ISOMAG.
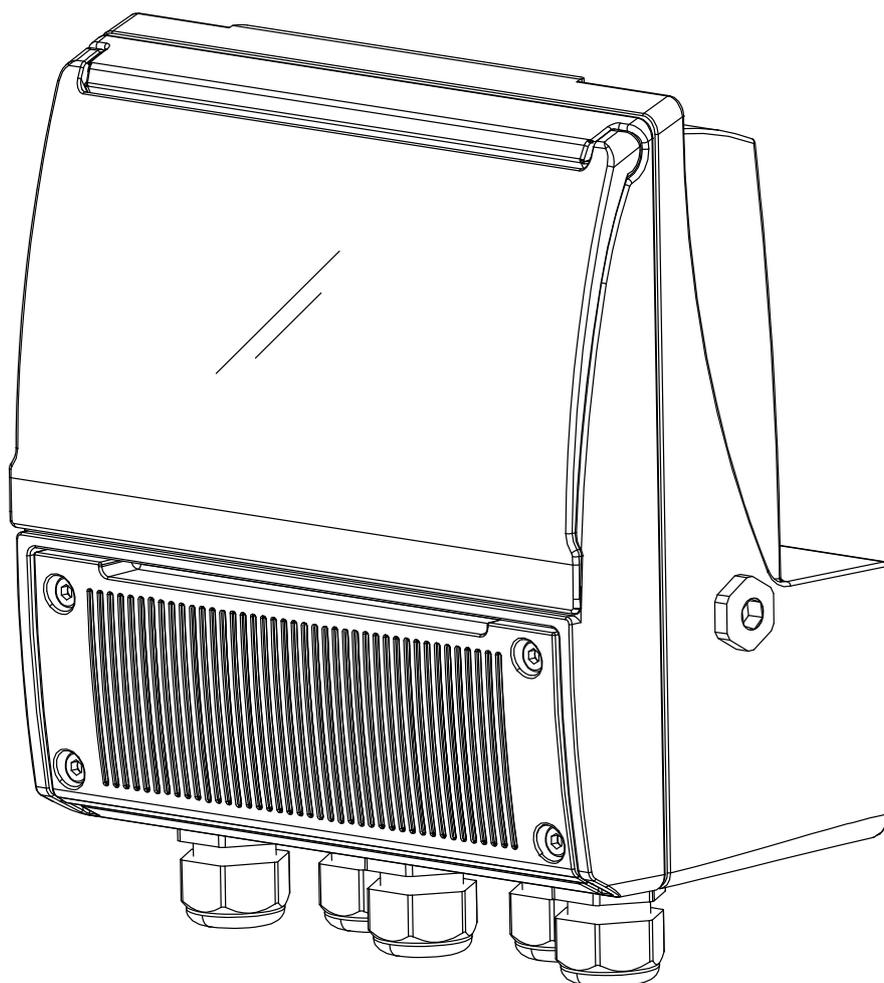
The friendly magmeter

OPERATING AND MAINTENANCE MANUAL

MV110

CE

ISOIL
I N D U S T R I A

Release number: **110_EN_IT_IS_R3_1.00.0**

The characters of file name in bold type indicate the software version which the manual refers to; it is visualized at the instrument start up, or by specific function on DIAGNOSTIC menu.

INDICE

INTRODUCTION

❑ These operating instructions and description of device functions are provided as part of the scope of supply.

❑ They could be modified without prior notice. The improper use, possible tampering of the instrument or parts of it and substitutions of any components not original, renders the warranty automatically void.

❑ The flow meter realizes a measure with liquids of conductivity greater than 5µS/cm in closed conduits, and is composed of a converter (described in this manual) and a sensor (refer to the specific manual).

❑ The converter could be coupled directly on the sensor (compact version) or coupled to the sensor by cable supplied with it (remote version).

CONVERTER →

SENSOR →
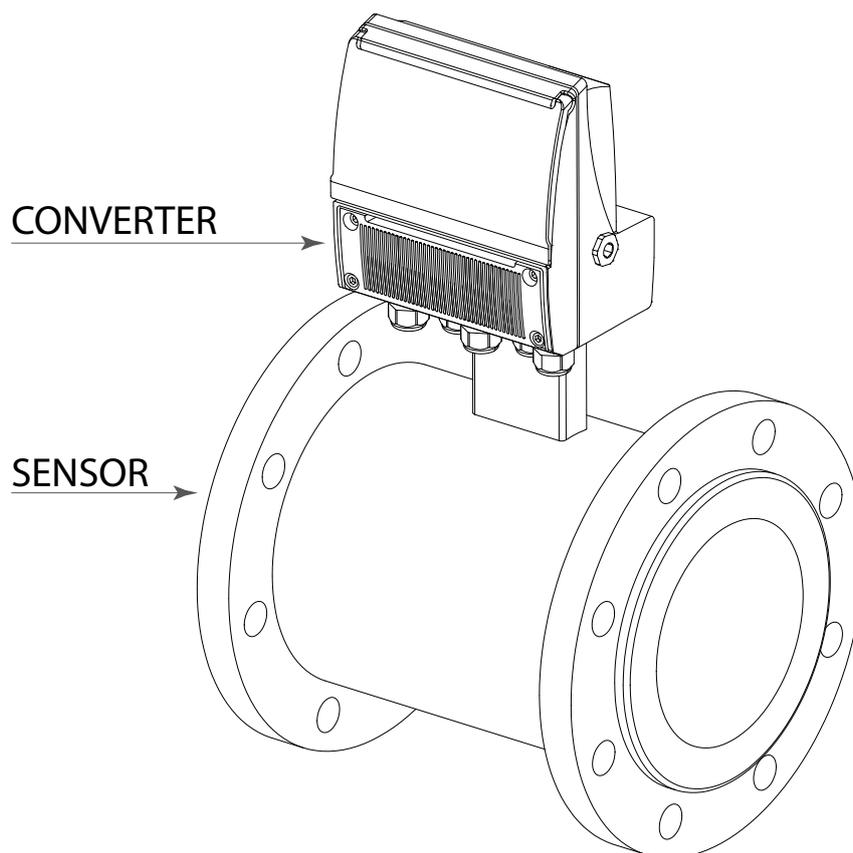
SAFETY INFORMATION

Any use other than described in this manual affects the protection provided by the manufacturer and compromises the safety of people and the entire measuring system and is, therefore, not permitted. The manufacturer is not liable for damaged caused by improper or non-designated use.

❑ Transport the measuring device to the measuring point in the original packaging. Do not remove covers or caps until immediately before installation. In case of cartons packaging it is possible to place one above the other but no more than three cartons. In case of wooden packaging do not place one above the other.

❑ Disposal of this product or parts of it must be carried out according to the local public or private waste collection service regulations.

❑ The converter must only be installed, connected and maintained by qualified and authorized specialists (e.g. electrical technicians) in full compliance with the instructions in this Operating Instruction, the applicable norms, legal regulations and certificates (depending on the application).

110_EN_IT_IS_R3_1.00.0

❑ The specialists must have read and understood these Operating Instructions and must follow the instructions it contains. The Operating Instructions provide detailed information about the converter. If you are unclear on anything in these Operating Instructions, you must call the ISOIL service department.

❑ The converter should only be installed after have verified technical data provided in these operating instructions and on the data plate.

❑ Specialists must take care during installation and use personal protective equipment as provided by any related security plan or risk assessment.

❑ Never mount or wire the converter while it is connected to the power supply and avoid any liquid contact with the instrument's internal components. To connect remove the terminals from the terminal block.

❑ Before connecting the power supply check the functionality of the safety equipment.

❑ Repairs may only be performed if a genuine spare parts kit is available and this repair work is expressly permitted.

❑ For the cleaning of the device use only a damp cloth, and for the maintenance/repairs contact the service center (for details see the last page).

Before starting up the equipment please verify the following:

❑ Power supply voltage must correspond to that specified on the data plate
❑ Electric connections must be completed as described
❑ Ground (earth) connections must be completed as specified

Verify periodically (every 3-4 months):

❑ The power supply cables integrity, wiring and other connected electrical parts
❑ The converter housing integrity
❑ The suitable tightness of the sealing elements
❑ The front panel integrity (display and keyboard)
❑ The mechanical fixing of the converter to the pipe or wall stand

SAFETY CONVENTION

DANGER ELECTRIC SHOCK	WARNING	PRECAUTIONS	ATTENTION

TECHNICAL CHARACTERISTICS

ELECTRICAL CHARACTERISTIC

Converter classification: class I, IP67/68 for aluminum and PA6 housing, installation category (overvoltage) II, rated pollution degree 2.

Power supply versions	Power supply voltage	Power supply frequency	Min Power	Max power
HV	100-240V~	45-66HZ		
LV	24-36V⎓	//	1,5 W (Sensor only)	5 W (all Loads)
	24-36V~	45-66HZ		
LLV	12-48V⎓	//		

❑ Voltage variations must not exceed ±10% of the nominal one.
❑ Input/output insulated up to 500V.
❑ The output 4-20mA (optional) is electrically connected to the ON/OFF outputs and the output power supply (24V ⎓).
❑ Version LV/LLV : inrusch current < 20A
Version HV : inrusch current < 25A

ENVIRONMENTAL USE CONDITIONS

❑ The converter can be installed internally or externally
❑ Altitude: from –200m to 4000m (from -656 to 6560 feet)
❑ Humidity range: 0-100%

AMBIENT TEMPERATURE		
	Min*	Max
°C	-10	60
°F	14	140

ATTENTION

The battery will not be charged outside the below limits :
❑ T board MV110 < 0 °C
❑ T board MV110 > 50 °C

If the converter is supplied in compact version (converter over the sensor), consider the ambient temperatures more restrictive, otherwise refer to the relevant manuals.
* For discontinuous use, a thermostat heat source installation may be necessary.

DATA PLATE

The instrument label contain the following information:

❑ **MODEL:** Convert Model
❑ **S/N:** Serial Number of the converter
❑ **SUPPLY:** Main power supply
❑ **Hz:** Supply frequency (AC)
❑ **POWER:** Maximum power consumption
❑ **IP:** Protection grade
❑ **T:** Operation temperature
❑ **COUPLING:** Serial number of sensor coupled
❑ **ITEM:** Free for user
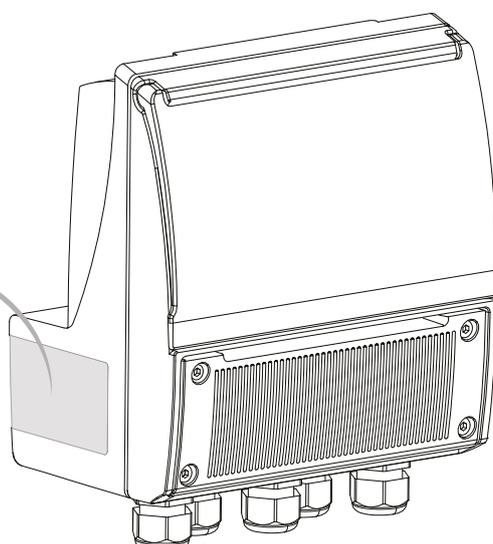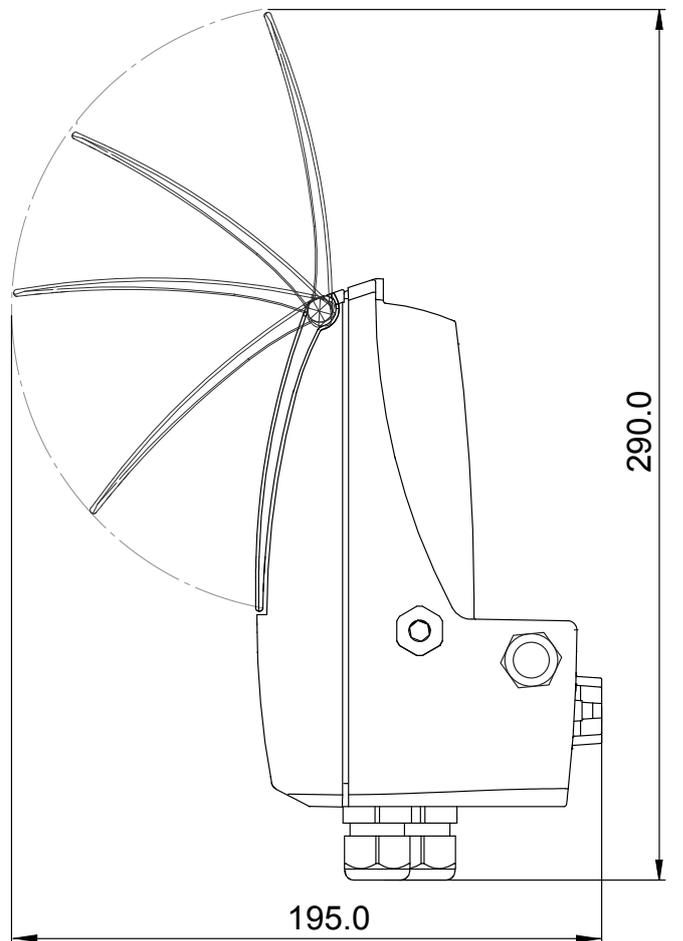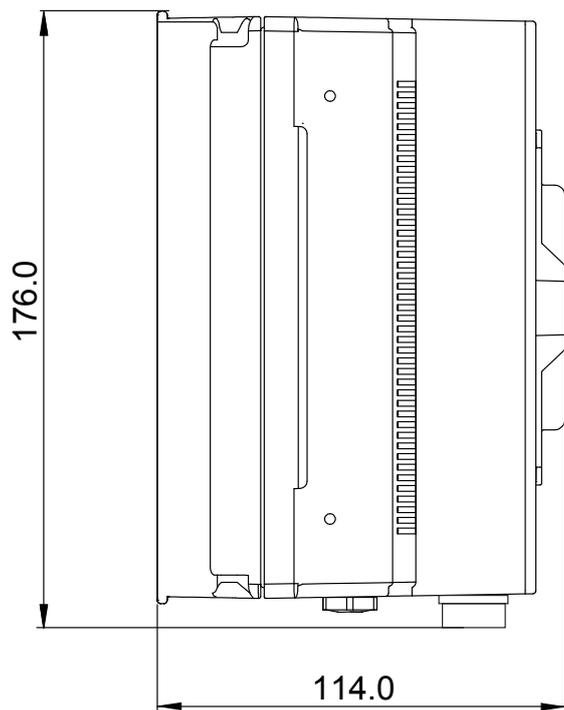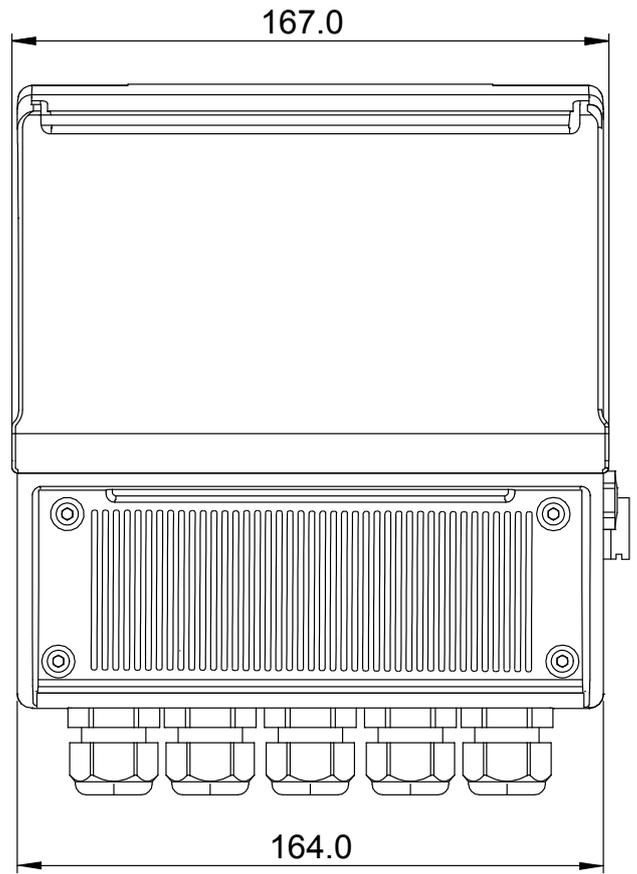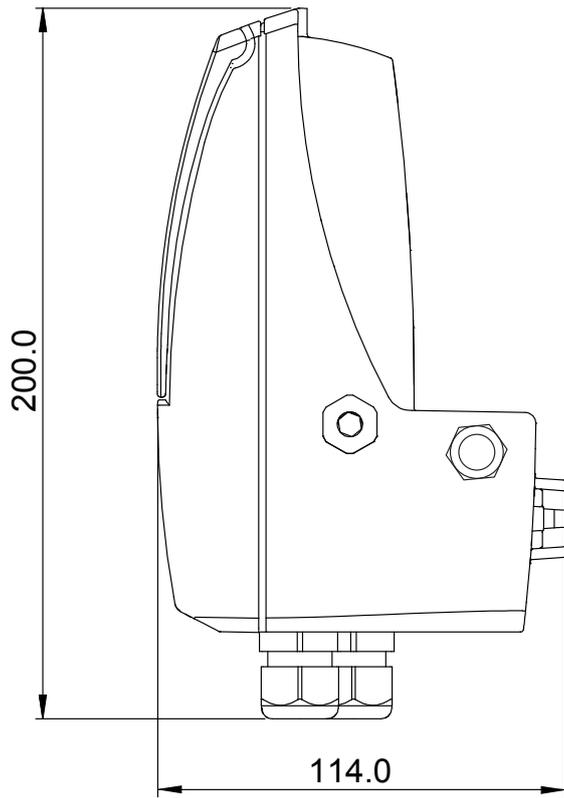
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DIMENSIONS

