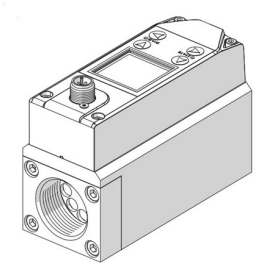

METAL WORK IM03 Flux 1-2 IO-Link Digital Flowmeter And Pressure Sensor User Manual

M0030401 IM03 – 11/2022
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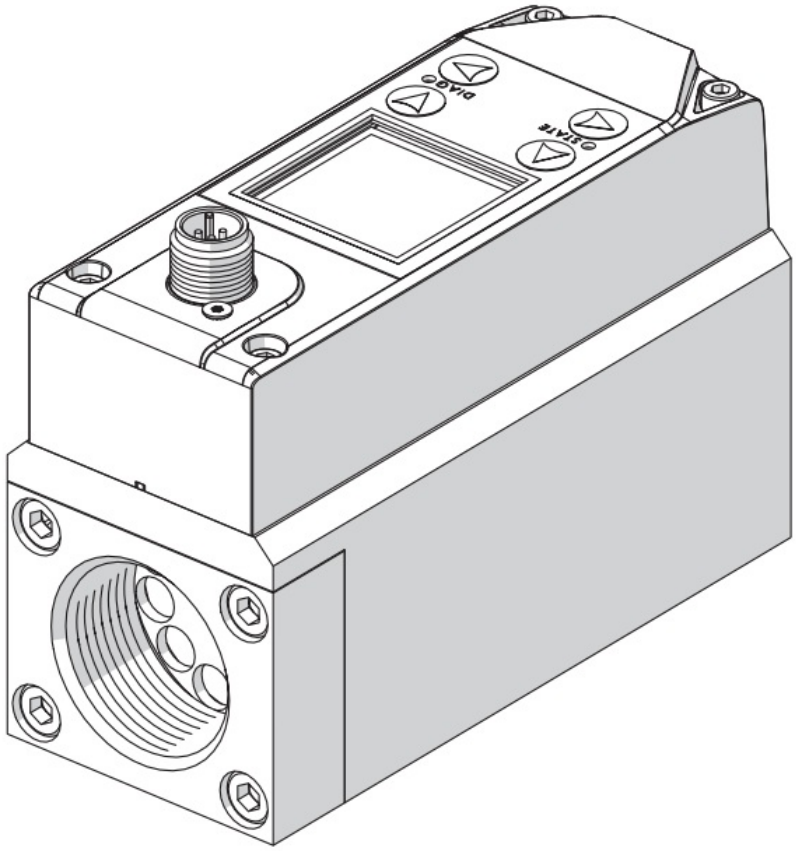


FLUX 1 – 2 IO-Link
DIGITAL FLOWMETER AND PRESSURE SENSOR
USER MANUAL

Contents

IM03 Flux 1-2 IO-Link Digital Flowmeter And Pressure Sensor

FLUX IO-Link is a control unit for measuring all significant data of the gas concerned.
Compliant with IO-Link specifications, it offers advanced diagnostics and provides connection to an IO-Link Master.
It supports COM3 communication, in accordance with V1.1 specification and Class A Port connection.

INTENDED USE

WARNING
The FLUX 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 electrical and electronic equipment.

TECHNICAL DATA

- Electrical connection: M12 5-pin connector.
- 12…24 VDC power supply.
- Maximum flowrate measured 2000 Nl/min for FLUX 1 version, 4000 Nl/min for FLUX 2 version.
- Maximum pressure 10 bar.
- Zero internal pressure drop.
- IP65 index of protection.
- Signaling LED.
- Graphic display and keypad for displaying measured values, with units of measurement and parameter setting.

HAZARDS

- Do not use with flammable gases.
- Do not use in an explosive atmosphere.

WARNING

- CANNOT be used as a normal counter available from the trade.
  It has not been designed and approved for use as a legal metrology instrument.
- DO NOT use gases other than those specified; measurement accuracy is not guaranteed and the device may get damaged.
- Do not use it outside the stated specifications.
- The compressed air from the compressor contains impurities (water, oil, dirt or other residues), which may affect accuracy or damage the sensor. Make sure that the air supplied to the FLUX is properly filtered and has a minimum purity level of 4.7.3, in accordance with ISO 8573-1.

- Do not use with lubricated air.
- Do not insert foreign objects into the connection ports.

INSTALLATION

1.1 PNEUMATIC CONNECTION

Pneumatic connection is via the threaded holes in the body.

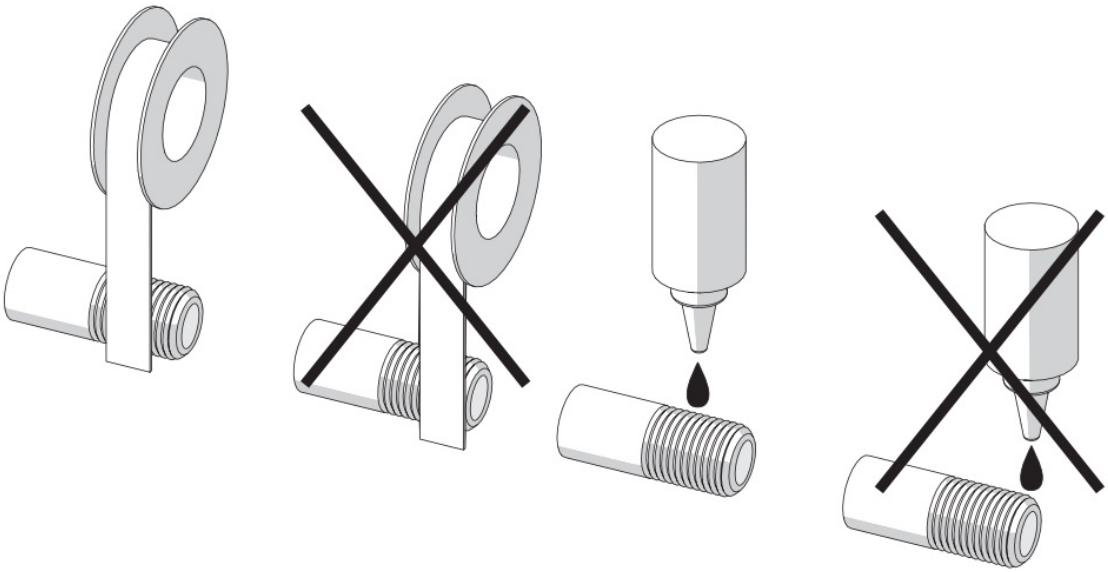
- Install the device following the arrow indicating the direction of the air flow.
- To connect the inlet side, use a straight pipe* at least 150 mm-long for FLUX 1 and at least 200 mm-long for FLUX 2.

  If straight piping is not installed, the accuracy may vary from what is stated.

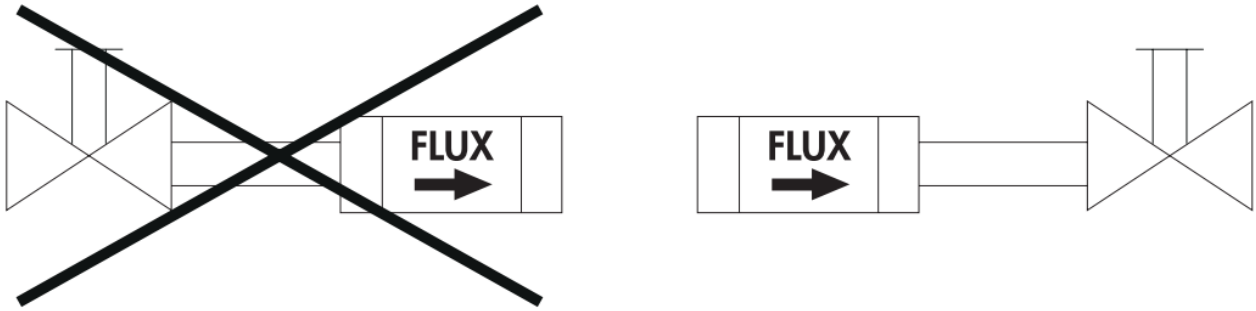
  * Straight pipe: the pipe must be straight with a constant cross-section.

FLUX 1	L ≥150 mm	L1≥50 mm
FLUX 2	L ≥200 mm	L1≥50 mm

- Clean the pipes before installation, uncleaned air may cause malfunctions or damages to the product.
- Make sure that the sealant does not get inside the pipe. Solid or liquid residues could damage the sensor.



