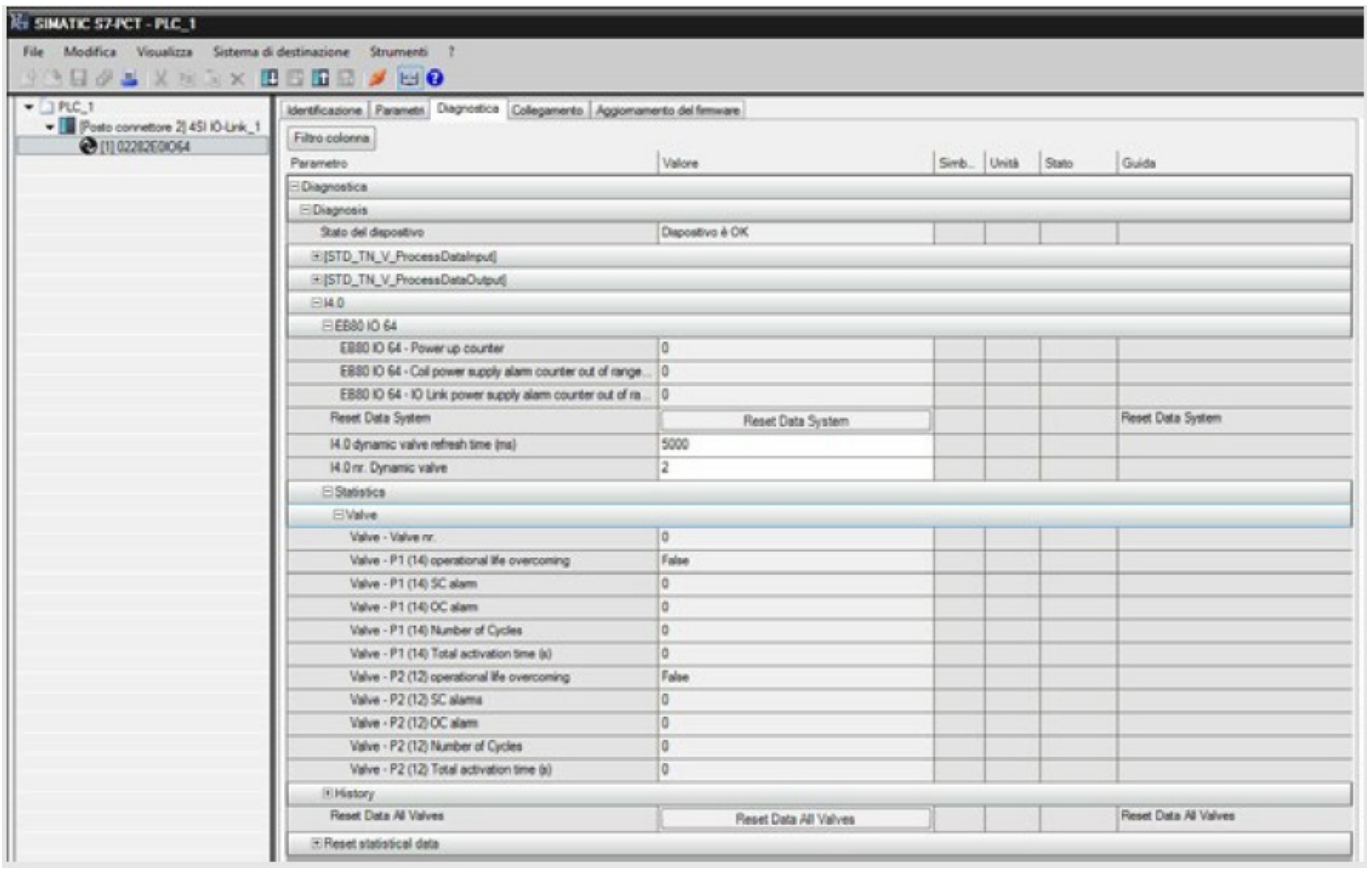
Parameter Data

- **Index:** 197

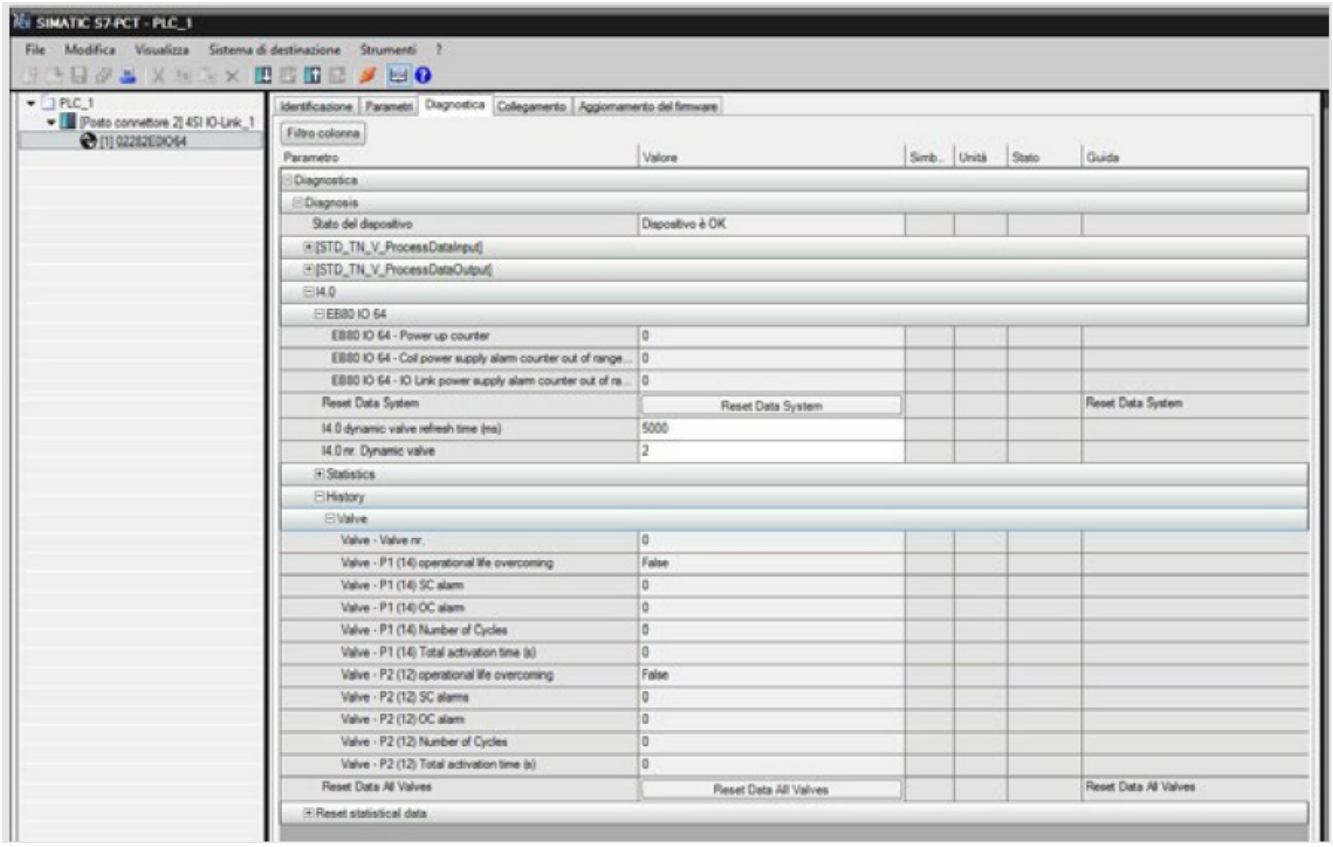
- **Subindex:** 01

Description	*Index*	*Sub Index*	*Format*
Number of switch-ons	*197*	*01*	*Dword*
Number of auxiliary power supply alarms out of range		*02*	*byte*
IO-Link power supply alarm out of range		*03*	*byte*

Examples of views in Siemens S7-PCT



- When replacing one or more valves, data can be reset using dedicated commands. The previous data are saved permanently in the related History fields and added to those saved with previous reset operations.