167.0

200.0

114.0

164.0

176.0

114.0

290.0

195.0

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SEPARATE VERSION
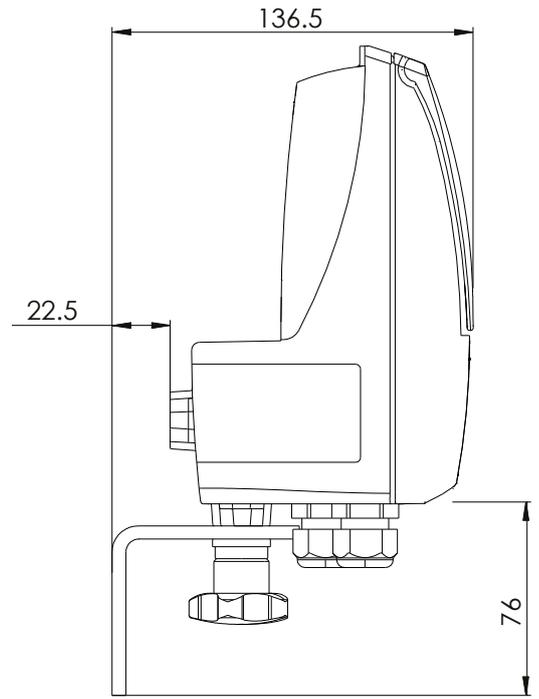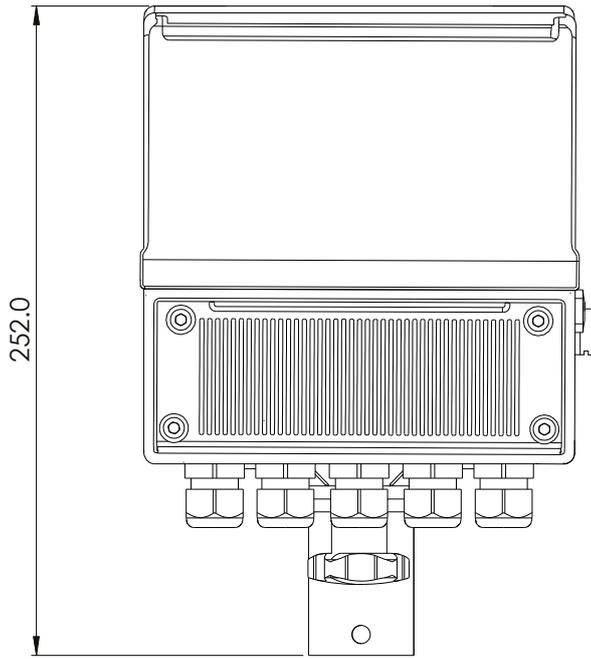
HORIZONTAL VERSION
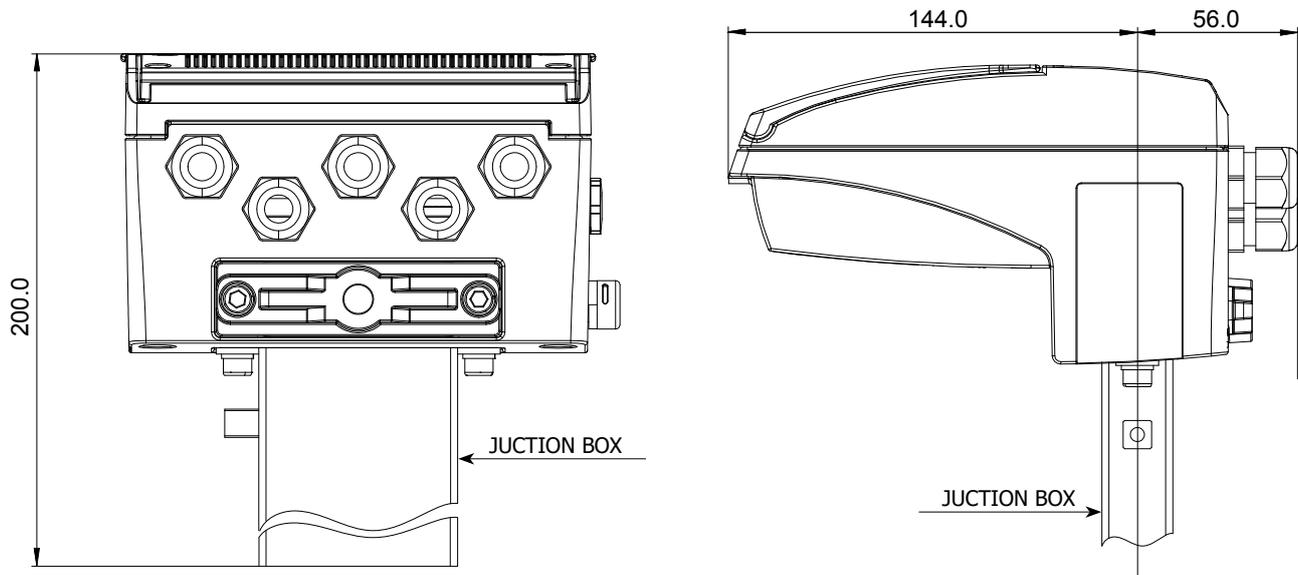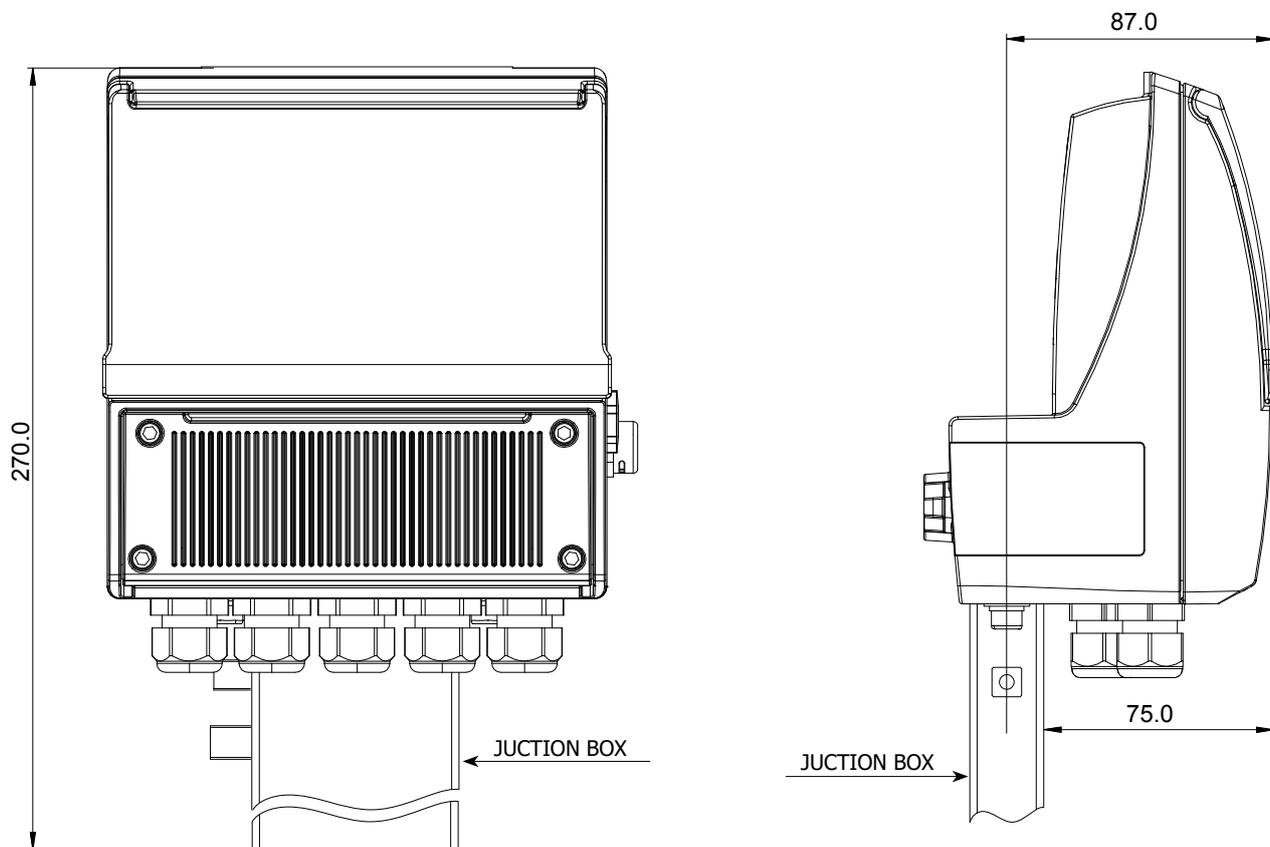
144.0

56.0

200.0

JUCTION BOX

JUCTION BOX

VERTICAL VERSION

87.0

270.0

JUCTION BOX

JUCTION BOX

75.0

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TORQUES

To guarantee the housing's IP degree the following torques are required:
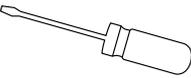
	Housing screw (1)	Cover terminal block screw (2)	Fixing Display Frame	PCB Screw	Version Cap (3)	Cable Glands (4)	Cap USB-B (5)
ALUMINIUM HOUSING	6 Nm	5.5 Nm	3 Nm	0.8 Nm	8 Nm	4 Nm	4 Nm
PLASTIC HOUSING	2 Nm	2 Nm	2.5 Nm	0.8 Nm	7 Nm	4 Nm	4 Nm
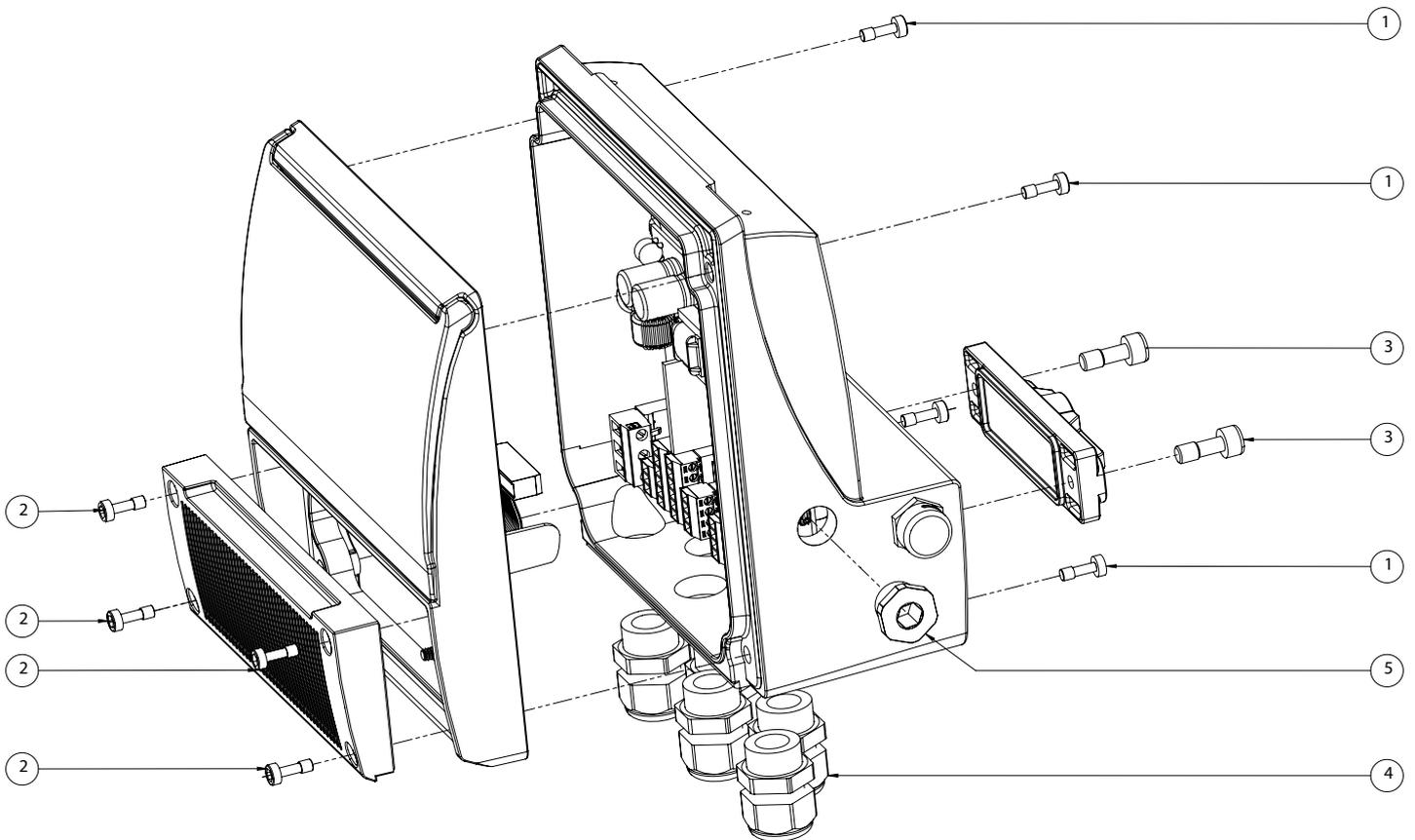
MV110 CONSTRUCTION