When air flow needs to be regulated with a control valve; install the device upstream of the valve.
Otherwise, grease or lubricating oil from the valve could damage the sensor.

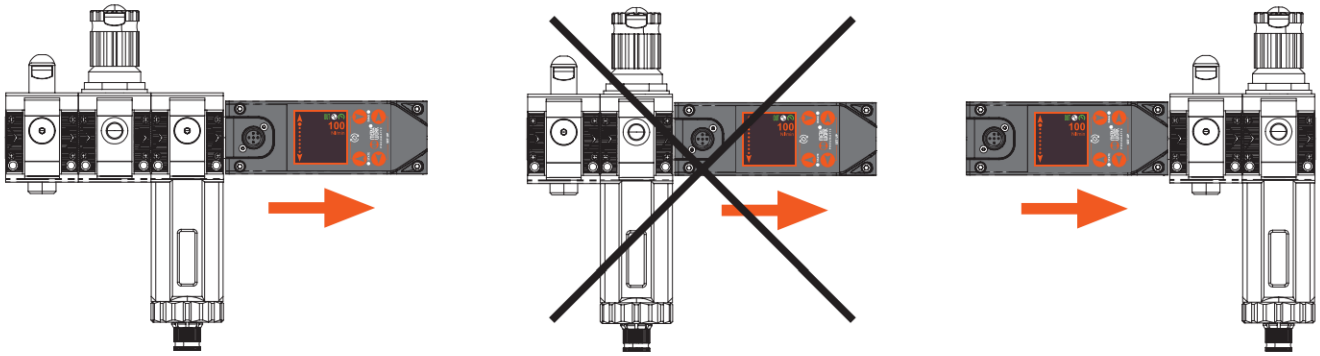


• The device can be installed in any direction.

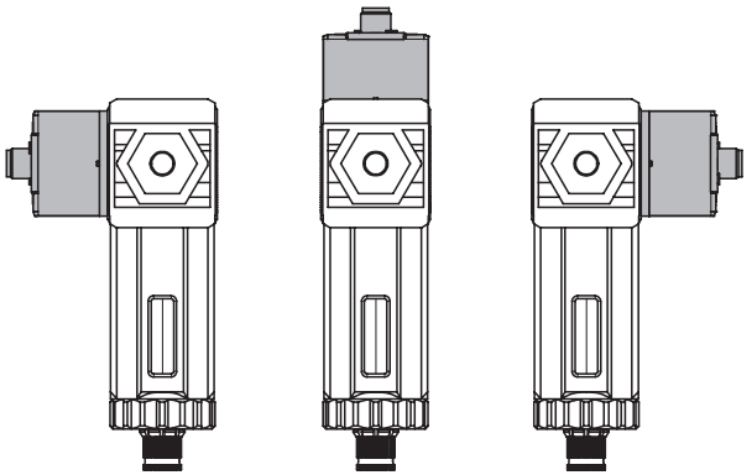
1.2 INTEGRATION WITH COMPONENTS IN THE Syntesi® PRODUCT RANGE
FLUX can be supplemented with Syntesi® component parts:

- FLUX 1 with Syntesi® size 1;
- FLUX 2 with Syntesi® size 2.

In order to guarantee the stated measurement accuracy and to prevent lubricant residues from damaging the measurement sensor, a filter has to be mounted at the FLUX inlet.
If the device is fitted with a Syntesi® filter, the SYN filter parameter must be enabled in the system menu to guarantee the stated accuracy (function available only for the version with display).



The Syntesi® components can be easily mounted on the outlet side of the FLUX.



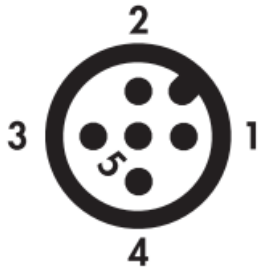
N.B.: If the FLUX is used downstream a Syntesi® filter, fit it in one of the three positions shown in the figure.

1.3 ELECTRICAL CONNECTION

A 5-pin M12 Code A connector is used for the electrical connection and must be connected to an IO-Link Master. Power is supplied directly via the Master.

Connection to the IO-Link network

M12 male connector, A encoding

	Port Class A 1 = L+ 2 = NC 3 = L4 = C/Q 5 =NC

Pin	Signal	Description of Port Class A	Lead colour
1	L+	+24VDC power supply	Brown
2	NC	/	White
3	L –	0VDC power supply	Blue
4	C/Q	IO-Link communication	Black
5	NC	/	Gray

WARNING

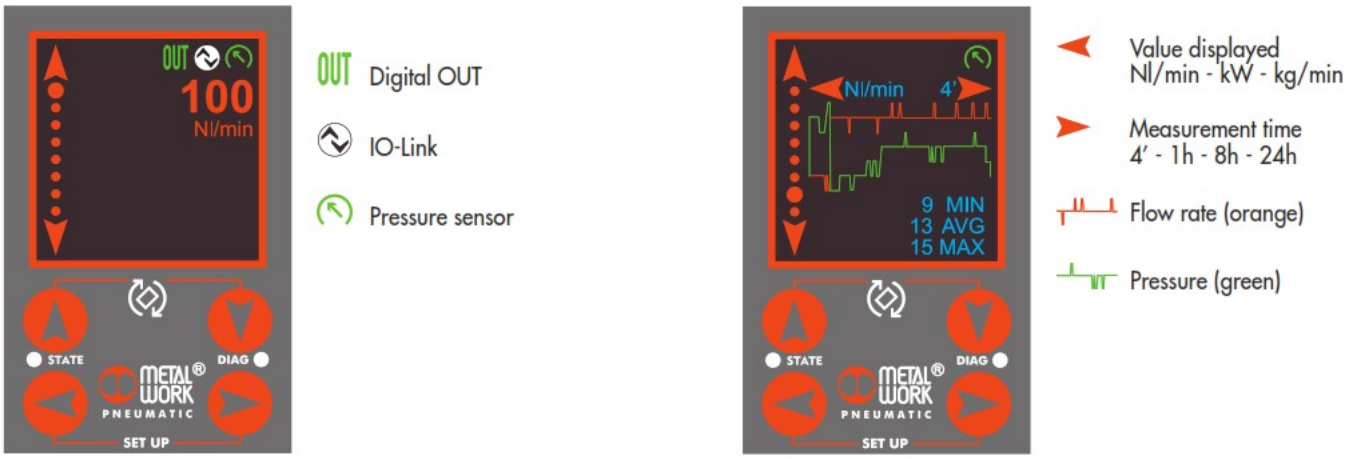
Switch off the mains supply before plugging or unplugging the connector (functional damage hazard).

WARNING

Keep the connecting cable separate from the power cables. The device may not work properly due to electromagnetic interference, strong currents or high voltage.

OPERATING DATA DISPLAY (ONLY FOR MODELS WITH DISPLAY)

Function icons are shown at the top of the display.



Press the two keys indicated by the icon . simultaneously for 1 second to rotate the scree The arrow keys automatically adapt to the rotation of the screen.

Use the vertical arrow keys to scroll through the display pages.

- page 1: displays the current flow rate.
- page 2: displays the current flow rate and pressure if a pressure sensor is connected, or the current power consumption.
- page 3: displays the current flow rate and power consumption if a pressure sensor is connected.
- page 4: displays the current flow rate and gas mass.
- page 5: displays the current flow rate and air temperature.
- page 6: displays all the current data.
- page 7: displays accumulated consumption.
- page 8: displays the flow rate chart.
- page 9: displays the flow rate and pressure chart, if a pressure sensor is connected.
  Display time can be set to 4 min, 1 hour, 8 hours, 24 hours.

MENU ACCESS (ONLY FOR MODELS WITH DISPLAY)

Parameter setting

Press the SET UP buttons simultaneously for 1 second to access the parameter settings.

Use the vertical arrow keys to select the function.

Press the right arrow key to access the function parameters.

Use the vertical arrow keys to change the parameter.

Press the right arrow to confirm.

Press the left arrow to return to the previous menu.

3.1 SYSTEM

The compressed air system is connected through the threaded holes on the body.
In order to prevent impurities or excessive condensation from causing malfunctions, it is recommended to supply the FLUX with dry 20µm-filtered compressed air at a pressure not exceeding 10 bar.

3.1.1 SYN filter

Set to ON when the FLUX is installed after a Syntesi unit filter to optimise flow rate reading.