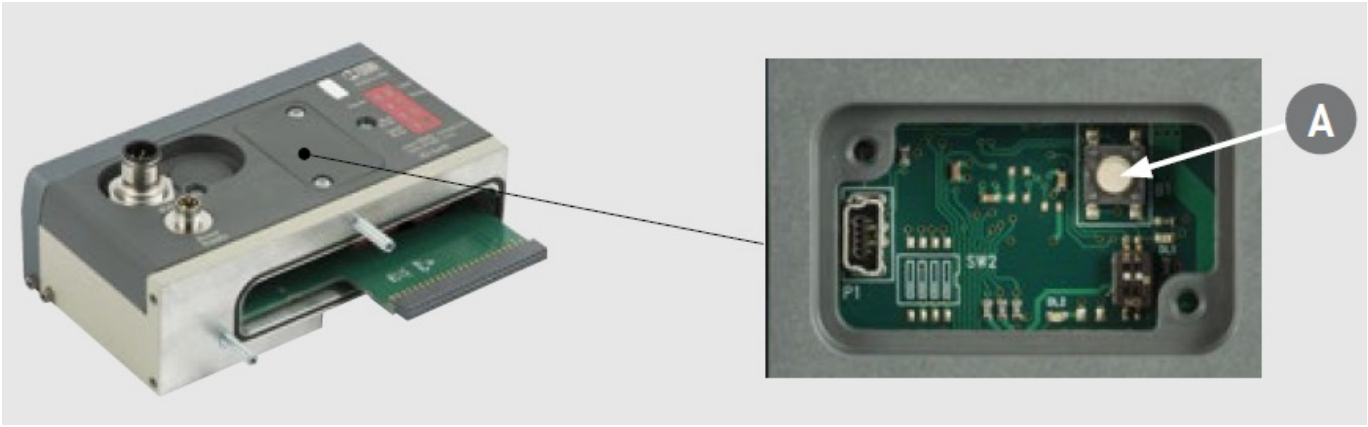


List of reset commands

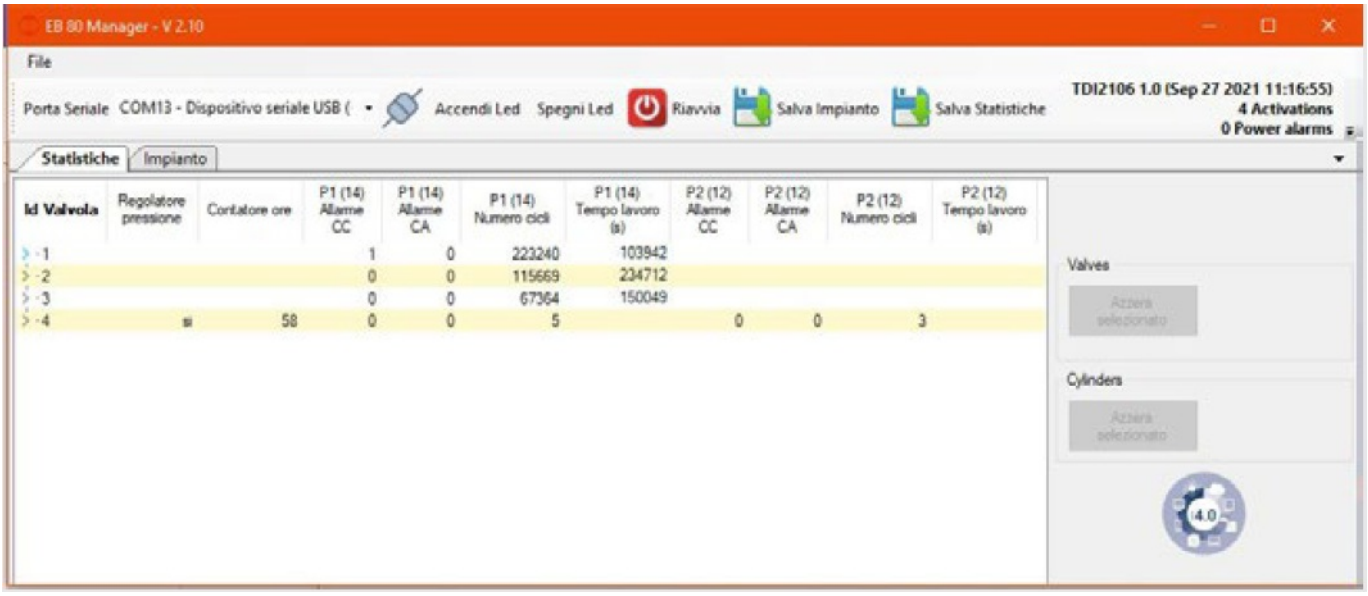
Parameter	***Index (Subindex = 0)***	***Value***	***Type***
Reset valve data 1	*160*	*0 = false* *1 = true*	*RW*
Reset valve data 2	*161*		
Reset valve data 3	*162*		
Reset valve data 4	*163*		
Reset valve data 5	*164*		
…	*…*		
Reset valve data 64	*223*		
Reset System Data	*224*		
Reset valve data 1 … 64	*225*		
Restore default values	*1300*		

DATA READING USING THE EB 80 Manager SOFTWARE

The EB 80 Manager software is used to read data directly from the EB 80 power connection with fieldbus, via the USB port (A) located under the power connection cover.