TERMINAL BLOCK COVER

1
2
3
4

MAIN HOUSING COVER

5
6
7
8
9
10
11

PCB MV110

12
13

MAIN HOUSING

14
15
16
17
18
19
20
21
22
23
24
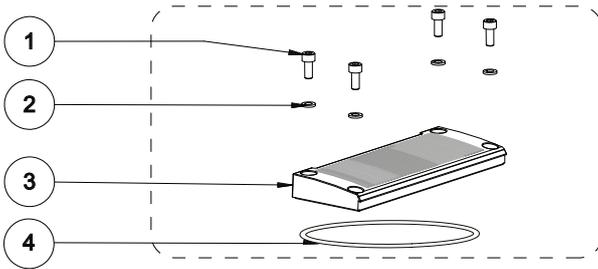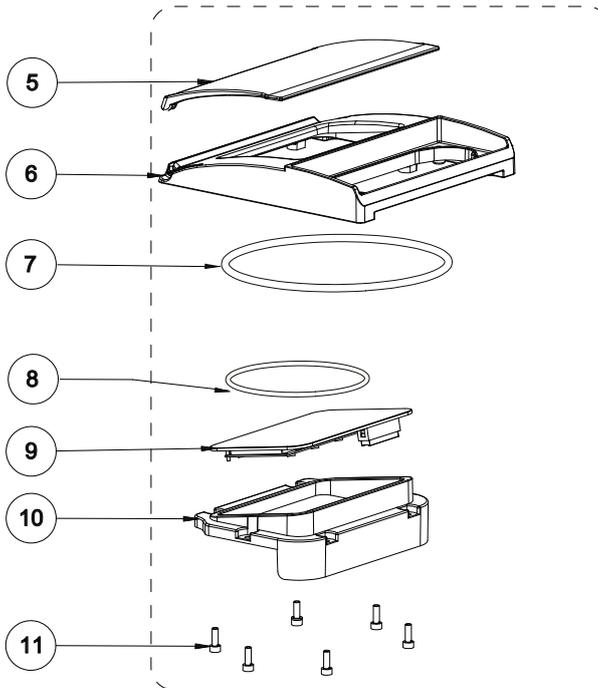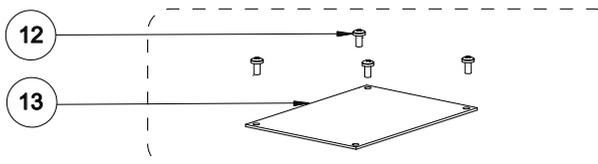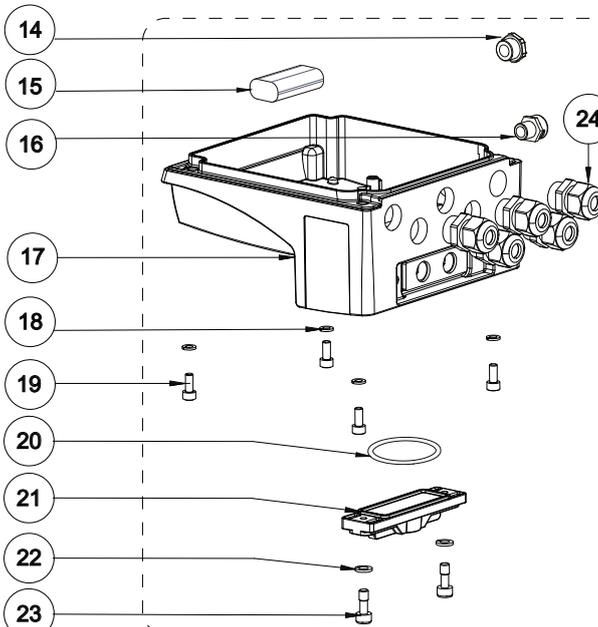
POS.	DESCRIPTION	
	PA6 VERSION	*ALUMINIUM VERSION*
1	SCREW M4x12	SCREW M5x12
2	GROWER Ø4	GROWER Ø5
3	TERMINAL BLOCK COVER	TERMINAL BLOCK COVER
4	O-RING-4400	
5	PROTECTION COVER	
6	HOUSING COVER	HOUSING COVER
7	ORING-4700	
8	ORING-117x3	
9	DISPLAY	
10	FIXING DISPLAY FRAME (MATERIAL PA06)	
11	SELF-TAPPING SCREW 4x10	TRILOBO SCREW 4x10
12	SELF-TAPPING SCREW 4x10	TRILOBO SCREW 4x10
13	PCB MV110	
14	PG9 CAP	
15	LITHIUM BATTERY	
16	ANTICONDESE CAP	
17	PA6 MAIN HOUSING	ALUMINIUM MAIN HOUSING
18	GROWER Ø4	GROWER Ø5
19	SCREW M4x12	SCREW M5x12
20	O-RING-155	
21	VERSION CAP (MATERIAL PA06)	
22	SCREW M6x16	
23	GROWER Ø6	
24	PG11 CABLE GLAND	

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INTERNAL LAYOUT

INTERNAL CONVERTER VIEWS

Remove the main housing cover by removing the 4 screws as shown here below.
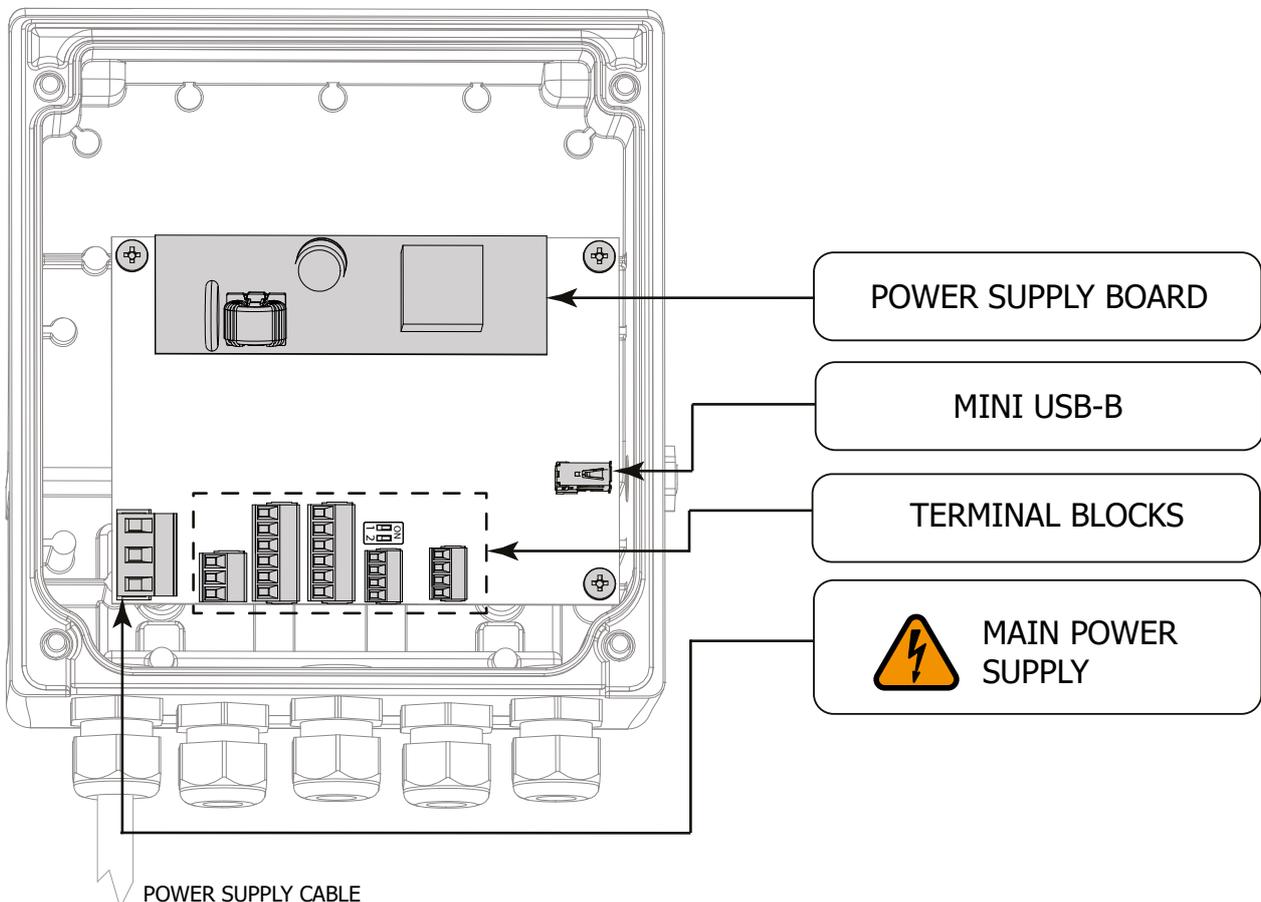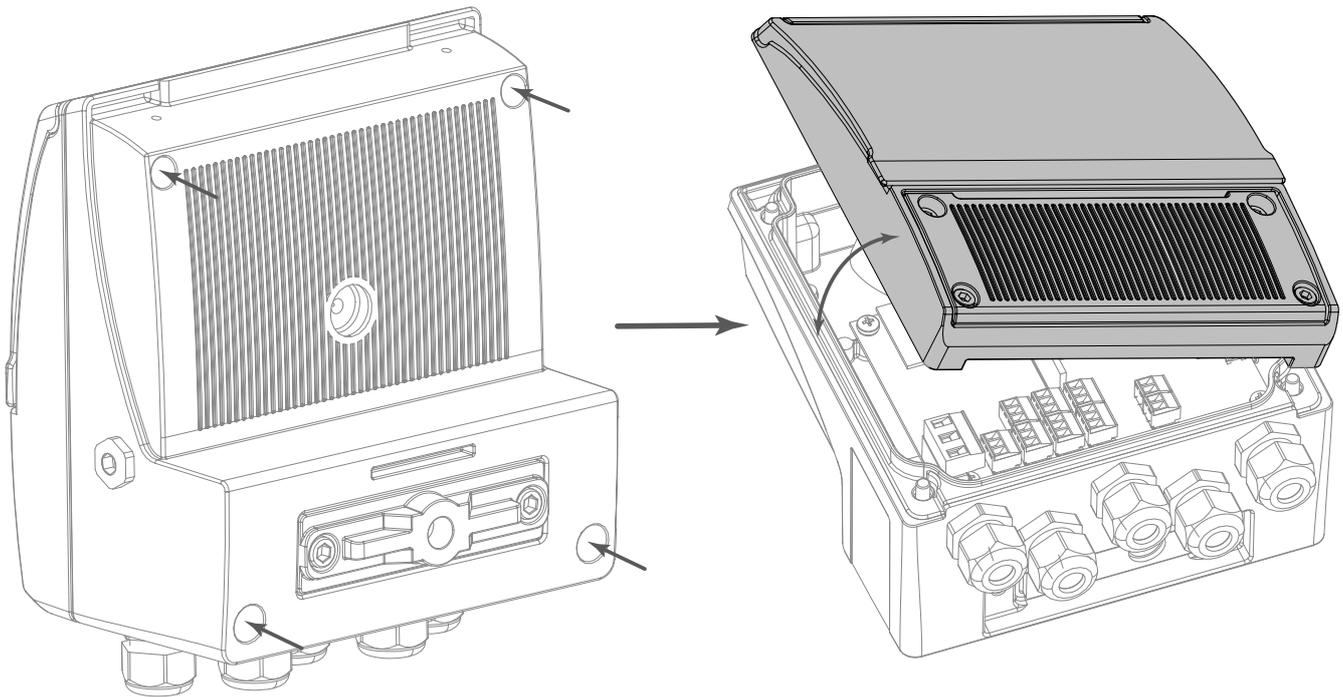
POWER SUPPLY BOARD

MINI USB-B

TERMINAL BLOCKS

MAIN POWER SUPPLY

POWER SUPPLY CABLE

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ELECTRICAL CONNECTION AND GROUNDING INSTRUCTIONS

⚠️ Always ensure that the converter and the sensor are grounded (earthed) correctly. The grounding of the sensor and converter **must** ensure that the instrument and liquid are equipotential.

ORING 4700

L(+)
N(-)
⏚ ⚡

COVER

GROWER

SCREW
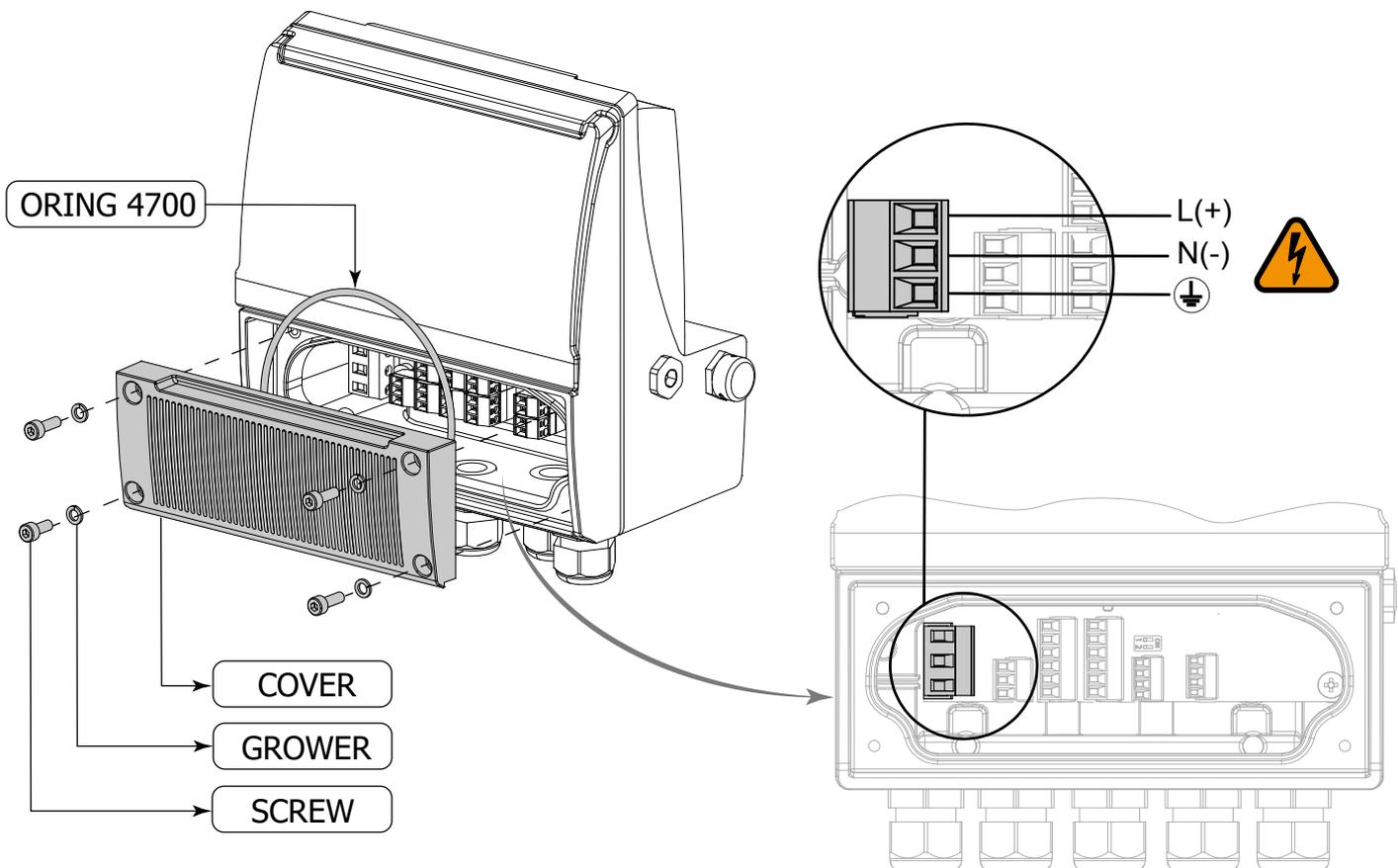
- ❏ Before connecting the power supply, verify that the mains voltage is within the limits indicated on data plate.
- ❏ For the connections use only approved conductors, with fire-proof properties, whose section varies from 0.25mm2 to 1.50mm2, based on distance/power; additionally fix the power supply wires with a additional fastening system located close to the terminal.
- ❏ The power supply line must be equipped with an external protection for overload current (fuse or automatic line breaker).
- ❏ Provide in close proximity the converter a circuit breaker easily accessible for the operator and clearly identified; whose symbols must conform to the electrical safety and local electrical requirements.
- ❏ Ensure that the component complies with the requirements of the standard for electrical safety distance.
- ❏ Check chemical compatibility of materials used in the connection security systems in order to minimize electrochemical corrosion. In the aluminum housing it should avoid direct contact between the ground connection cable and the aluminum housing. It is therefore recommended to connect the safety ground cable, by placing it between the washer and the metal bracket on the related terminal or use an eyelet terminal crimped on the ground protection cable.
- ❏ The sensor, hardwired inputs and outputs are connected to the converter through terminal blocks located inside the converter.
- ❏ To locate the terminal block loosen the 4 screws on the terminal block cover. When the front cover is lifted, the terminal block is visible. The terminal block is the hardwire connection of the converter to external equipment, including the sensor.