3.1.2 Gas type

Helps optimise the measurement of the current flow and consumption figures.
Types of gas: Air Helium CO2 Nitrogen

3.1.3 K ENERGY

K-Energy is the amount of Wh consumed to generate 1 Nm 3 of compressed air, depending on the efficiency of the production system.
Used to calculate the current power (kW) and accumulated energy (kWh) consumption.

3.2 I/O

3.2.1 Digital Output – available for models with display

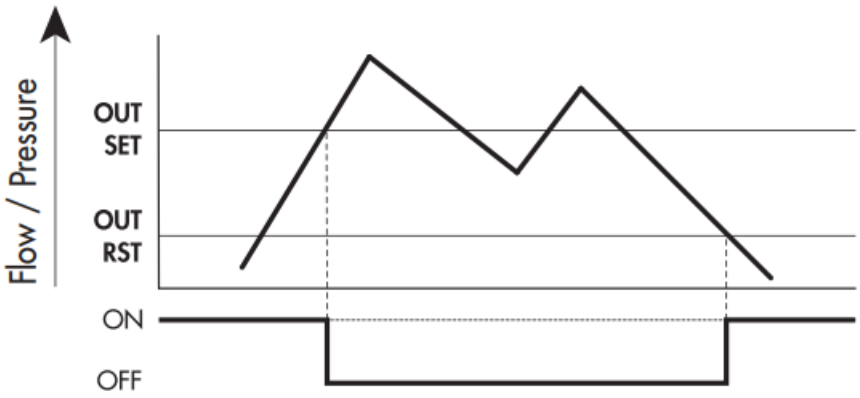
The digital output can be set as a “Normally Open” or “Normally Closed” contact.
It can relate to current flow, pressure or air consumption.

3.2.1.1 Parameters

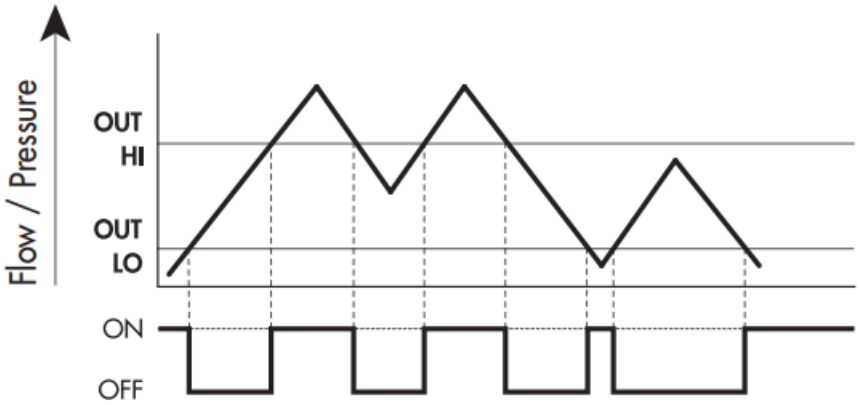
- Contact type: NO/NC
- Reference:

– FLOW: Threshold Setting:	the output switches according to flow values. function – LEVEL SWITCH, BAND SWITCH; OUT SET/HI – Flow value for output activation; OUT RST/LO – Flow value for output de-activation.
– PRESSURE: Threshold Setting:	the output switches according to pressure values. function – LEVEL SWITCH, BAND SWITCH; OUT SET/HI – Pressure value for output activation; OUT RST/LO – Pressure value for output de-activation.
– VOLUME CONSUMPTI ON:	Function – CONTACT SWITCH, the output switches at the value set under CNT Tar get; Function – CYCLIC PULSE, the output switches for 100 ms each time the value set in CNT Target is reached. The minimum flow rate can be set to 10 Nl for FLUX 1 and 20 Nl for FLUX 2.

FLOW / **PRESSURE**
DIGITAL OUT MODE NORMALLY OPEN – NO
Level switch mode with hysteresis