Connecting the EB 80 to the PC. Open the EB 80 Manager software.



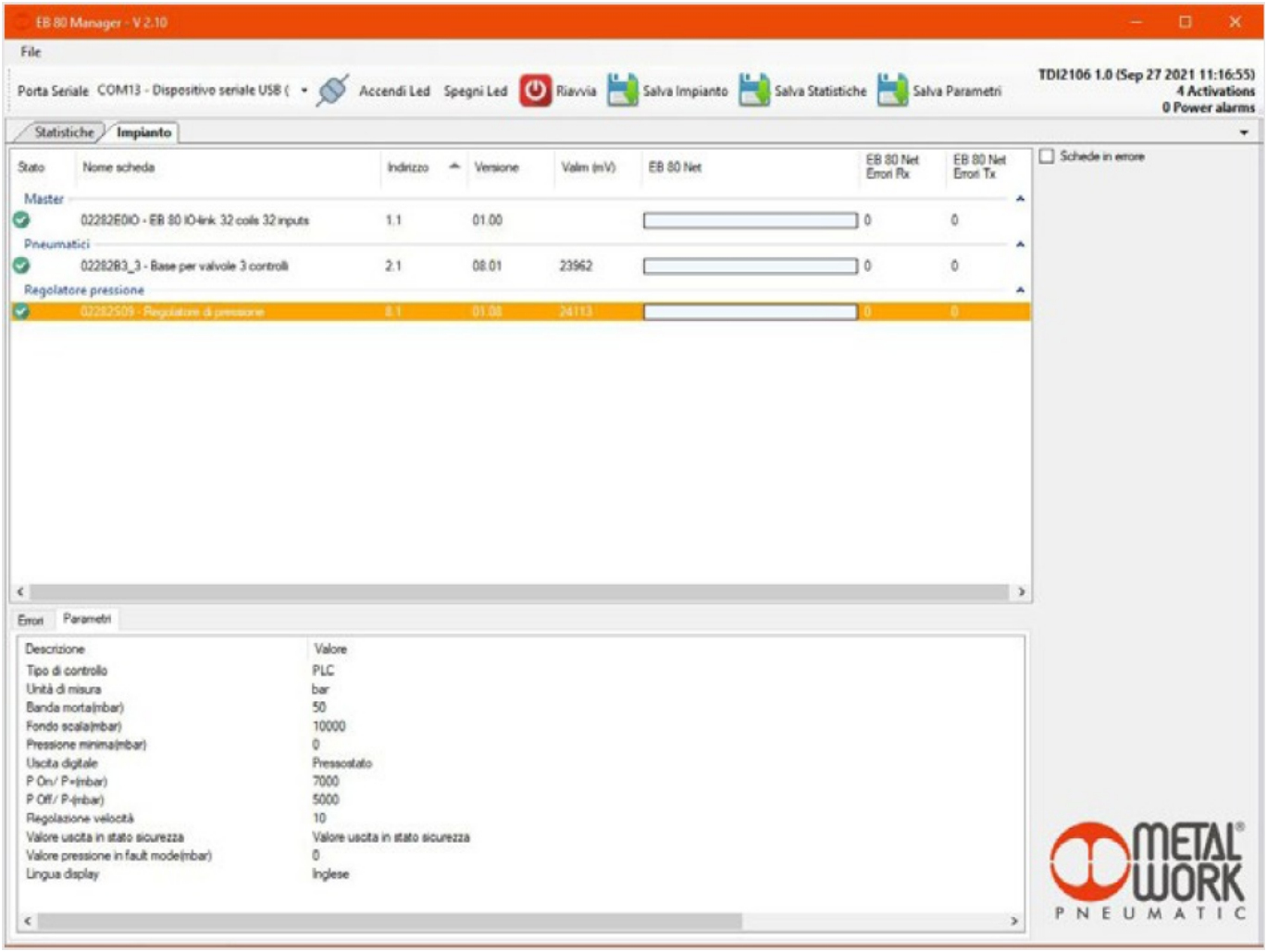
Select the serial port: COMx-MetalWork and connect up to the system by clicking on the connection icon. The data of all the valves, of pressure Regulators and configured actuators will be displayed.