The following pages give informations on the terminal block numbering, and the respective connecting of the sensor cables, and inputs/outputs.

ELECTRICAL CONNECTION CONVERTER- SENSOR

⚠ Sudden movements of the electrodes cable could introduce noise.

*SH = SHIELD OF CABLE internally connected to ground.
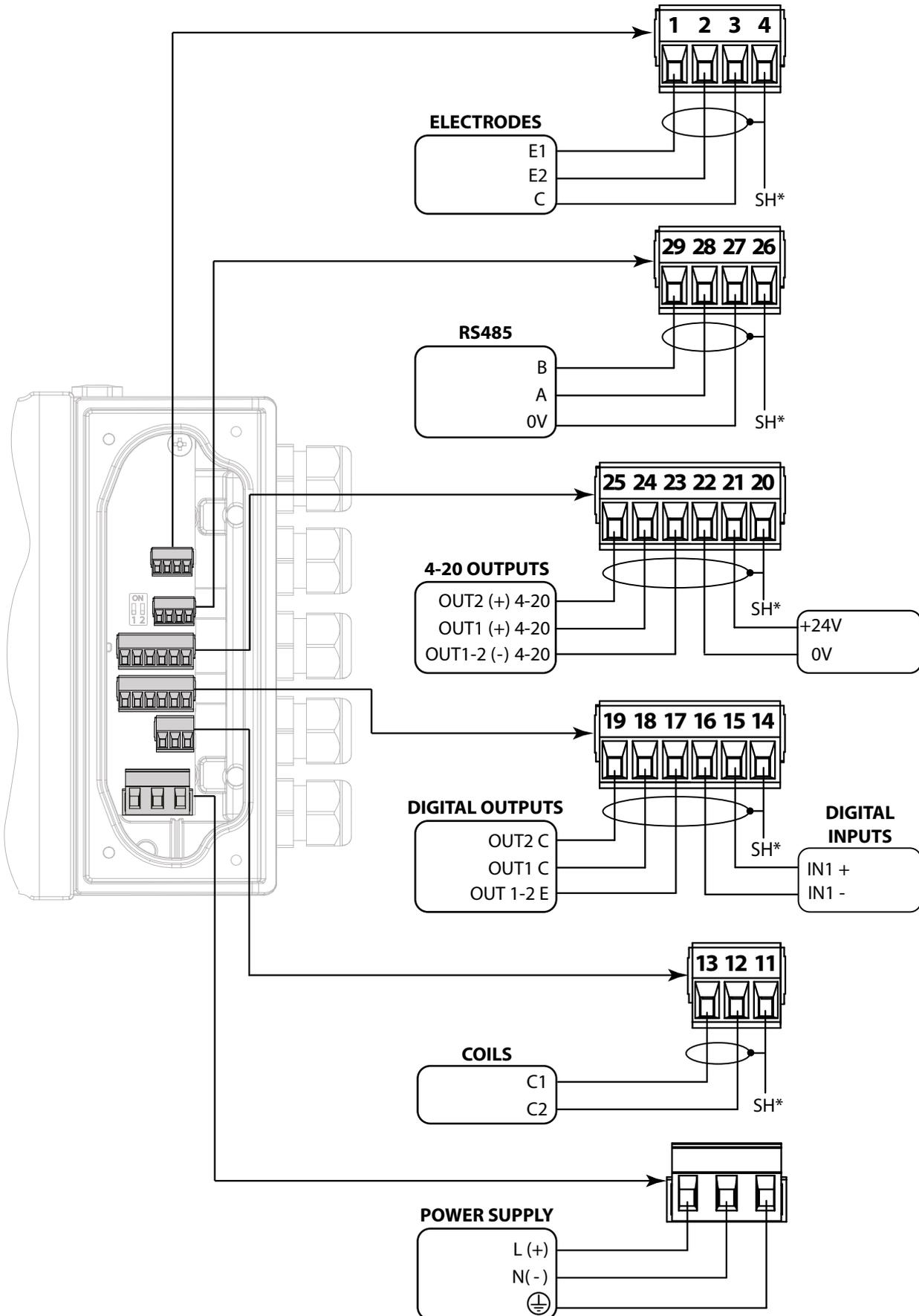
| 1 | 2 | 3 | 4 |

ELECTRODES
E1
E2
C
SH*

| 29 | 28 | 27 | 26 |

RS485
B
A
0V
SH*

| 25 | 24 | 23 | 22 | 21 | 20 |

4-20 OUTPUTS
OUT2 (+) 4-20
OUT1 (+) 4-20
OUT1-2 (-) 4-20
SH*
+24V
0V

| 19 | 18 | 17 | 16 | 15 | 14 |

DIGITAL OUTPUTS
OUT2 C
OUT1 C
OUT 1-2 E
SH*
DIGITAL INPUTS
IN1 +
IN1 -

| 13 | 12 | 11 |

COILS
C1
C2
SH*

POWER SUPPLY
L (+)
N(-)
⏚

ON
1 2

DIGITAL INPUT ON/OFF OPERATION

EXTERNAL POWER SUPPLY

10KΩ

15(+)

3-40Vdc (ON)
0/1.5Vdc (OFF)

16(+)

INTERNAL POWER SUPPLY

+24   21

10KΩ   15

16

-0   22

RESET TOTALIZERS

Block

3-40V

Reset

0-1.5V
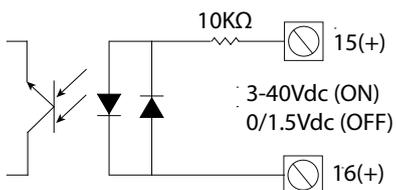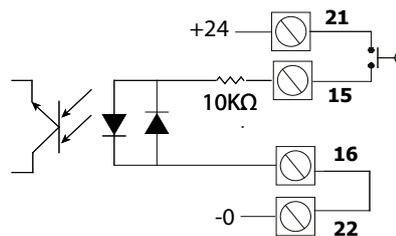
T   Tmin=100ms
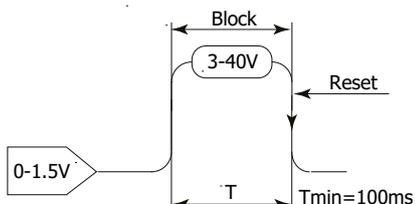
Necessary conditions for enabling the function
❑ POS. 6.1 see page 26 (T+; total direct positive set on)
❑ POS. 6.2 see page 26 (P+; partial direct positive set on)
❑ POS. 6.3 see page 26 (T-; total direct negative set on)
❑ POS. 6.4 see page 26 (P-; total direct negative set on)

BLOCK TOTALIZERS

Block Totalizers

3-40V

0-1.5V

Totalizers Active
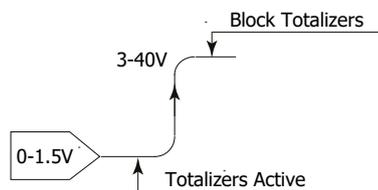
Necessary conditions for enabling the function
❑ POS. 6.5 see page 26 (Totalizer counting lock command set on)

RANGE CHANGE

Scale 2

3-40V

0-1.5V

Scale 1
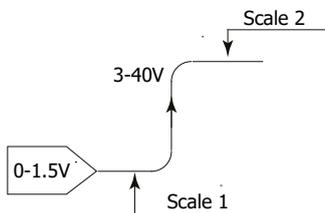
Necessary conditions for enabling the function
❑ POS. 6.8 see page 26 (Range change set on)

MEASURE LOCK

Measure blocked

18-30V

<18v

Measure
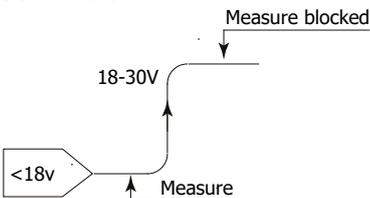
Necessary conditions for enabling the function
❑ POS. 6.6 see page 26 (Totalizer counting lock command set on)

SAMPLE RATE	Tmin
10HZ	220ms
20HZ	110ms
50HZ	45ms

MUST BE
$T > T_{min}$

OUTPUTS WIRING

DIGITAL OUTPUTS

18 OUT 1(+)
19 OUT 2(+)

17 (COM. OUT 1-2)
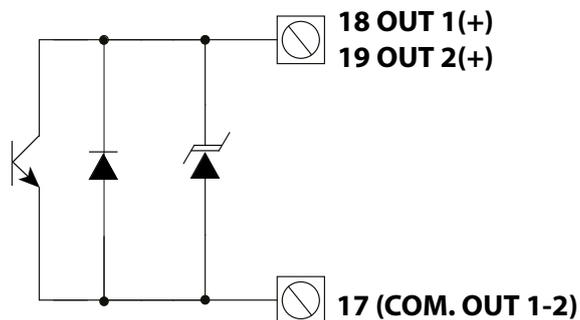
❏ Opto-insulated output with floating collector and emitter terminals freely connectable
❏ Maximum switching voltage: 40V ⎓
❏ Maximum switching current: 150mA
❏ Maximum saturation voltage between collector and emitter @150mA: 1.2V
❏ Maximum switching frequency (load on the collector or emitter, RL=470, VOUT=24V ⎓): 1250Hz
❏ Maximum reverse current bearable on the input during and accidental polarity reversion (VEC): 100mA
❏ Insulation from other secondary circuits: 500V ⎓

ANALOG OUTPUTS

24 OUT 1(+)
25 OUT 2(+)

23 (COM. 4-20 OUT 1-2)
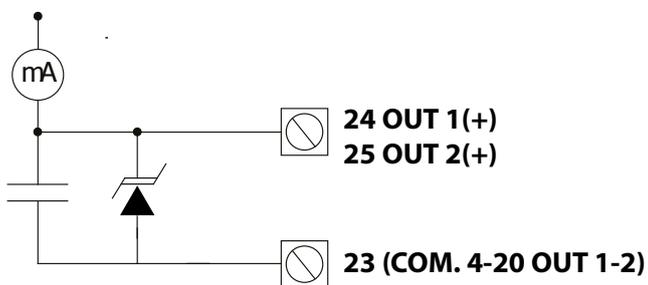
❏ Opto-insulated output
❏ Maximum load: 1000Ω
❏ Maximum voltage without load: 27V
❏ Refresh frequency is the same of the sample frequency of the connected sensor
❏ Protected against persistent over voltages to maximum 30V

RS485 MODBUS MODULE (OPTIONAL)

Positioning to 'ON' the termination switches 1 and 2, a 120Ω résistance is activated in the RS458 circuit (see terminal block).

TERMINATION SWITCH

29 28 27 26 TERMINAL BLOCK

SH

0V
A **RS485** **PC**
B
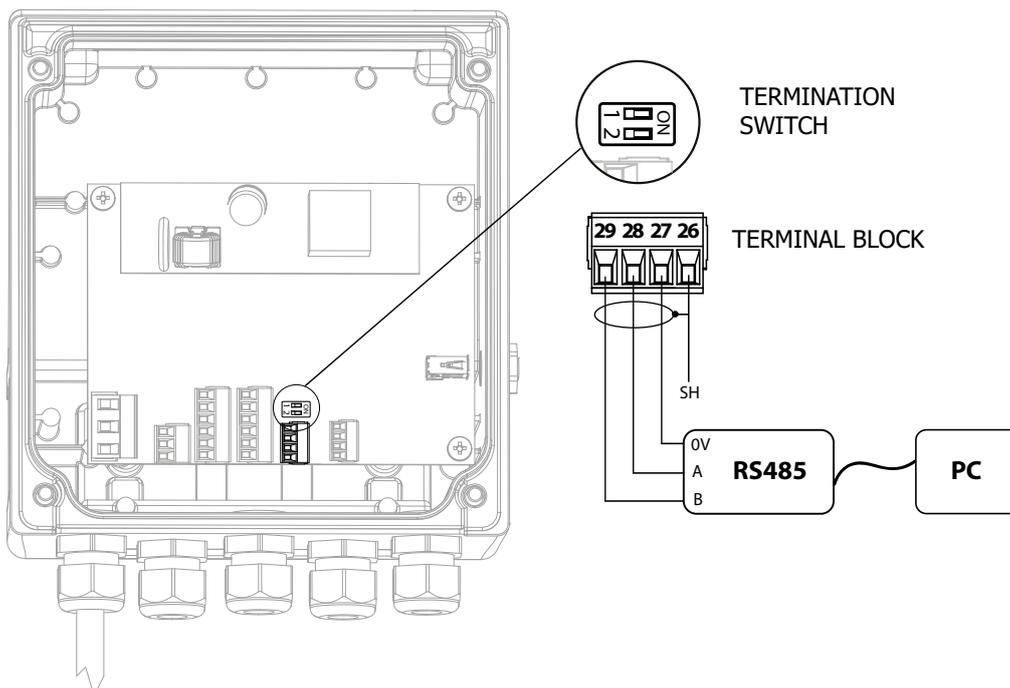
CONNECTORS MIL

THE following are the links of the MIL connectors IP68

SENSOR SIGNALS

A contact from terminal 1 of the converter (electrode 1)
Contact F from terminal 2 of the converter (electrode 2)
Contact And from terminal 3 of the converter (COM. Elec.)
Contact B from terminal 13 of the converter (COIL 1)
Contact C from terminal 12 of the converter (COIL 2)
Contact D from terminal 4 and 11 of converter
(SHIELD electrodes - COILS)

Connector
6 poles

INPUT/OUTPUT

1. Contact B from terminal 24 of the converter (Out1 4-20 +)
2. Contact A from terminal 25 of the converter (Out2 4-20 +)
3. Contact H from terminal 23 of the converter (Out1-2 4-20 -)
4. Contact C from terminal 21 of the converter (+ 24V)
5. Contact J from terminal 22 of the converter (0V)
6. Contact K from terminal 15 of the inverter (IN1 +)
7. Contact G from terminal 16 of the converter (IN1-)
8. Contact D from terminal 19 of the converter (C Out2)
9. Contact E from terminal 18 of the converter (Out1 C)
10. Contact F from terminal 17 of the converter (Out1-2 E)
11. Contact C from terminal 28 of the converter (RS485 A)
12. Contact J from terminal 29 of the converter (RS485 B)

NB: the connections 4 and 5 exclude the use
connections 11 and 12.