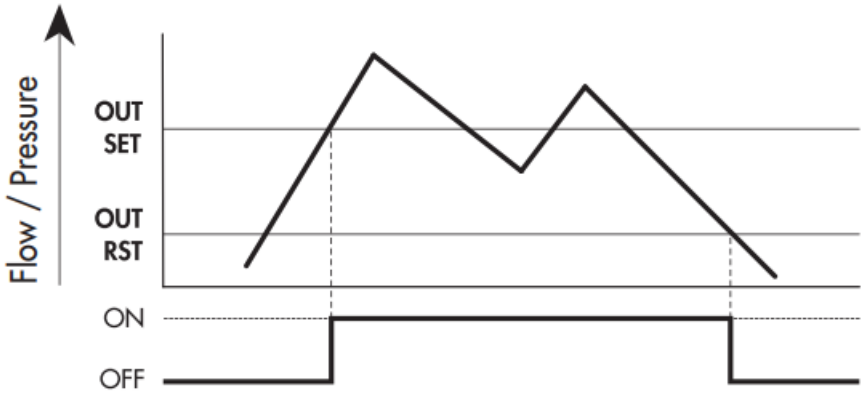


Band switch mode

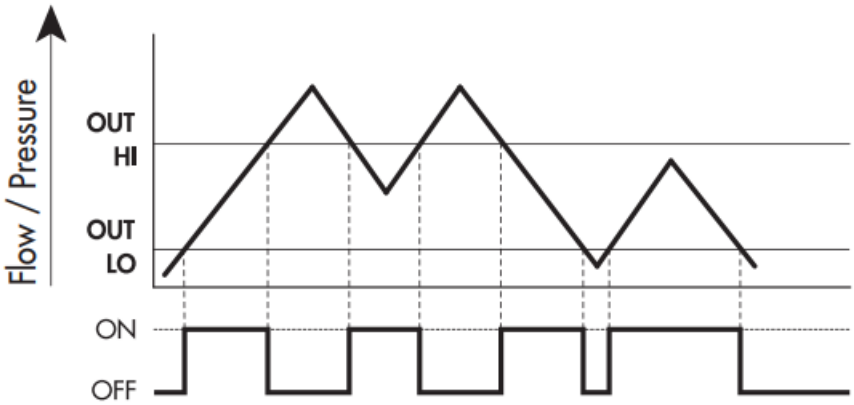


DIGITAL OUT MODE NORMALLY CLOSED – NC
Level switch mode with hysteresis

Level switch mode with hysteresis



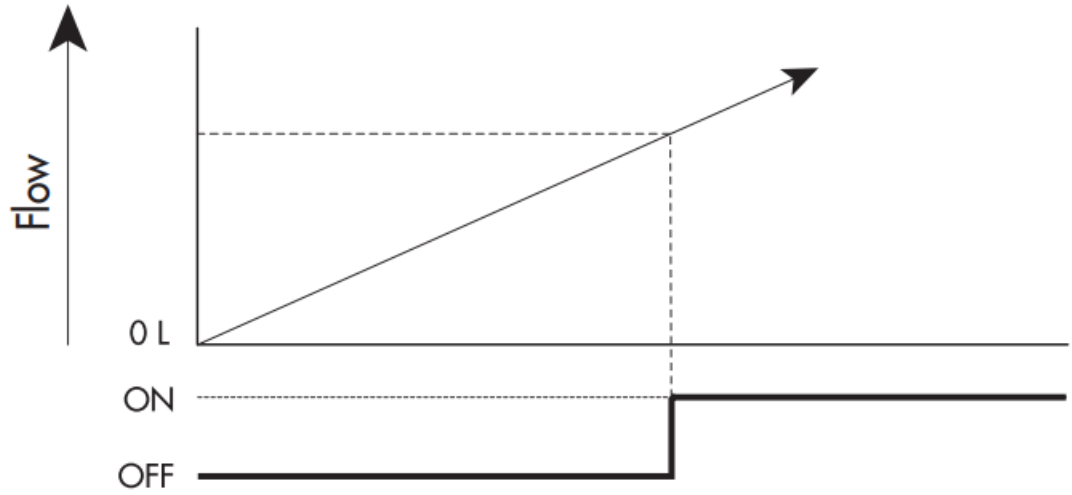
Band switch mode



VOLUME CONSUMPTION

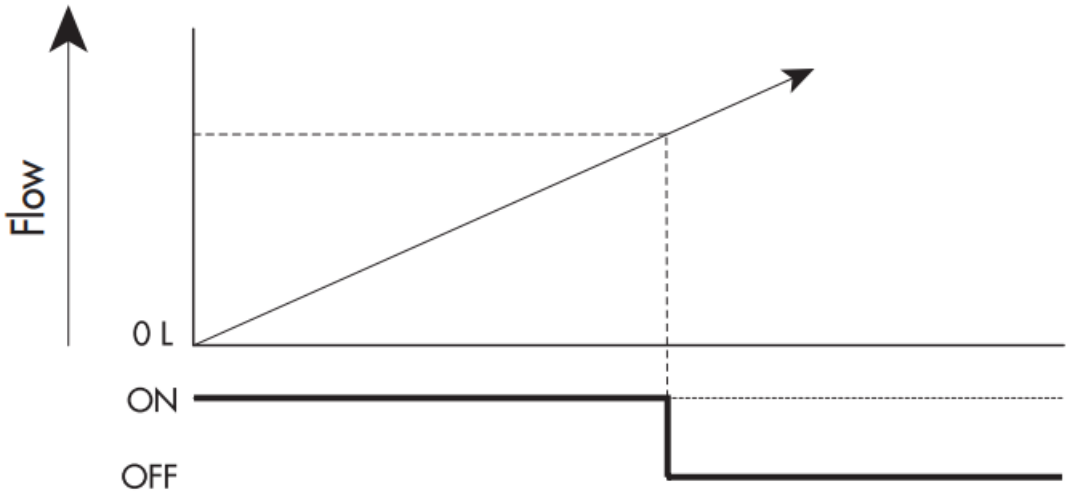
DIGITAL OUT MODE NORMALLY OPEN – NO

Volume consumption mode

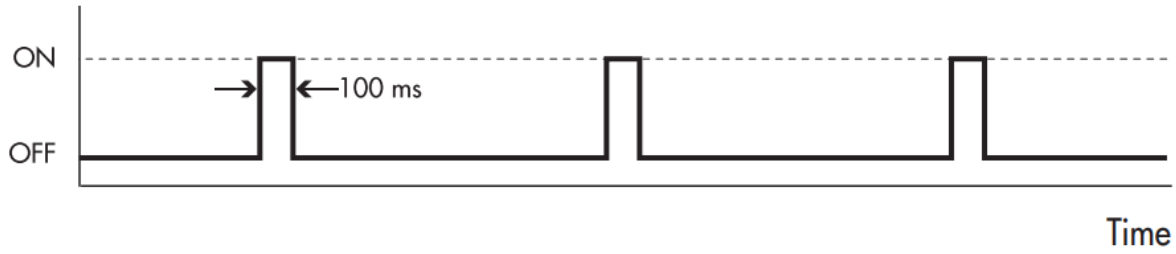


DIGITAL OUT MODE NORMALLY CLOSED – NC

Volume consumption mode



CYCLIC PULSE OUTPUT MODE



3.3. DISPLAY

Is possible to rotate the display by 90°, 180° or 270° to adapt it to the mounting position, by pressing the two keys indicated by the icon for 1 second.

3.3.1 PARAMETERS

- Language: Italiano, English, Deutsch, Français, Español.
- low rate unit of measurement: Nl/min, Nl/h, Nm 3 /min, Nm 3 /h, Nft 3 /min, Nft 3 /h.
- Pressure unit of measurement: bar, MPa, psi.

Setting the flow rate value display for colour change from orange to yellow.
Can be used to highlight abnormal air consumption.

- SET FL COL. – flow rate value at which the colour changes to yellow.
- RES FL COL. – flow rate value at which the colour reverts to orange.

3.4 SERVICE

- Consumption reset: accumulated consumption is reset.
- Sensor check: with flow rate and pressure at zero, it verifies that the measuring sensor is not faulty.
- Internal temperature: displays the temperature of control electronics.
- Password: This is a three-digit code used to protect the set configuration.

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

- Factory reset: resets the factory configuration.