Data reset of valves

When a valve is replaced, it is advisable to reset the number of cycles. To do this, select the valve to be reset and click on the “Valves – Reset Selected” button. The data of the first row will be reset and saved in another non-resettable memory area, which can be viewed by clicking on the arrow of the tree menu. In this way, the “relative” data of the valve being used and the “absolute” data of the system are available. At each reset, the relative data is added to the absolute data.

Display of the set parameters

By selecting the module, in the “parameters” tab the parameters settings are displayed.



TECHNICAL DATA

IO-Link ELECTRICAL CONNECTION

TECHNICAL DATA			
Fieldbus		*IO-Link version 1.1*	
Communication speed	*Kbps*	*230.4 (COM3)*	
Vendor ID / Device ID		*1046 (hex 0x0416) / 32 (hex 0x000020)*	
Minimum cycle time	*ms*	*2.8*	
Process data length		*5 byte of Input / 4 byte of Output*	
Supply voltage range (M8 connector)	*VDC*	*12 -10%*	*24 +30%*
Minimum operating voltage	*VDC*	*10.8 **	
Maximum operating voltage	VDC	*31.2*	
Maximum admissible voltage	*VDC*	*32 ****	
IO-Link power supply (L+L – Bus IN connector)	*VDC*	*min 20, max 30*	
Protection		*Module protected from overload and polarity inversion. Outputs protected from overloads and short-circuits.*	
Connections		*Fieldbus: M12 male, A-coded – port class A. Power supply: M8, 4-PIN*	
Diagnostics		*IO-Link: via local LED lights and software messages. Outputs: via local LED lights and state bytes*	
Power supply current absorption		*See page 6*	
Maximum number of pilots		*32*	
Maximum number of digital inputs		*32*	
Data bit value		*0 = non-active; 1= active*	
State of outputs in the absence of communication		*Configurable for each output: non-active, holding of the state, setting of a preset state*	

- Minimum voltage of 10.8VDC required at solenoid pilots. Check the minimum voltage at the power pack output using the calculations shown on page 5
- **IMPORTANT!** Voltage greater than 32VDC will damage the system irreparably.

SIGNAL MODULES – S – DIGITAL INPUTS

TECHNICAL DATA *Sensor supply voltage Current for each connector*	*mA*	***8 Inputs M8*** *Corresponding to power voltage max 200*
Current for each module	*mA*	*max 500*
Input impedance *Type of input*	*kΩ*	*3.9* *Software-configurable PNP/NPN*
Protection		*Overload and short-circuit protected inputs*
Connections *Input active signals*		*8 M8 3-pole female connectors* *One LED for each input*

PROPORTIONAL PRESSURE REGULATOR

TECHNICAL DATA		Local output version		Series control version	
Fluid		Filtered, unlubricated air. The air must be filtered at least 10 µm			
MIN inlet pressure	bar	Regulation pressure + 0.5 to 1			
MAX inlet pressure	bar	10.5			
Temperature range	°C	from 0 to 50			
Pressure regulation range	bar	from 0.05 to 10 (settable full scale and minimum pressure)			
Flow rate at 6.3 bar ΔP 0.5	Nl/min	720		850	
Flow rate at 6.3 bar ΔP 1	Nl/min	1000		1250	
Exhaust flow rate at 6.3 bar with 0.1 bar overpressure	Nl/min	380		450	
Exhaust flow rate at 6.3 bar with 0.5 bar overpressure	Nl/min	800		1100	
Response time	Volume [cc]	100	1000	100	1000
from 6 to 7 bar	s	0.1	0.15	0.1	0.15
from 7 to 6 bar	s	0.1	0.15	0.1	0.15
Weight	kg	0.6			
Class of protection		IP 65			
Hysteresis		≤ ± 0.2% (Full scale)			
Repeatability		≤ ± 0.2% (Full scale)			
Sensitivity/Dead-band		setting range 10 to 300 mbar			
Output pressure (display version)	Accuracy	≤ ± 0.3% (Full scale)			
	Unit of measurement	bar, MPa, psi			
	Minimum resolution	0.01 bar - 0.001 MPa - 0.01 psi			
Temperature characteristics		Max 2 mbar / °C			
Installation position		In any position			
Current absorption		Max 220 mA at 12VDC			
Notes		The features shown refer to the static condition only. With air consumption the pressure may vary.			

- www.metalwork.eu

Documents / Resources

	[METAL WORK EB 80 with IO-Link 64 Output interface] [pdf] User Manual EB 80 with IO-Link 64 Output interface, EB 80, with IO-Link 64 Output interface, 64 Output interface, 64 Output interface

References

- Metal Work S.p.A.