Connector
10 poles

POWER SUPPLY

C from terminal L power converter (+ dc)
A from terminal N power converter (-dc)
B from terminal GROUND Power Converter

Connector
4 poles

NOTE: Military Connector 6 poles for sensor converter only provided in the separate version of the converter.

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START VISUALIZATION PAGES

The direct exposure of the converter to the solar rays, could damage the liquid crystal display. The visualization pages can be change according to instrument's setup.

◀▶ Push to change visualization

Display	Label
	Flow rate direction +/-
	Unit of measure
	Flag
dm³/s +10.000	Flow rate value
	Flow rate trend
m/s +1.273	Flow Speed

Display	Label
0.0000 dm³/s +0.00% 5 ALARM(S)	Flow rate value
	% Full Scale
	n° ALARM

Display	Label
dm³/s 0.0000	Flow rate value
T+ dm³ 0.000	Direct Total Totalizer
P+ dm³ 0.000 5 ALARM(S)	Direct Partial Totalizer

Display	Label
dm³/s 0.0000	Flow rate value
T- dm³ 0.000	Reverse Total Totalizer
P- dm³ 0.000 5 ALARM(S)	Reverse Partial Totalizer

Display	Label
dm³/s 0.0000	Flow rate value
TN dm³ +0.000	Totalizer Total Net
PN dm³ +0.000 5 ALARM(S)	Totalizer Partial Net

Display	Label
dm³/s 0.0000	Flow rate value
T+ dm³ 0.000	Direct Total Totalizer
P+ dm³ 0.000	Direct Partial Totalizer
T- dm³ 0.000	Inverse Total Totalizer
P- dm³ 0.000 4 ALARM(S)	Inverse Partial Totalizer

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◀▶ Push to change visualization

```
T+dm³        0.000
P+dm³        0.000
T-dm³        0.000
P-dm³        0.000
   4 ALARM(S)
```

Totalizer Total +

Totalizer Partial +

Totalizer Total -

Totalizer Partial -

```
E1 V         0.001
E2 V         0.001
E1R kΩ         9.6
E2R kΩ         9.6
   1 ALARM(S)
```

Electrodes Voltage

Electrodes Resistance

```
   4 ALARM(S)
CLOCK NOT SET
EXCITATION ERROR
SIGNAL ERROR
FL.SENSOR ERROR

2000/01/01-01:14
```

n°Alarm

Alarm List

Date and Time

```
T+dm³ 233627.258
```

Direct Total Totalizer

```
P+dm³ 233633.381
```

Direct Partial Totalizer

```
T-dm³  14617.888
```

Reverse Total Totalizer

```
P-dm³  14617.888
```

Reverse Partial Totalizer

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MEANING OF FLAGS

FLAG	DESCRIPTION	FLAG	DESCRIPTION
Ø	EMPTY PIPE	! ↘	MIN FLOW ALARM
📥	FILE UPLOAD	! ↗	MAX FLOW ALARM
📤	FILE DOWNLOAD	↘↘	VIDEO TERMINAL CONNECTED
🔋	BATTERY RECHARGE (FLASHING) LOW BATTERY (FIXED)	◢!	FLOW RATE OVERFLOW
▲▼	FLOW RATE SIMULATION (FLASHING)	⊓1	PULSE 1 OVERFLOW
→▪←	CALIBRATION (FLASHING)	⊓2	PULSE 2 OVERFLOW
✕	GENERIC ALARM (FLASHING)	◔	POWERED DEVICE WITH ONE CHARGERS BATTERY (MID-DIRECTIVE)
!	GENERAL ALARM ONLY ON PHYSICAL DISPLAY (FLASHING)	◵	
✗	SIGNAL ERROR	◴	
✦	EXCITATION ERROR	◷	

MEANING OF LED COLORS
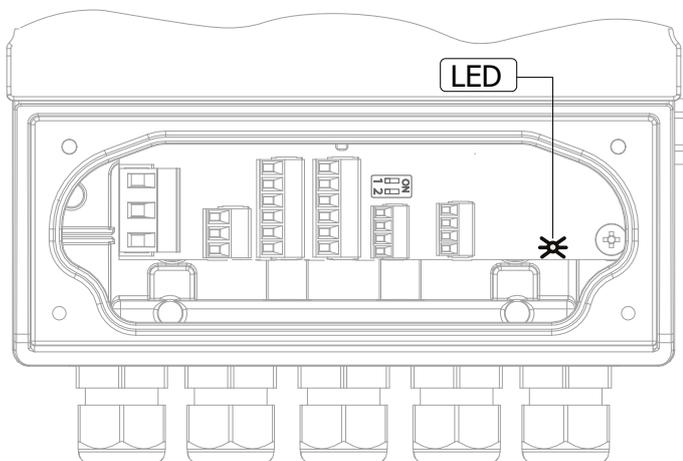
LED Red: Alarm signal
LED Blue: Usb communication enable
LED Green: Functioning system correctly

ACCESS TO THE CONFIGURATION MENU

The configuration can be done in two different ways:
- ❑ By keypad of converter
- ❑ By MCP interface (Virtual display of instrument)

ACCESS VIA KEYPAD
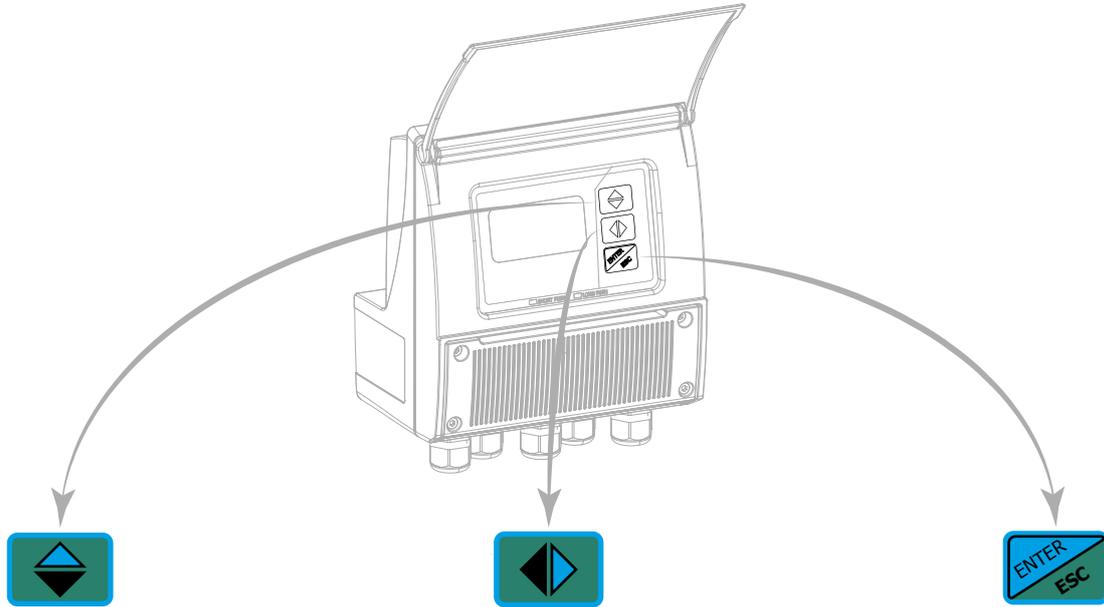
SHORT PRESSING (< 1 SECOND):
Increases the numeric figure or the parameter selected by the cursor
Returns to the previous subject on the menu.

LONG PRESSING (> 1 SECOND):
Decreases the numeric figure or the parameter selected by the cursor. Proceeds to the next subject on the menu.

SHORT PRESSING (< 1 SECOND):
Moves/positions the cursor rightward on the input field. Proceeds to the following subject of the menu. Change the display of the process data

LONG PRESSING (> 1 SECOND):
Moves/positions the cursor leftward on the input field. Returns to the previous subject on the menu

SHORT PRESSING (< 1 SECOND):
Enter /leave the selected function
Enables the main menu for the instrument configuration Cancels the selected function under progress

LONG PRESSING (> 1 SECOND):
Leaves the current menu
Enables the totalizer reset request (when enabled) Confirms the selected function.

ACCESS VIA MCP INTERFACE (VIRTUAL DISPLAY)

MCP is a Windows® software that allows to set all the converter functions and personalize the menu. The MCP program is required for the blind version of the converter. To use MCP interface consult the relevant user manual.

110_EN_IT_IS_R3_1.00.0
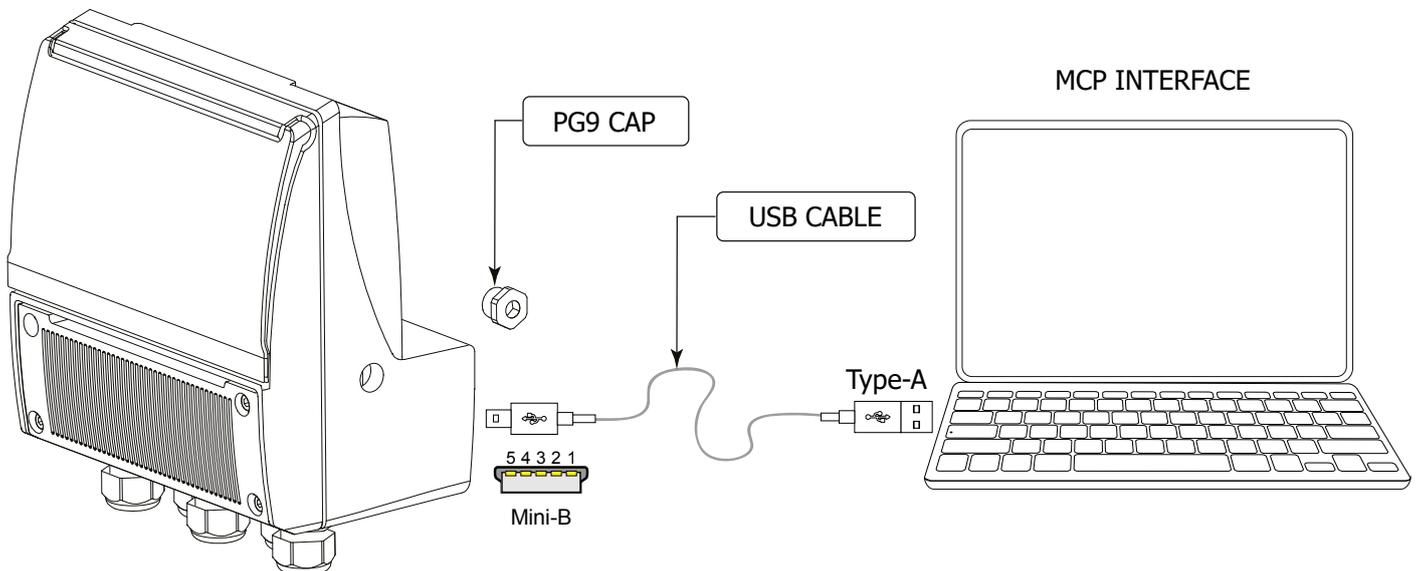
FLOW RATE VISUALIZATION

This symbol appears (red color on the virtual display) only when the overall noise is over 2.5% of flow rate.
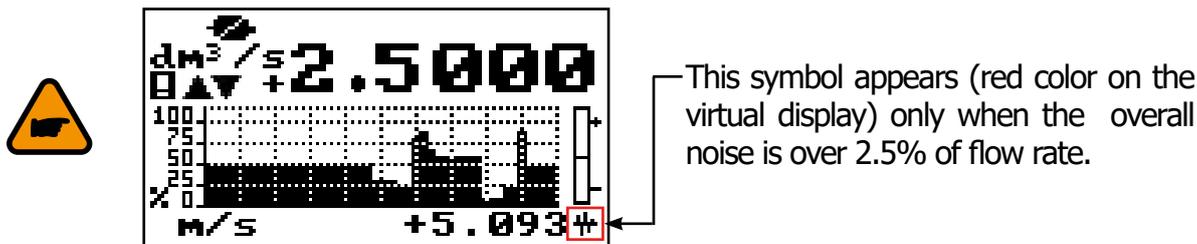
The MV 110 can show a 5 digits display for flow rate units; this mean the maximum flow rate value that can be represented on the display is 99999 (no matter the positioning of the decimal point). The minimum is 0.0025. The representable measure unit depends on sensor flow rate and diameter; the permitted units are those, that permits the instrument full scale value not exceeding 99999.
Example for DN 300, Full scale value: 3m/s:

❑ **PERMITTED measure unit** (example): l/s (216.00); m3/h (777.60); m3/s (0.2160)
❑ **NOT PERMITTED measure unit** (example): l/h (777600)

FLOW RATE ALERT

This FLAG becomes active when there is a flow variation (flow rate not stable).

QUICK START MENU

The QUICK START MENU allows to user immediate access to some of the most commonly used functions; through MCP software it possible customize this menu to make it suitable for the specific application.

Access to all functions

See programming functions section
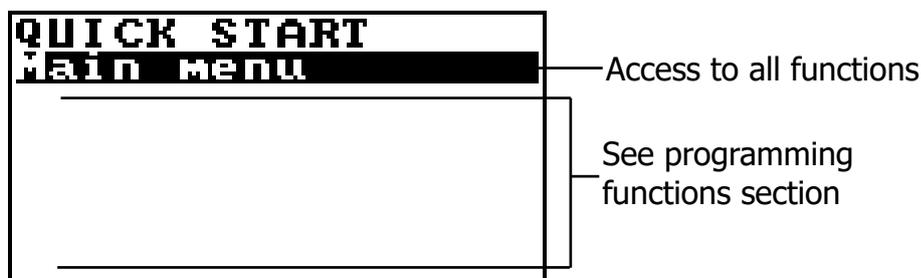
The user has immediate access to the Quick Start menu when the converter is powered up by pressing the Enter key. If access to the quick start menu does not occur, then it could be disabled using the function "9.11 Quick start menu visualization" page 27 .

CONVERTER ACCESS CODE

The access for programming the instrument is regulated by six access levels logically grouped.
Every level is protected by a different code.

❑ *Access Level 1-2-3-4 Freely programmable by user*

ACCESS CODE SET : MENU 13 SYSTEM

```
SYSTEM
Day.saving=   ON
Time zone=h+01.00
2016/04/04-16:07
L1  code=********
L2  code=********
L3  code=********
L4  code=********
L5  code=********
L6  code=********
Restr.access=  ON
 010.011.012.013
 010.011.012.014
 255.255.255.000
KT=        0.96469
KS=        1.00000
KR=        1.00000
DAC1  4mA=    02460
DAC1  20mA=   11050
DAC2  4mA=    02460
DAC2  20mA=   11050
 Stand-by
 FW update
13-System
```

```
SYSTEM
L1  code=*******5]
L2  code=********
L3  code=********
L4  code=********
L5  code=********
L6  code=********
        0◄►99999999
```

 The CODE is Settable by keyboard or MCP interface.
Depending on the level of access different display functions will be visible. (See section "FUNCTIONS DESCRIPTION" page 29)
These access levels interact with the "Restricted access"

RESTRICTED ACCESS SET : MENU 13 SYSTEM

```
SYSTEM
L1  code=********
L2  code=********
L3  code=********
L4  code=********
L5  code=********
L6  code=********
Restr.access=OFF
```

Settable Values

→ ON

→ OFF

Restrict = ON: Access permitted only to functions provided for a specific level;
Example: If the operator has a code of access level 3, after having set it, he can change only the functions with level 3 access.