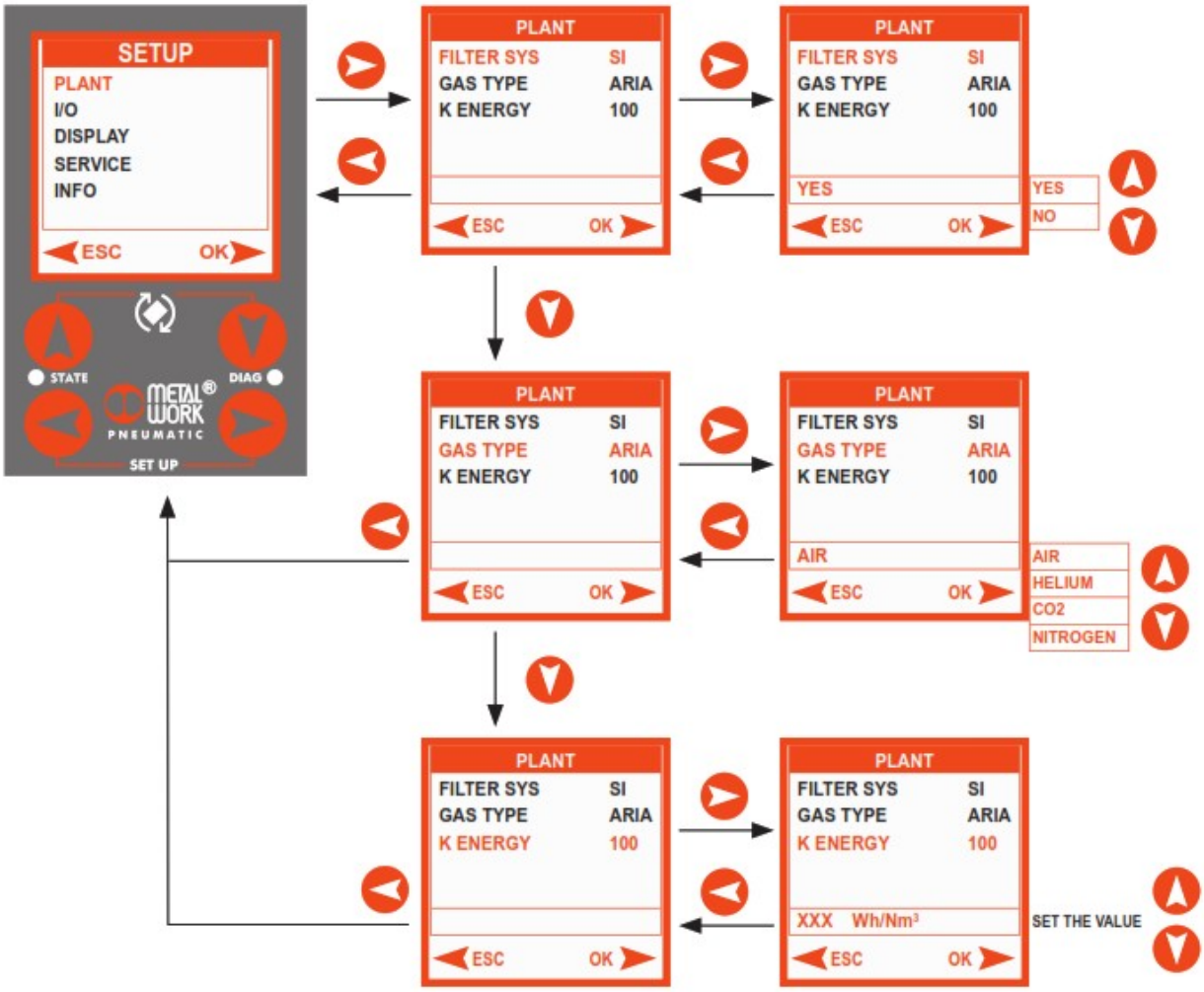
3.5 INFO

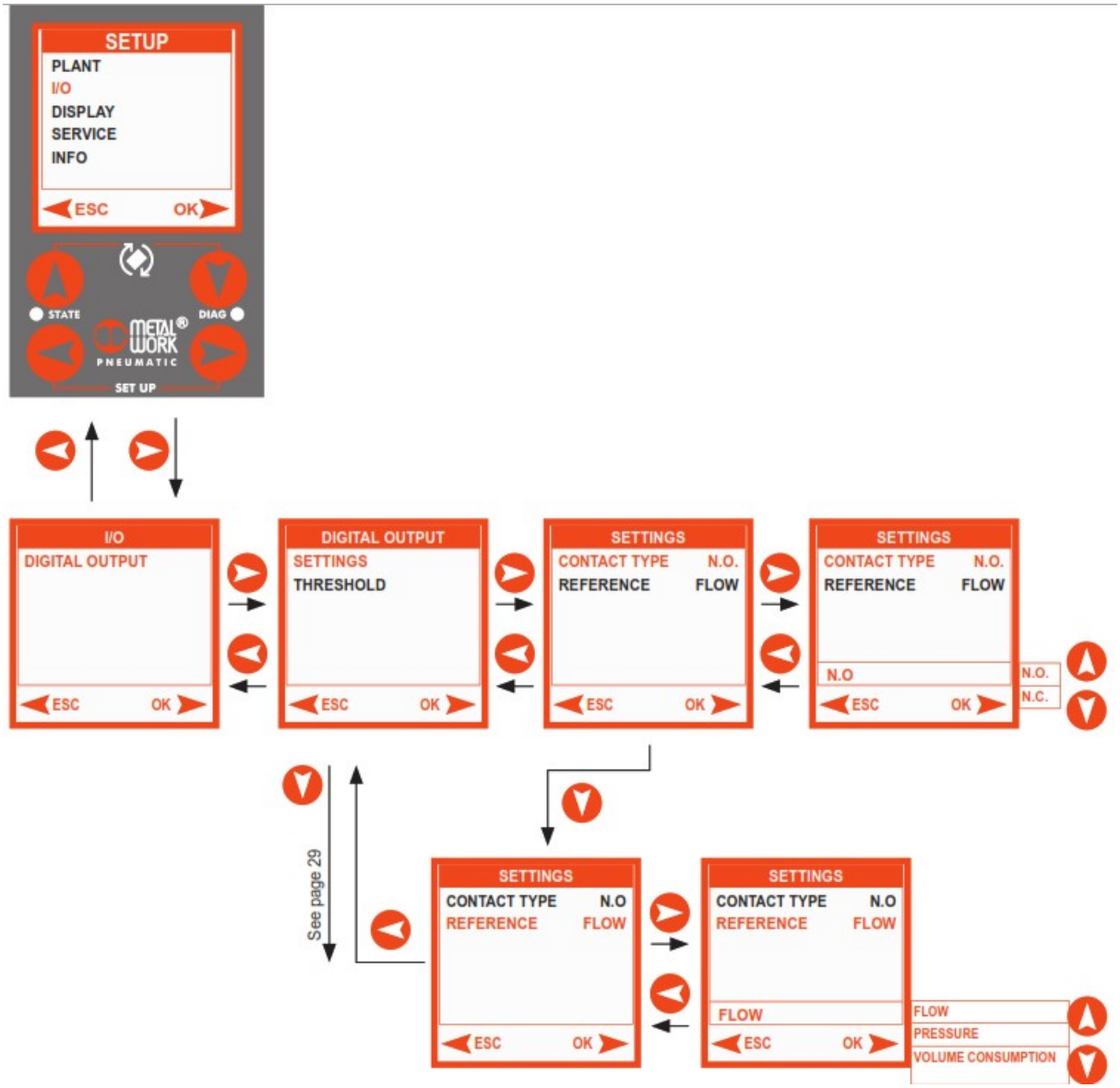
- S/N: serial number.
- Software version.
- Diameter: diameter of the internal passage.
- Pressure: pressure transducer availability.
- Model: type and options available.

A	Analogue
I	IO-Link
H	Display

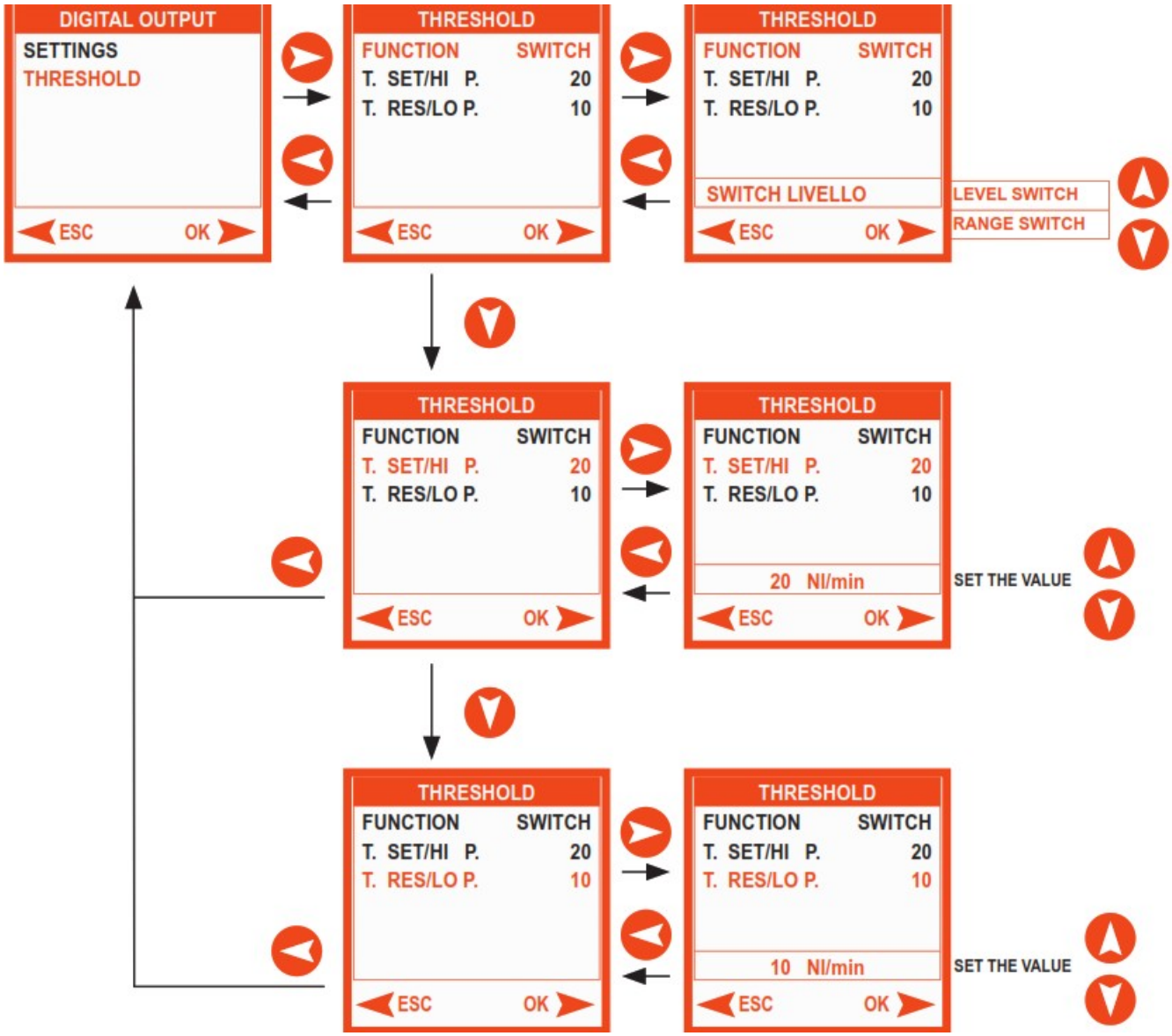
MENU ACCESS FROM KEYPAD (ONLY FOR MODELS WITH DISPLAY)

- Press the and buttons simultaneously for 1 second to access the parameter setting menu.
- Use the arrow keys to scroll through the menu and edit the parameters.
- Press OK to confirm.


SETUP
PLANT
I/O
DISPLAY
SERVICE
INFO
ESC
OK
STATE
DIAG
METAL WORK
PNEUMATIC
SET UP
PLANT
FILTER SYS SI
GAS TYPE ARIA
K ENERGY 100
ESC
OK
YES
NO
AIR
HELIUM
CO2
NITROGEN
XXX Wh/Nm³
SET THE VALUE

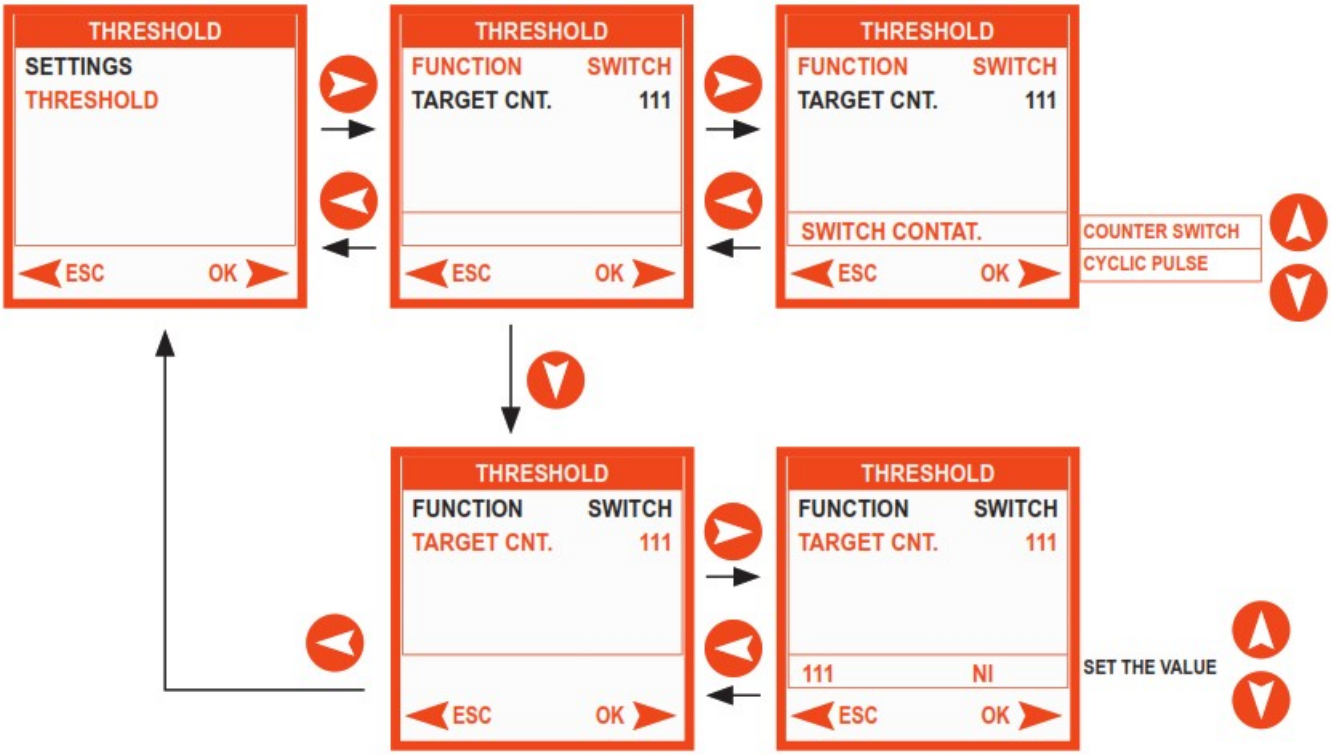


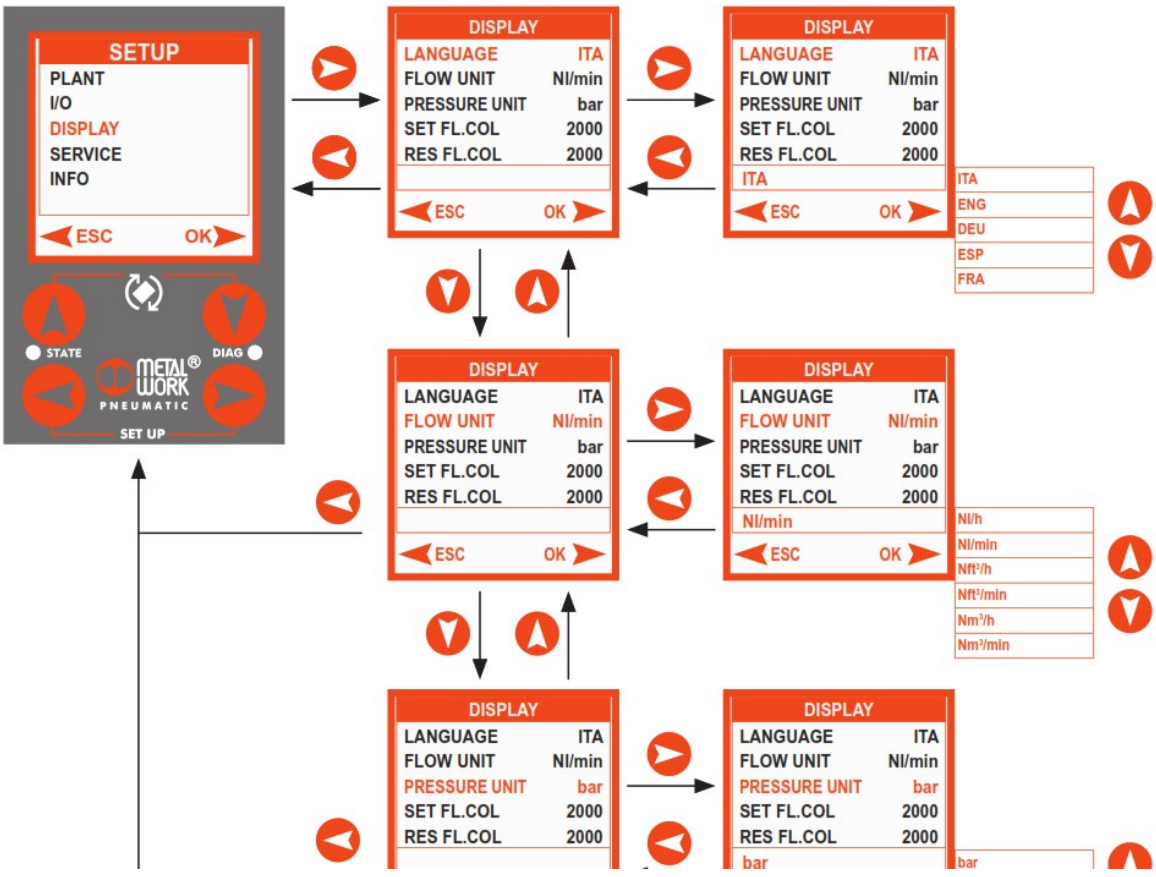
SOGLIE
– FLUSSO
– PRESSIONE

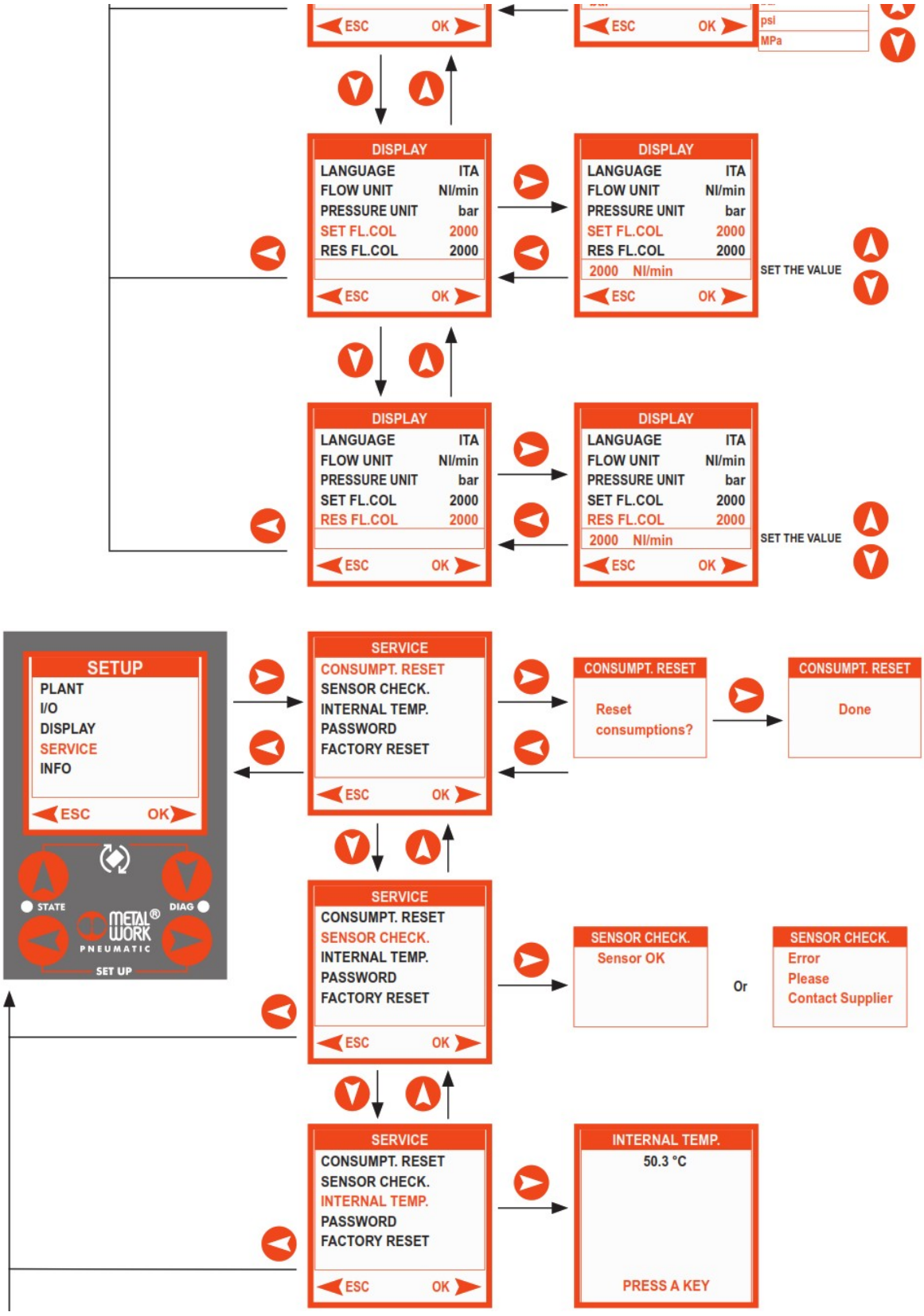


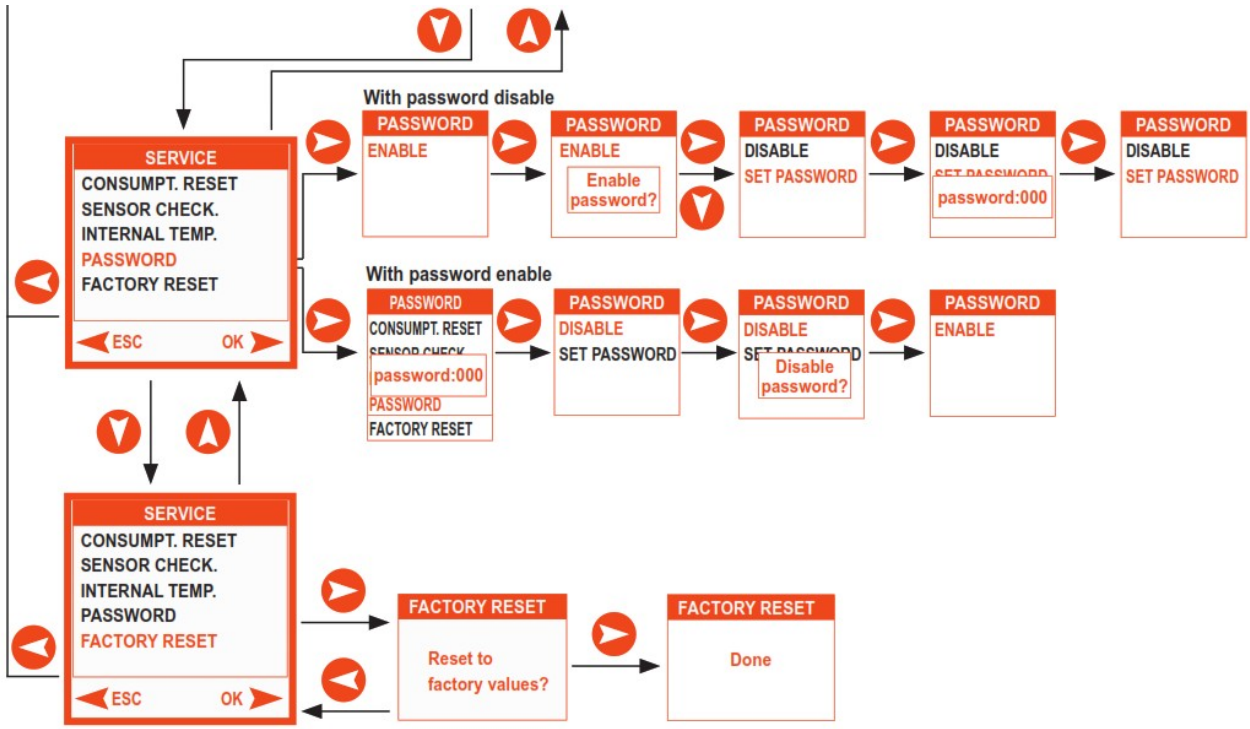
SOGLIE

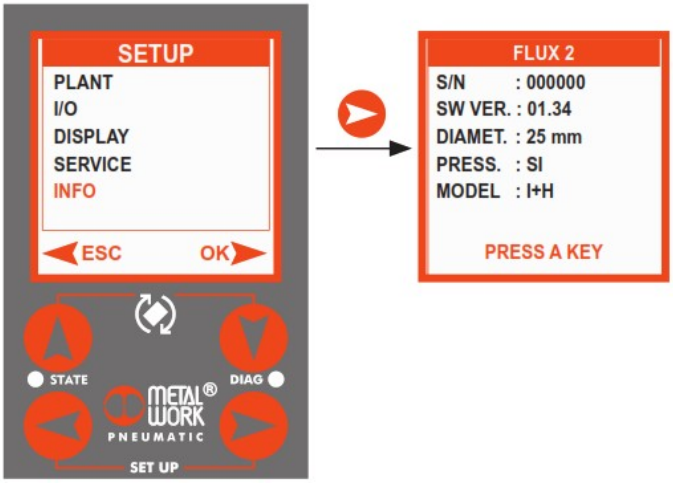
– CONSUMO VOLUME


THRESHOLD
SETTINGS
THRESHOLD
ESC
OK
THRESHOLD
FUNCTION SWITCH
TARGET CNT. 111
ESC
OK
THRESHOLD
FUNCTION SWITCH
TARGET CNT. 111
SWITCH CONTAT.
ESC
OK
COUNTER SWITCH
CYCLIC PULSE
THRESHOLD
FUNCTION SWITCH
TARGET CNT. 111
ESC
OK
THRESHOLD
FUNCTION SWITCH
TARGET CNT. 111
111 Nl
ESC
OK
SET THE VALUE


SETUP
PLANT
I/O
DISPLAY
SERVICE
INFO
ESC
OK
STATE
DIAG
METAL WORK PNEUMATIC
SET UP
DISPLAY
LANGUAGE ITA
FLOW UNIT Nl/min
PRESSURE UNIT bar
SET FL.COL 2000
RES FL.COL 2000
ESC
OK
DISPLAY
LANGUAGE ITA
FLOW UNIT Nl/min
PRESSURE UNIT bar
SET FL.COL 2000
RES FL.COL 2000
ITA
ESC
OK
ITA
ENG
DEU
ESP
FRA
DISPLAY
LANGUAGE ITA