Restict = OFF: It enables to change functions for the selected level and ALL the functions with lower access level.
Example: If the operator has the code of level 3, after having set it, he can change all the functions at level 3 and those at lower levels.

* WARNING: take careful note of the customized code, since there is no way for the user to retrieve or reset it if lost.

Factory preset access codes:

❑ **L1: 10000000**
❑ **L2: 20000000**
❑ **L3: 30000000**
❑ **L4: 40000000**

The following example shows how to change the Full scale by Quick Start menu; the second illustrates how to change the function by the Main menu.

EXAMPLE: modifying the full scale value from 4dm³/s to 5dm³/s, from the "Quick start menu"

1
Enter in the "Quick start menu"

2
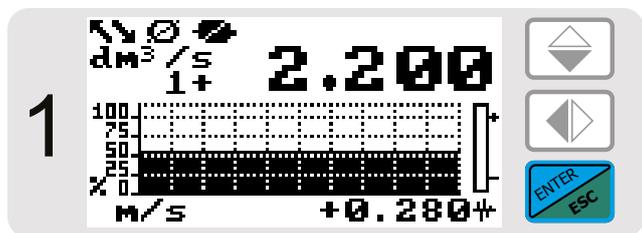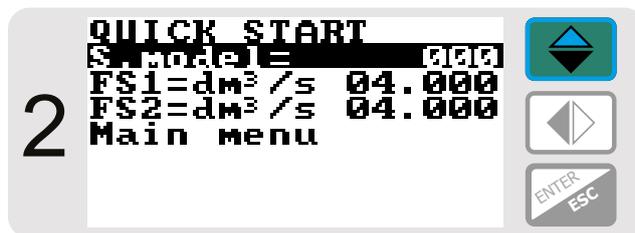
3
Push repeatedly

4
Push repeatedly

5
Change the value

6
Confirm the new value

7
Long Push
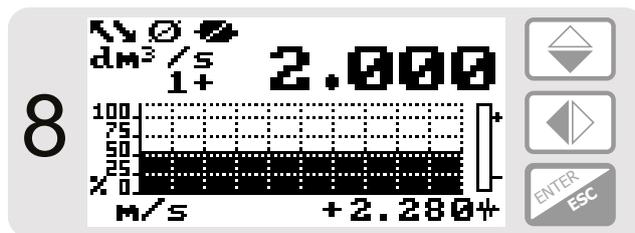
8
Main Page

EXAMPLE: modifying the full scale value from 4dm³/s to 5dm³/s, from the "Main Menu" (quick start menu enabled)
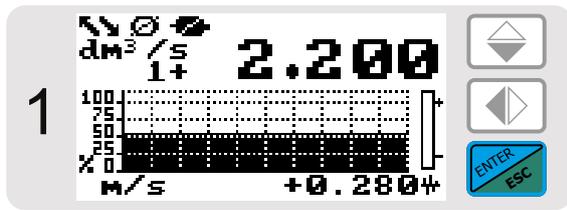
1 — Enter in the "Quick start menu"
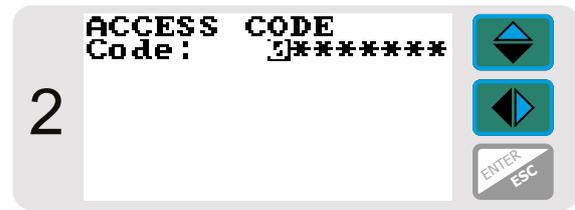
2 — x8 Times

3

4

5 — Access to the "Main Menu"

6

MAIN MENU
1-Sensor
2-Units
3-Scales
4-Measure
5-Alarms
6-Inputs

7 — Access to the "Scale Menu"
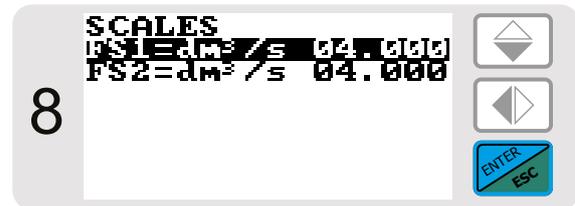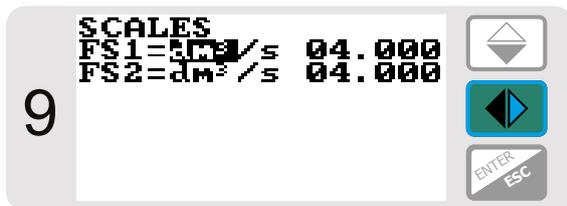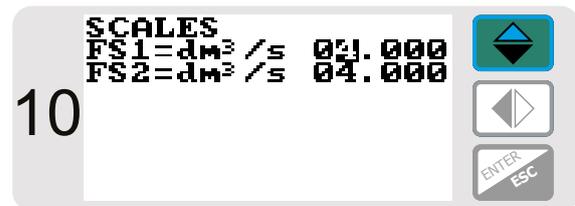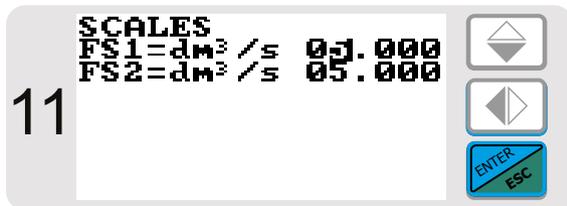
MAIN MENU
1-Sensor
2-Units
3-Scales
4-Measure
5-Alarms
6-Inputs

8 — Access to the "Fs1"

SCALES
FS1=dm³/s 04.000
FS2=dm³/s 04.000

9 — Push repeatedly

SCALES
FS1=dm³/s 04.000
FS2=dm³/s 04.000

10 — Change the value

SCALES
FS1=dm³/s 04.000
FS2=dm³/s 04.000

11 — Confirm the new value

SCALES
FS1=dm³/s 05.000
FS2=dm³/s 05.000

12

SCALES
FS1=dm³/s 05.000
FS2=dm³/s 05.000

13 — Long push

MAIN MENU
1-Sensor
2-Units
3-Scales
4-Measure
5-Alarms
6-Inputs

14

110_EN_IT_IS_R3_1.00.0
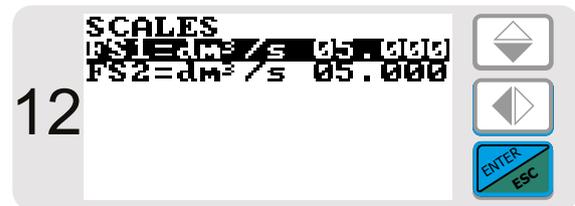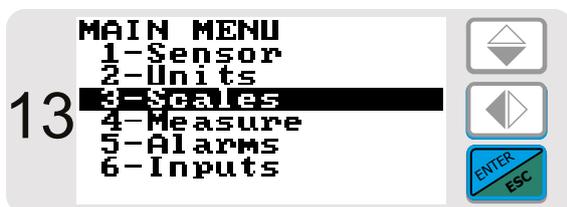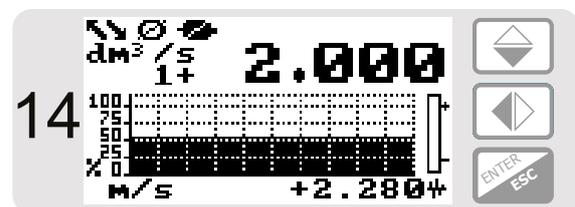
FUNCTIONS MENU

The main menu is selected from the Quick start menu by pressing the [ENTER/ESC] key and entering the access code; enter the access code if required. Note: Functions in grey here below are displayed only with other functions active, or with optional modules.

1.1	Sensors model: Enter the first two characters of the serial number of the sensor
1.2	Flow sensor lining material type
1.3	Type of sensor: fullbore or insertion
1.4	Type of measure units for sensor parameter: metric or imperial
1.5	Insert ND of sensor (0-2500)
1.6	Calibration data of sensor visualized on sensor's label
1.7	Sensor coefficient KZ (zero point)
1.8	Sensor coefficient KD
1.9	Insertion position
1.10	KP dynamic, coefficient for insertion
1.11	Sensor coefficient Ki
1.12	Sensor coefficient Kp
1.13	Sensor coefficient KC
1.14	Sensor excitation current
1.15	Current regulator proportional band
1.16	Current regulator derivation constant
1.17	Measure sampling frequency
1.18	Enables the empty pipe detection feature
1.19	Empty pipe detection threshold
1.20	Electrode cleaning
1.21	Sensor connecting cable length
1.22	Signal error delay (n. sample)
1.23	Automatic sensor verify enable
1.24	Pipe hydraulic zero calibration

2.1	Nominal diameter measure unit
2.2	Cable length on separate version
2.3	Flowrate type measure unit: metric or imperial
2.4	Pulse 1 type measure unit: metric or not metric
2.5	Pulse 2 type measure unit: metric or not metric
2.6	Total direct totalizer measure unit type: metric or imperial
2.7	Total direct totalizer measure unit
2.8	Total direct totalizer decimal point position
2.9	Partial direct totalizer measure unit type: metric or not metric
2.10	Partial direct totalizer measure unit
2.11	Partial direct totalizer decimal point position
2.12	Total reverse totalizer measure unit type: metric or not metric
2.13	Total reverse totalizer measure unit
2.14	Total reverse totalizer decimal point position
2.15	Partial reverse totalizer measure unit type: metric or not metric
2.16	Partial reverse totalizer measure unit
2.17	Partial reverse totalizer decimal point position
2.18	Temperature measure unit
2.19	Enable/disable the selection of mass units on full scale set
2.20	Specific gravity coefficient

3.1	Full scale flow rate 1
3.2	Full scale flow rate 2
3.3	Pulse value on channel 1
3.4	Duration of the pulse generated on channel 1
3.5	Pulse value on channel 2
3.6	Duration of the pulse generated on channel 2
3.7	Full scale frequency for channel 1 (0.1Hz-1000.0Hz)
3.8	Full scale frequency for channel 2 (0.1Hz-1000.0Hz)

110_EN_IT_IS_R3_1.00.0

MAIN MENU
1-Sensor
2-Units
3-Scales
4-Measure

MEASURE
Damping=   SMART
Cut-off=%   00.1
Cal.verify=   ON
Autorange=   ON

4.1	Measure filter
4.2	Low flow zero threshold: 0-25% of full scale value
4.3	Automatic calibration verify
4.4	Automatic change of measurement range

MAIN MENU
1-Sensor
2-Units
3-Scales
4-Measure
5-Alarms

ALARMS
Max.thr+=%   000
Max.thr-=%   000
Min.thr+=%   000
Min.thr-=%   000
Hysteresis=%   03
mA v.alarm=%   000
Hz v.alarm=%   000

5.1	Maximum value alarm set for direct flow rate
5.2	Maximum value alarm set for reverse flow rate
5.3	Minimum value alarm set for direct flow rate
5.4	Minimum value alarm set for reverse flow rate
5.5	Hysteresis threshold set for the minimum and maximum flow rate alarms
5.6	Current output value in case of failure
5.7	Frequency output value in case of alarms

MAIN MENU
1-Sensor
2-Units
3-Scales
4-Measure
5-Alarms
6-Inputs

INPUTS
T+ reset=   OFF
P+ reset=   OFF
T- reset=   OFF
P- reset=   OFF
Count lock=   OFF
Meas.lock=   OFF
Calibration=   OFF
Range change=OFF

6.1	Total direct (positive) flow totalizer reset enable
6.2	Partial direct (positive) flow totalizer reset enable
6.3	Total reverse (negative) flow totalizer reset enable
6.4	Partial reverse (negative) flow totalizer reset enable
6.5	Totalizer counting lock command
6.6	Measure zero lock command
6.7	Calibration external command
6.8	Range change external command

MAIN MENU
1-Sensor
2-Units
3-Scales
4-Measure
5-Alarms
6-Inputs
7-Outputs

OUTPUTS
Out1=   PULSES+
Out2=   PULSES-
Out mA1=4_22 +/-
Out mA2=4_22 +/-
A1S=   l/s 4.9087
A2S=   l/s 4.9087

7.1	Output 1 functions
7.2	Output 2 functions
7.3	Choice of the function and the range of current output n.1
7.4	Choice of the function and the range of current output n.2
7.5	Full Scale value for analog out1
7.6	Full Scale value for analog out2

ISOIL
INDUSTRIA

COMMUNICATION

```
MAIN MENU
 1-Sensor
 2-Units
 3-Scales
 4-Measure
 5-Alarms
 6-Inputs
 7-Outputs
 8-Communication
```

```
COMMUNICATION
HART pr.=        05
HART O.C.=       ON
Dev.Addr=       001
Speed=bps      9600
Parity=          NO
Delay=ms         00
C.timeout=        2
```

8.1	HART packet byte preambles
8.2	HART bus output control
8.3	Device communication address number
8.4	MODBUS link speed
8.5	MODBUS link parity
8.6	MODBUS reply delay
8.7	Maximum delay between chars (frames) MODBUS

```
DISPLAY
Language=        EN
Contrast=         5
Disp.time=s     020
D.rate=Hz         5
Disp.fn.=         1
Disp.lock=       ON
Part.tot.=       ON
Neg.tot.=        ON
Net tot.=        ON
Disp.date=       ON
Quick start=     ON
```

9.1	Choice of the language
9.2	Display contrast
9.3	Display/keyboard inactivity time
9.4	Display updating frequency: 1-2-5-10 Hz
9.5	Display function number
9.6	Display function selection lock
9.7	Partial totalizer enable
9.8	Negative totalizer enable
9.9	Net totalizer enable
9.10	Time and date display enable
9.11	Quick start menu visualization

```
 9-Display
10-Data logger
11-Functions
12-Diagnostic
13-System
```

```
DATA LOGGER
D.logger en.=    ON
Meas.units=      ON
Field separ.=     .
Interv.=   01:01:00
Log T+=          ON
Log P+=          ON
Log T-=          ON
Log P-=          ON
Log TN=          ON
Log PN=          ON
Log Q(UM)=       ON
Log Q(%)=        ON
Log AL.EV=       ON
Log STR=         ON
Log BTS=         ON
Log IBV=         ON
Log EDC=         ON
Log EAC=         ON
Log EIZ=         ON
Log SCV=         ON
```

10.1	Data logger enabling
10.2	Measure unit recording enable
10.3	Field separator character
10.4	Sampling interval
10.5	Enable logging of total direct totalizer
10.6	Enable logging of partial direct totalizer
10.7	Enable logging of total reverse totalizer
10.8	Enable logging of partial reverse totalizer
10.9	Enable logging of total net totalizer
10.10	Enable logging of partial net totalizer
10.11	Enable logging of flow rate in measure unit
10.12	Enable logging of flow rate in percentage
10.13	Enable logging of alarm events
10.14	Enable logging of sensor test results
10.15	Enable logging of board temperature
10.16	Enable logging of internal board voltage
10.17	Enable logging of electrodes DC voltage
10.18	Enable logging of electrodes AC voltage
10.19	Enable logging of electrodes impedance
10.20	Enable logging of sensor coils value

```
10-Data logger
11-Functions
12-Diagnostic
13-System
```

```
FUNCTIONS
T+ reset
P+ reset
T- reset
P- reset
Load Sens.f.def
Load Conv.f.def
Save Sens.f.def
Save Conv.f.def
Calibration
```

11.1	Execute immediate reset of total direct totalizer
11.2	Execute immediate reset of partial direct totalizer
11.3	Execute immediate reset of total reverse totalizer
11.4	Execute immediate reset of partial reverse totalizer
11.5	Load sensor factory default
11.6	Load converter factory default
11.7	Save sensor factory default values
11.8	Save converter factory default values
11.9	Execute immediate internal circuit calibration

```
11-Functions
12-Diagnostic
13-System
```

```
DIAGNOSTIC
Self test
Test display
Sens.verify
Flow sim.=        ON
Display measures
Disp.comm.vars
Display graphs
Gen.sens.set
SD card info
Firmware info
S/N=          999001
WT=0002:21:00:22
12-Diagnostic
13-System
```

12.1	Self test diagnostic function
12.2	Function tests physical display
12.3	Sensor verify diagnostic function
12.4	Flow rate simulation enabling
12.5	Display internal measured value
12.6	Display comm. diagnostic values
12.7	Display measure as graphs
12.8	Generic sensor parameters set
12.9	Sd card status informations
12.10	Firmware version/revision
12.11	Board serial number
12.12	Total working time

```
SYSTEM
Dayl.saving=      ON
Time zone=h+01.00
2016/04/04-16:07
L1 code=********
L2 code=********
L3 code=********
L4 code=********
L5 code=********
L6 code=********
Restr.access=  ON
  010.011.012.013
  010.011.012.014
  255.255.255.000
KT=        0.96469
KS=        1.00000
KR=        1.00000
DAC1 4mA=    02460
DAC1 20mA=   11050
DAC2 4mA=    02460
DAC2 20mA=   11050
Stand-by
FW update
13-System
```

13.1	Daylight saving time change
13.2	Localized time zone
13.3	System date and time
13.4	Access level 1 code
13.5	Access level 2 code
13.6	Access level 3 code
13.7	Access level 4 code
13.8	Access level 5 code
13.9	Access level 6 code
13.10	Restricted access level
13.11	Device IP network address
13.12	Client IP network address
13.13	Network mask
13.14	Calibration coefficient KT
13.15	Calibration coefficient KF
13.16	Calibration coefficient KR
13.17	DAC1 out 4mA calibration point
13.18	DAC1 out 20mA calibration point
13.19	DAC2 out 4mA calibration point
13.20	DAC2 out 20mA calibration point
13.21	Stand-by
13.22	firmware update

FUNCTIONS DESCRIPTION

Here below the explanation on how the rows of menu are described.

Menu visualized on the converter (from 1 to 13)

MENU 1 - SENSOR

(POS. 1.1) *Sensor Model*   **[S. model xxx]**   *AL4*   **[SMODL]**

Access level

MCP command

Convert request1

Synthetic description of the function
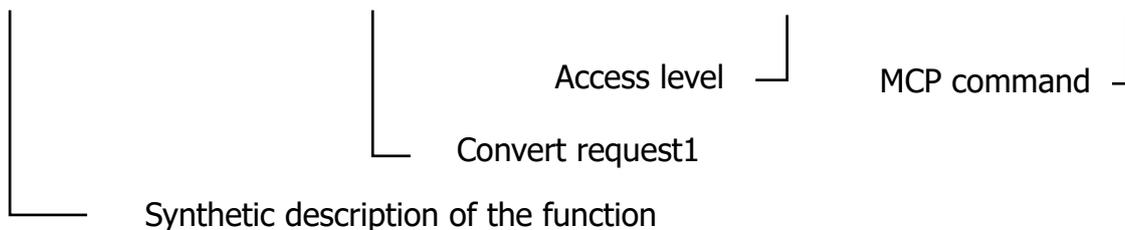
The following picture describes where to find the name of the MCP functions in MCP-software.
More info see MCP manual.

Line editor for the insertion and execution of MCP commands.

MENU 1 - SENSOR

(POS. 1.1) *Sensor model*   **[S. model xxx]**   *AL4*   **[SMODL]**
Enter the first two characters of the serial number of the sensor as on the sensor label.

(POS. 1.2) *Lining Type*   **[Lining= UNSPEC.]**   *AL4*   **[LIMAT]**
Flow sensor lining material type.   (PFA; PU-TDI; ALON; PEEK; HR; PP; PA-11; PTFE-HT; PTFE)

(POS. 1.3) *Type of sensor*   **[S. type= FULL BORE]**   *AL4*   **[STYPE]**
Select the sensor type of full-bore or insertion.

(POS. 1.4) *Unit type*   **[U.type= METRIC]**   *AL4*   **[SUTYP]**
Select type of measure unit of sensor's parameter. Values metric or imperial (inch).

(POS. 1.5) *Diameter*   **[Diam.= mm xxx]**   *AL4*   **[PDIMV]**
Select the nominal diameter of the sensor (0-2500). ND is written on the sensor label.

(POS. 1.6) *KA*   **[KA= +/- xx.xxx]**   *AL4*   **[CFFKA]**
KA factor: coefficient of calibration which is located on the sensor label

(POS. 1.7) *KZ*   **[KZ= +/- xxxxx]**   *AL4*   **[CFFKZ]**
Calibration Factor. KZ is located on the sensor label

(POS. 1.8) *KD*   **[KD= +/- xxxxx]**   *AL4*   **[CFFKD]**
Calibration Dynamic Factor. KD is located on the sensor label.

(POS. 1.9) *Insertion position*   **[Ins.position= x]**   *AL4*   **[SIPOS]**
This function is active with POS.1.3 on "Insertion". See the insertion sensor manual for more details

(POS. 1.10) *KP dynamic*   **[KP dynamic= ON/OFF]**   *AL4*   **[SIPOS]**
This function is active with POS.POS. 1.3 see page 25 set on insertion. See manual of insertion sensor for more details

(POS. 1.11) *Ki*   **[Ki= +/- xx.xxx]**   *AL4*   **[CFFKI]**
This function is active with POS. 1.3 see page 25 set on insertion. See manual of insertion sensor for more details

(POS. 1.12) *Kp*   **[Kp = +/- xxxxx]**   *AL4*   **[SIDKP]**
This function is active with POS. 1.3 see page 25 set on insertion. See manual of insertion sensor for more details

(POS. 1.13) *KC*   [KC= +/- xx.xxx]   *AL4*   [CFFKC]

Calibration Factor. This function is activated if the sensor model is NOT present on the sensors table standard parameters

(POS. 1.14) *Coils Ex.Current*   [C.Curr.= mA xxx.x]   *AL4*   [CEXCC]

Excitation coils current. This function is activated if the sensor model is NOT present on the sensors table standard parameters

(POS. 1.15) *C. Reg. PB*   [C.Reg.PB= xxx]   *AL4*   [CRPRB]

Current regulator parameter. This function is activated if the sensor model is NOT present on the sensors table standard parameters

(POS. 1.16) *C. Reg. DK*   [C.Reg. DK = xxx]   *AL4*   [CRDER]

Current regulator parameter. This function is activated if the sensor model is NOT present on the sensors table standard parameters

(POS. 1.17) *S. Freq.*   [S.Freq.= Hz xx]   *AL4*   [SFREQ]

Measure sampling frequency. This function is activated if the sensor model is NOT present on the sensors table standard parameters

(POS. 1.18) *Empty Pipe Detection*   [E.P.Detect= ON]   *AL4*   [EPDEN]

Enables the empty pipe detection function. This function is useful to keep the meter lock to zero when the pipe become empty.

(POS. 1.19) *Empty pipe thr.*   [R max= Kohm xxxx]   *AL4*   [EPDTH]

Maximum resistance value at the inputs (electrodes) determine the empty pipe condition. This feature is enabled only if the "1.17 Enables the empty pipe detection feature" page 25 Empty Pipe Detection is ON.

(POS. 1.20) *Electrodes cleaning*   [El. cleaning=AVG]   *AL4*   [ELCLN]

This function is useful to keep the electrodes clean; the allowed values are: OFF, minimum, average and maximum. It is **not recommended** to use this function when the liquid has a conductivity less than 100µS/cm (**set to OFF**).

(POS. 1.21) *Sensor Cable*   [S.cable=m xxx]   *AL4*   [SCALN]

Lenght of cable between sensor and converter on separate version.

(POS. 1.22) *Signal error delay*   [S.err.delay=m   xxx]   *AL4*   [SEALT]

Delay before generating error. This function is useful to prevent unexpected lock to zero of measure caused by sporadic events (empty pipe, excitation error, signal error)

(POS. 1.23) *Sensor verify*   [Sens. verify= OFF]   *AL3*   [ASVFE]

Enable the Automatic sensor verification (see BIV optional function).

(POS. 1.24) *Zero point calibration*   [Zero point cal.]

This feature appears only when the process conditions are as follow:

- measure filters recommended (Damping) set to SMART 2 second / 5 second
- stable flow rate and lower than 0.1% of the absolute scale (10 m/s)
- It must have elapsed at least 10 minutes after the last significant change of flow rate

When the above conditions are met, the zero point calibration function will appears on the display, press the "Enter / ESC" and automatically the procedure will start.

NOTICE: Be sure that the the sensor is completely full of liquid and perfectly still. Even subtle movements of the fluid can cause significant errors, therefore proceed with great care.

MENU 1 - SENSOR: ONLY MCP FUNCTIONS

Sensor Coils Time A	[MCP ONLY]	*AL4*	[SCTMA]

Reference sensor coil time A

Sensor Coils Time B	[MCP ONLY]	*AL4*	[SCTMB]

Reference sensor coil time B

Sensor Coils Resistance	[MCP ONLY]	*AL4*	[SCRES]

Reference sensor coil resistance

Resistance E1	[MCP ONLY]	*AL4*	[SE1RR]

Resistance value of E1 electrodes

Resistance E2	[MCP ONLY]	*AL4*	[SE2RR]

Resistance value E2 electrodes

Sensor Coils Temperature Reference	[MCP ONLY]	*AL4*	[SCTRF]

sensor data reference temperature. Temperature measured on the coils of the sensor at the time of saving the instrument reference data for B.I.V. function The temperature value in degrees Celsius, which owns the sensor.

Note: the temperature must be estimated on the basis of the place of the sensor installation.

Coefficient KL	[MCP ONLY]	*AL4*	[SETKL]

Sensor linearity coefficient.

MENU 2 - UNITS

WARNING: The totalizer value is updated and changed depending on the setting of unit value.
The scale change may cause accuracy loss depending of rounding up.
For example, if T +=0,234 liters with 3 decimals, it become T +=0.001 m³ losing 0.234 liters in rounding up.

(POS. 2.1) *Diameter*   [Diam.= mm]   *AL2*   [SDIUM]

Sensor diameter unit of measure (mm or inch)

(POS. 2.2) *S.cable length unit of m. type*   [S.Cable= m]   *AL2*   [SCAUM]

Sensor cable length for separate version. Select m or foot.

(POS. 2.3) *Flow rate unit of m. type*   [FR unit= METRIC]   *AL2*   [FRMUT]

Flow rate type measure unit. Select metric or not metric (Imperial units)

(POS. 2.4) *Pulse 1 unit of m. type*   [PL1 unit= METRIC]   *AL2*   [PL1UT]

This function is active with POS. 7.1 see page 26 enable.
This function changes the choice of measure unit POS. 3.3 see page 25
Pulse 1 type measure unit: metric or not metric (Imperial units).

(POS. 2.5) *Pulse 2 unit   of m. type*   [PL2 unit= METRIC]   *AL2*   [PL2UT]

This function is active with POS. 7.2 see page 26 enable.
This function changes the choice of measure unit POS. 3.5 see page 25
Pulse 2 type measure unit: metric or not metric Imperial units).

(POS. 2.6) *Totalizer+ unit of m. type*   [T+ unit= METRIC]   *AL2*   [TTPUT]

Setting total direct totalizer measure unit type: metric or not metric Imperial units).
This function changes the values measure unit on POS. 2.7 see page 25

(POS. 2.7) *Totalizer+ unit of measure*   [T+ unit= dm³]   *AL2*   [TTPUM]

Setting total direct totalizer measure unit.
This function visualized on visualization pages.

(POS. 2.8) *Totalizer+ Decimal Point pos.*   [T+ D.P.= x]   *AL2*   [TTPDP]

Setting total direct totalizer decimal point position.
Example: T+D.P.= 3 visualized value T+dm³   0.000 / T+D.P.= 2 visualized value T+dm³   0.00

(POS. 2.9) Total. *Partial+unit of m. type*   [P+ unit= METRIC]   *AL2*   [TPPUT]

This function is active with POS. 9.7 see page 27 enable.
Setting partial direct totalizer measure unit type: metric or not metric (Imperial units).
This function changes the values measure unit on POS. 2.10 see page 25 .
It is visualized on visualization pages.

(POS. 2.10) Total. *Partial+ unit of measure*   [P+ unit= dm³]   *AL2*   [TPPUM]

Setting partial direct totalizer measure unit.
This function visualized on visualization pages.

(POS. 2.11) Total. *Partial+ Dec. Point pos.*   **[P+ D.P.= x]**   *AL2*   **[TPPDP]**

Setting partial direct totalizer decimal point position.
Example: P+D.P.= 3 visualized value P+dm³   0.000 / P+D.P.= 2 visualized value P+dm³   0.00

(POS. 2.12) *Total. T- unit of m. type*   **[T- unit= METRIC]**   *AL2*   **[TTNUT]**

This function is active with POS. 9.8 see page 27, enabled.
Setting total reverse totalizer measure unit type: metric or not metric (Imperial units).
This function changes the values measure unit on POS. 2.13 see page 25.
It is visualized on visualization pages.

(POS. 2.13) *Total. T- unit of measure*   **[T- unit= dm³]**   *AL2*   **[TTNUM]**

Setting total reverse totalizer measure unit.
This function visualized on visualization pages.

(POS. 2.14) *Total. T- Decimal Point* **Pos.**   **[T- D.P.= x]**   *AL2*   **[TTNDP]**

Setting total reverse totalizer decimal point position.
Example: T- D.P.= 3 visualized value T- dm³   0.000
         T- D.P.= 2 visualized value T- dm³   0.00

(POS. 2.15) Total. *Partial -unit of m. type*   **[P- unit= METRIC]**   *AL2*   **[TPNUT]**

This function is active with POS. 9.8 see page 27, enable.
Setting partial reverse totalizer measure unit type: metric or not metric (Imperial units).
This function changes the values measure unit on POS. 2.16 see page 25
It is visualized on visualization pages.

(POS. 2.16) Total. *Partial- unit of measure*   **[P- unit= dm³]**   *AL2*   **[TPNUM]**

Setting partial reverse totalizer measure unit.
This function visualized on visualization pages.

(POS. 2.17) Total. *P- Decimal Point* **Pos.**   **[P- D.P.= x]**   *AL2*   **[TPNDP]**

Setting partial reverse totalizer decimal point position.
Example: P- D.P.= 3 visualized value P-dm³   0.000
          P- D.P.= 2 visualized value P-dm³   0.00

(POS. 2.18) *Temperature unit of measure*   **[Temp. unit= C°]**   *AL2*   **[TMPUT]**

Setting temperature measure unit.

(POS. 2.19) *Mass units enable*   **[Mass units= dm³]**   *AL2*   **[MSSUE]**

Enable or Disable the selection of mass unit of full scale set.

(POS. 2.20) *Specific Gravity* **coeffic.**   **[Sg= Kg/dm³   x.xxxx]**   *AL2*   **[VMSGC]**

Setting specific gravity coefficient. This Function is active with POS. 2.19 see page 25, enable.