FLOW UNIT Nl/min
PRESSURE UNIT bar
SET FL.COL 2000
RES FL.COL 2000
ESC
OK
DISPLAY
LANGUAGE ITA
FLOW UNIT Nl/min
PRESSURE UNIT bar
SET FL.COL 2000
RES FL.COL 2000
Nl/min
ESC
OK
Nl/h
Nl/min
Nft³/h
Nft³/min
Nm³/h
Nm³/min
DISPLAY
LANGUAGE ITA
FLOW UNIT Nl/min
PRESSURE UNIT bar
SET FL.COL 2000
RES FL.COL 2000
DISPLAY
LANGUAGE ITA
FLOW UNIT Nl/min
PRESSURE UNIT bar
SET FL.COL 2000
RES FL.COL 2000
bar
bar


ESC
OK
psi
MPa
DISPLAY
LANGUAGE ITA
FLOW UNIT Nl/min
PRESSURE UNIT bar
SET FL.COL 2000
RES FL.COL 2000
2000 Nl/min
SET THE VALUE
SETUP
PLANT
I/O
DISPLAY
SERVICE
INFO
STATE
DIAG
METAL WORK
PNEUMATIC
SET UP
SERVICE
CONSUMPT. RESET
SENSOR CHECK.
INTERNAL TEMP.
PASSWORD
FACTORY RESET
CONSUMPT. RESET
Reset consumptions?
Done
SENSOR CHECK.
Sensor OK
Or
Error
Please
Contact Supplier
INTERNAL TEMP.
50.3 °C
PRESS A KEY





COMMISSIONING

INSTALLING THE FLUX IO-Link in an IO-Link NETWORK

5.1 IODD CONFIGURATION FILE

The corresponding “MetalWork-FLUX-_ _ _ _ _ _ _ _ _ _-IODD1 1” IODD configuration file available on the Metal Work website is supplied with the FLUX IO-Link.

5.2 ADDRESSING

5.2.1 Cyclic data

- 4 input bytes for the measured flow [Nl/h]
- 2 input bytes for measured pressure [mbar]
- 1 input byte for status indication (digital switch)
- 1 input byte for diagnostics.

Function	Data type	Address
Flow Nl/h	DWord	%ID0
Pressure mbar	Word	%IW4
Digital output	Byte (bit 0)	%I5.0
Diagnostics	Byte	%IB6

5.2.2 Acyclic data

Function	Index	Subindex	Description	Data type	Format
Temperature °C	100	0	Temperature °C	Read 2 byte	Hex
Flow Nl/min	101	0	Flow Nl/min	Read 2 byte	Hex
Flow Nl/h	102	0	Flow Nl/h	Read 4 byte	Hex
Flow Nm 3/min	103	0	Flow Nm 3/min	Read 4 byte	Hex
Flow Nm 3/h	104	0	Flow Nm 3/h	Read 4 byte	Hex
Flow ft 3/min	105	0	Flow ft3/min	Read 4 byte	Hex
Flow ft 3/h	106	0	Flow ft 3/h	Read 4 byte	Hex
Volume consumption Nl	107	0	Volume consumption Nl	Read 4 byte	Hex
Energy consumption kWh	108	0	Energy consumption kWh	Read 4 byte	Hex
Mass consumption kg	109	0	Mass consumption kg	Read 4 byte	Hex
Mass flow rate gr/min	110	0	Mass flow rate gr/min	Read 2 byte	Hex
Power W	111	0	Power W	Read 2 byte	Hex
Series FLUX	112	0	1 = FLUX 1 2 = FLUX 2	Read 1 byte	Hex
Display	113	0	0 = Not present 1 = Present	Read 1 byte	Hex
Pressure sensor	115	0	0 = Not present 1 = Present	Read 1 byte	Hex
Alarms	116	0	0 = No alarms 1 = Alarm	Read 1 byte	Hex
Consumption reset	2	0	Value = Dec 160 Hex 0xA0	Write 1 byte	Hex

5.2.3 Configuration of parameters from Master IO-Link

Parameter	Index	Subindex	Description	Data type
Display – Flow rate unit of measurement	65	0	0 = Nl_min 1 = Nl_h 2 = Nm 3_min 3 = Nm 3_h 4 = ft 3 /min 5 = ft 3/h	R/W 1 byte

GAS type	66	0	0 = Air 1 = Nitrogen 2 = CO2 3 = Helium	R/W 1 byte
Display – Pressure unit of measurement	67	0	0 = bar 1 = MPa 2 = psi	R/W 1 byte
K-Energy Wh/Nm³	68	0	DEC value = 100 hex 00 64	R/W 1 byte
Digital output enable status	69	0	0 = NO 1 = NC	R/W 1 byte
Digital output enable reference	70	0	0 = Flow [Nl/h] 1 = Volume consum ption 2 = Pressure [mbar]	R/W 1 byte
Digital output function	71	0	0 = level switch (reference – flow rate or pressure) 1 = band switch (reference – flow rate or pressure) 2 = contact switch (reference – vol ume) 3 = cyclic pulse (reference – volum e)	R/W 1 byte
Digital output function – Set/High value Nl/ h o mbar	72	0	Reference value for digital output activation	R/W4 byte
Digital output function – Set/Low value Nl/ h o mbar	73	0	Digital output function Reference v alue for digital outputde-activation	R/W4 byte
Digital output function – counter Nl	74	0	Totalizer value for digital output activation	R/W4 byte
Display – Language	75	0	0 = ENG 1 = ITA 2 = FRA 3 = ESP 4 = DEU	R/W 1 byte
Display – orientation °	76	0	0, 90, 180, 270	R/W 2 byte
Display – FLUX ON color Nl/h	77	0	Flow rate value at which the colour changes to yellow	R/W 4 byte
Display – FLUX Off color Nl/h	78	0	Flow rate value at which the colour reverts to orange	R/W 4 byte
Syntesi® filter	79	0	0 = Not present 1 = Present	R/W 1 byte

IO-Link NODE DIAGNOSTIC MODE

	LED STATE	MEANING
○	OFF	No power supply, device switched off
●	ON (green)	Device powered correctly
☀	Flashing (green)	Device malfunction. Power supply out of range, faulty sensor.
	LED DIAG	**MEANING**
●	ON (green)	Operating status
☀	Flashing (green)	Pre-operating status
●	ON (red)	IO-Link communication error
☀	Flashing (red)	IO-Link power supply error (undervoltage or overvoltage)
○	OFF	No IO-Link power supply

DIAGNOSTICS AND TROUBLESHOOTING

The diagnostics functions report the status of the device via error codes in hexadecimal or decimal format in order of priority to the controller. The status byte is read by the controller as an input byte.
The table below describes the correct interpretation of the codes:

Codice Hex	Codice DEC	Meaning	Note
0xD5	213	Flow sensor failure	Contact service
0xD1	209	Pressure sensor failure	Contact service
0xCC	204	Analogue output failure	Power failure or current too high, check the devi ce i s connected to a proper input.
0xB0	176	Digital output failure.	Power failure or current too high.
0x16	22	Flash memory reset or corrupted / E 2 prom reset or corrupted or not ready / Measurement log error.	Memory read/write error. Switch the unit off and on again. If the fault persists, contact service.
0x15	21	Power supply out of range.	Power the system with a voltage within the perm issible operating range.
0x00	0	The module operates correctly.	

TECHNICAL DATA

	FLUX 1	FLUX 2
Measured flow range Nl/min	0 to 2000	0 to 4000
Fluid	Compressed air free of any lubricants and inert gases	
Fluid temperature °C	0 to 50	
Direction of flow	Unidirectional	
Measuring method	Thermal	
Working pressure range bar	0 to 10	
MPa	0 to 1	
psi	0 to 145	
Pressure drop	None	
Temperature range °C	0 to 50	
Threaded ports	1/2″	1″
Degree of protection	IP65	
Weight g	585	705
IO-Link supply voltage range VDC	15 – 27 (with IO-Link Master)	
Current consumption mA	80 mA (at 24VDC)	
DISPLAY		

Instant flow rate Nl/min	0 to 2200	0 to 4400
Cumulative flow rate Nl	999.999.999	
Nm 3	999.999	
Nft 3	35.320.000	
Pressure n bar	0 to 10	
Resolution bar	0.01	
PRECISION ●		
Flow rate		
Measuring range	0 to 100% of the full scale	
Single unit display accuracy	from 0 to 20% of the FS – better than ±1% of the FS	
	from 20% to 100% of the FS – better than ±3% of the F S	
Display accuracy of unit installed in an SY unit	from 0 to 20% of the FS – better than ±2% of the FS	
	from 20% to 100% of the FS – better than ±6% of the F S	
Repeatability	±1% of the FS	
Temperature characteristic		
Version with pressure transducer	Automatic compensation of fluid temperature from 0 to 50°	
	Between 0 and 15°C and between 35 and 50°C ±0.6% of the FS every °C	
Version without pressure transducer	Without compensation, between 0 and 15°C and betwe en 35 and 50°C	
	±1.2 % of the FS every °C	
Pressure		
Measuring range bar	0 to 10	
Display accuracy	±2% of the FS	
DIGITAL OUTPUT		
Operating mode, if set on flow rate	Level switch, Band switch, Value switch, Cyclic pulse	
Min. accumulated volume by pulse (pulse width 100 msec)	10	20
	1	
	1	
Response mode, with pressure mode setting	Level switch, Band switch	
Hysteresis	Adjustable	

■ In versions with pressure transducer.
● At a pressure of 5 bar and a fluid temperature of 25°C ±10°C.

Documents / Resources

	METAL WORK IM03 Flux 1-2 IO-Link Digital Flowmeter And Pressure Sensor [pdf] User Manual IM03 Flux 1-2 IO-Link Digital Flowmeter And Pressure Sensor, IM03, Flux 1-2 IO-Link Digital Flowmeter And Pressure Sensor, IO-Link Digital Flowmeter And Pressure Sensor, Digital Flowmeter And Pressure Sensor, Flowmeter And Pressure Sensor, Pressure Sensor, Sensor

References

- User Manual