MENU 3 - SCALE

(POS. 3.1-2) *Flow Rate Full Scale 1-2*   **[FS1-2= l/s xxxx.x]**   *AL2*   **[FRFS1-FRFS2]**

The FS2 (full scale flow rate 2) is active with POS. 6.6 see page 26 ,enabled.

The full scale is used to indicate to the maximum meter's flow rate. The full scale should be chosen carefully as it's parameters are used for several other parameters.There are three fields to fill in order to set this parameter, from left to right: 1) measure unit, 2) time unit of measure and 3) numeric value. The selection is made by positioning the cursor on the field to modify. To change the type unit of measure (metric, Imperial units, mass or volume) see POS. 2.3 see page 25 and POS. 2.19 see page 25 and POS. 2.20 see page 25. The value of Fs1-2 depend nominal diameter POS. 1.4 see page 25. The following tables shown the units of measure available and the conversion factor by comparison with 1dm3 and 1kg. The converter accepts any kind of combination of units of measure satisfying both the following conditions:

❑ Numeric field value 99999

❑ 1/25 fsmax ≤ numeric field value ≤ fsmax.

Where fsmax is the maximum full scale value corresponding to the sensor, equal to a 10m/s liquid speed. The measure units are shown as appear on the display. The Imperial units units are diversified by using capital and small characters.

METRIC	
cm^3	Cubic centimeter
ml	Milliliter
l	Liter
dm^3	Cubic decimeter
dal	Decalitre
hl	Hectolitre
m^3	Cubic meter
ML	Mega Liter

NOT METRIC	
in^3	Cubic inch
Gal	American gallon
GAL	British gallon
ft^3	Cubic foot
bbl	Standard barrel
BBL	Oil barrel
yd^3	Cubic yard
kgl	KAmerican gallon
KGL	KBritish gallon
IGL	Imperial gallon
IKG	Imperial K gallon
Aft	Acre foot
MGL	Mega gallon
IMG	Imperial mega gallon

MASS UNIT NOT METRIC	
Oz	Ounce
Lb	Pound
Ton	Short tons

MASS UNIT METRIC	
g	Gram
kg	Kilogram
t	Ton

When a measure mass unit is set, the specific gravity function is automatically enabled by the system. Please, note that the mass measure is heavily affected by the temperature. With certain liquids this may cause significant measurement errors. The following measure of time units can be selected: **s** = second, **m** = minute, **h** = hour, **d** = day .

NOTES FOR USING THE MCP INTERFACE

The command FRFS1 =? and command FRS2 = ?, edited by MCP software, return a list of only the unit compatible with the nominal diameter set. If the sensor is insertion type and the diameter is zero, the only possible unit is m/s if the flow rate were chosen metric units, else f/s for the unit of measurement non metric.

(POS. 3.3-3.5)Output _Pulse 1-2_   [Pls1-2= dm³   x.xxxxx]   _AL2_   [OP1PV-OP2PV]

Pls1 and Pls2 is active with POS. 7.1 see page 26 and POS. 7.2 see page 26, enable and setting pulse value on channel 1 and channel 2. This function allows the user to set a signal (a pulse) to be given from the converter when a defined amount of liquid has passed through the sensor. To set the parameter, complete the 2 fields, from left to right: 1)measure unit, 2) numeric value. The selection is performed by positioning the cursor in the field to be modified. To change the unit type (metric, British or American, mass or volume) see POS. 2.4 see page 25 and POS. 2.5 see page 25, POS. 2.19 see page 25 and POS. 2.20 see page 25. The value of Pls1-2 depends on nominal diameter POS. 1.4 see page 25. Only those units described (POS. 3.1 see page 25-POS. 3.2 see page 25) above are available to be selected.

(POS. 3.4-3.6) _Output1-2 Pulse Time_   [Tpls1-2= ms x.xxxxx]   _AL2_   [OP1PT OP2PT]

Tpls1 and Tpls2 is active with POS. 7.1 see page 26 and POS. 7.2 see page 26 enable. Setting duration of the pulse generated on channel 1 and 2.
With the liquid volume to generate the pulse value (POS. 3.3 see page 25 POS. 3.5 see page 25)
set by the user. The user must set the corresponding duration of the pulse to be outputed. This value is expressed in milliseconds and has to be between 0.4 and 9999.99. When the high frequency output is present, then the minimum value can type of device is connected to the converter, the user must verify that the set pulse duration is compatible with the external device processing such pulses. If, for example, an electro-mechanical pulse counter is connected, a minimum pulse time of 0.04 milliseconds can be set.
ATTENTION: The converter can not detect problems that may occur; firstly, the pulse is too long the coils may burn out, secondly, if the pulse is too short, the counter may not be able to function, causing damage of the output.

(POS. 3.7-3.8)Output full scale freq.1-2   [Frq1-2= x.xxxxx]   _AL2_   [OU1FF-OU2FF]

Frq1 and Frq2 are activated with POS. 7.1 see page 26 and POS. 7.2 see page 26 enabled and set to the value freq+/-/+-. Setting duration of the pulse generated on channel 1 and 2.

(POS. 4.1) *Damping*   [Damping=OFF/SMART/(TIME)]   *AL3*   [MFDMP]

This section of manual is extremely important because the correct setting of the filters allows to obtain a proper response of the instrument to the measured flow rate and the specific requirements of use; as a general rule, consider that, starting from Damping = OFF (no filter applied to the measure), successive values, introduce increasing damping. The following diagrams show the instrument's response to changes in flow rate from 0 to 100%, using the different settings of the damping function.

The SMART is an adaptive filter that adapts automatically to most of the processes (recommended value), making the response of the meter very ready to fast changes of flow and at the same time extremely precise and stable for slow variations. It may be convenient to use a constant damping filter time, where there is a pulsating flow (for example generated by peristaltic pumps). With longer times you get a mean value stable, while with short times the measure will closely follow the flow pulses, but consequently more unstable. NOTE: If the rechargeable battery is active, the damping could be set only in "SMART".
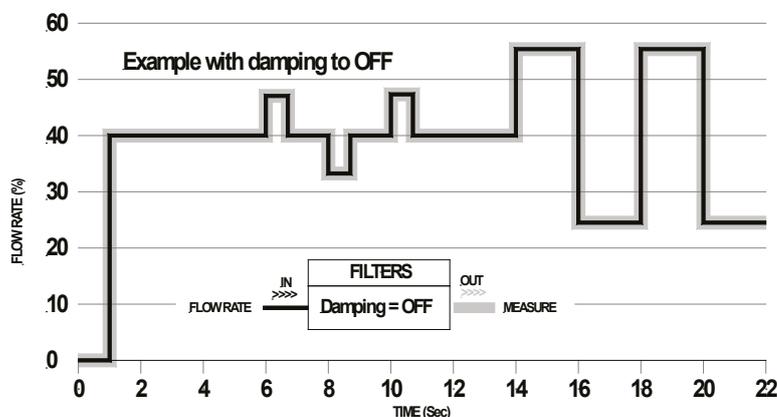
Damping function(OFF). the meter follows the trend of fast changes in flow.
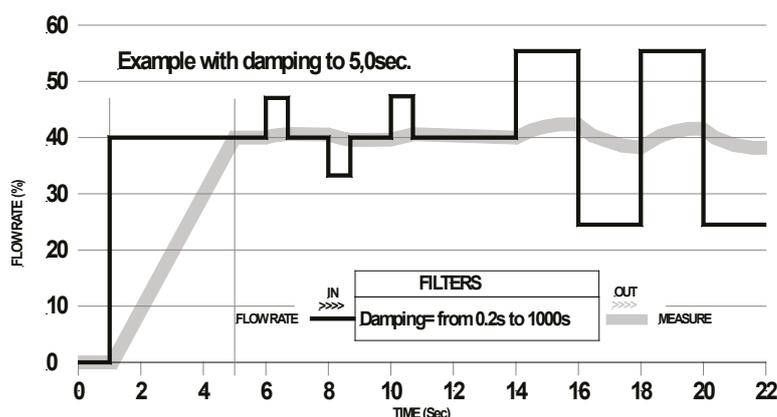
Damping mode based on time (fro 0.2s to 1000s) The measure is averaged over a number of samples determined by the value assigned to the dampening function. When the damping parameter is expressed in seconds, the filter works damping the measurement noise and sudden change of flow rate. Increasing the parameter of damping increases the stability of the measurement.

(POS. 4.2) *Cut-off threshold*   **[Cut-off=% xxx]**   *AL3*   **[MFCUT]**

Setting the low flow cutoff threshold. This function is useful to avoid that flows close to zero, due to the electrical noises from tiny movements of liquid (due for example to vibrations of the pipe) which cause an increasing of the totalizers. The allowed range for this function is 0-25% of full scale set. For most applications a value between 0.5 and 1% is recommended.

(POS. 4.3) *Calibration verify*   **[Cal.verify=ON]**   *AL3*   **[ACAVE]**

This function enables an automatic verification of board's coefficients. As the converter performs continuously a large number of tests, we recommend to use this function only in presence of wide range of temperature. Instead it is NOT recommended to use it when the instrument is used in metering applications (batch).

(POS. 4.4) *Automatic scale change enable*   **[Autorange=ON/OFF]**   *AL3*   **[ARNGE]**

Enables the automatic change of scale. The meter may have two different working ranges in order to suit to the variable process conditions. In order to get the best results out of this function it is important range N.2 (Fs2) if enabled is bigger than N.1 (Fs1). When the flow rate increases and reaches the 100% of the full scale 1, then the meter automatically switches to scale 2. When the flow rate decreases again reaching a value on scale 2 equal to the 90% of full scale N.1, then the active scale is 1 again. Allowed values for this parameter: ON/OFF.

Notice: when the autorange is enabled, is not allow to use the manual range change (POS. 6.6 see page 26).

This function does NOT increase the accuracy of the measure; its aim is to increase the resolution of 4/20 mA when the meter work at very low flow rates (typical case the flow rate of water distribution with daytime flow much higher than the night flow).

MENU 4 - MEASURE: ONLY MCP FUNCTIONS

Measure Filter Cut-off Threshold 2   **[MCP ONLY]**   *AL3*   **[MFCT2]**

Setting the low flow cutoff threshold, it is similar to the function in 4.2. The value of this function is NOT visible on diplay but only with MCP command.

MENU 5 - ALARMS

(POS. 5.1) *Maximum flow rate threshold direct*   **[Max. thr+=% XXX]**   *AL3* **[FRAXP]**

Maximum value alarm set for direct flow rate set. When the flow rate value exceeds such a threshold, then an alarm message is generated. The value of this parameter is expressed as percentage of the full scale value and may be set from 0 to 125%. Setting this parameter to zero disables the alarm generation.

(POS. 5.2) *Maximum flow rate threshold negative*   **[Max. thr-=% XXX]**   *AL3* **[FRAXN]**

Maximum value alarm set for reverse flow rate set. When the flow rate value exceeds such a threshold, then an alarm message is generated. The value of this parameter is expressed as percentage of the full scale value and may be set from 0 to 125%. Setting this parameter to zero disables the alarm generation.

(POS. 5.3) *Minimum flow rate treshold positive*   **[Min. thr+=% XXX]**   *AL3* **[FRANP]**

Minimum value alarm set for reverse flow rate set. When the flow rate value falls below such a threshold, then an alarm message is generated. The value of this parameter is expressed as percentage of the full scale value and may be set from 0 to 125%. Setting this parameter to zero disables the alarm generation.

(POS. 5.4) *Minimum flow rate threshold negative*   **[Min. thr-=% XXX]**   *AL3* **[FRANN]**

Minimum alue alarm set for reverse flow rate set. When the flow rate value falls below such a threshold, then an alarm message is generated. The value of this parameter is expressed as percentage of the full scale value and may be set from 0 to 125%. TSetting this parameter to zero disables the alarm generation.

(POS. 5.5) *Hysteresis*   **[Hysteresis=% XX]**   *AL3* **[ATHYS]**

Hysteresis threshold set for the minimum and maximum flow rate alarms. The value of this parameter is expressed as percentage of the full scale value and may be set from 0 to 25%.

(POS. 5.6) *Current output value in case of failure*   **[mA V.alarm =%   XXX]**   *AL3* **[OCACV]**

The output current signal can be specified by the user in case of failure of either, empty pipe, coils interrupted, or ADC error. The signal current is set as a percentage (0 to 125%) of the 0/4-20mA current. 125% corresponds to 24mA and does not depend on the selected range (0-20/4-20mA).

The NAMUR NE43 recommendation asks for a alarms signalling value for the current output lower than 3.6mA (<18%) or bigger than 21mA (>105%). It would then be preferable to set the value of this function at the 10%, so that the current value in case of the a.m. cases would be 2 mA, allowing the following diagnostics:

❏ current < 2mA - 5%: line interrupted, power supply failure or faulty converter;
❏ 2mA -5% * current * 2mA + 5%: hardware alarm;
❏ 4mA * current * 20mA: normal working range;
20mA < current * 22mA: out of range, measure above 100% f.s.

(POS. 5.7) *Frequency output value in case of failure*   **[Hz V.alarm=%XXX]**   *AL3* **[OFACV]**

This function is active with POS. 7.1 see page 26 and POS. 7.2 see page 26   enable to (FREQ.+, FREQ.-, FREQ.±) To set the frequency value assigned to the on/off output in one or more of the following failure cases:

❏ Empty pipe; Coils interrupted ; ADC error. Allowable range is from 0 to 125% of the frequency full scale value. Although there are no specific rules regulating cases such as these, it would be convenient to use the failure information as follows:

❏ 0% Hz * frequency * 100% f.s.: normal working range;
❏ 100% f.s. < frequency * 110% f.s.: overflow, measure above the 100% of the f.s.;
❏ 115% f.s. * frequency * 125% f.s.: hardware alarm condition.

MENU 6 - INPUTS

(POS. 6.1-2) *Reset totalizer + enable*   **[T/P+/RESET=ON/OFF]**   *AL3*   **[VTTPE] [VTPPE]**

When one of this function is enabled, the related totalizer + may be reset through the on/off input.

(POS. 6.3-4) *Reset totalizer - enable*   **[T/P-/RESET=ON/OFF]**   *AL3*   **[VTTNE] [VTPNE]**

When one of this function is enabled, the related totalizer - may be reset through the on/off input.

(POS. 6.5) *Totalizers counting lock command*   **[COUNT LOCK= ON/OFF]**   *AL3*   **[TCLIE]**

Totalizers counting lock command enable. When this function is active, applying a voltage on the on/off input terminals the system stops the totalizers no matter which is the flow rate.

(POS. 6.6) *Measure zero lock input enable*   **[Meas.lock=ON/OFF]**   *AL3*   **[MSLIE]**

When this function is active (ON), applying a voltage on the on input terminals, the measurement is stopped, the meter will display zero flow.

(POS. 6.7) *Calibration Func. input enable*   **[Calibration=ON/OFF]**   *AL3*   **[CALIE]**

When this function is active, applying a voltage on the on/off input terminals the meter performs a autozero calibration cycle. ATTENTION: If the voltage pulse is less than 1 sec., the meter performs a calibration cycle to compensate possible thermal drifts. If the voltage pulse is more 1 sec, the meter performs a zero calibration measure. To perform the calibration it is absolutely necessary for the sensor to be full of liquid and that the liquid is perfectly still. Even very small movement of the liquid may affect the result of the calibration, and, consequently, the accuracy of the system.

(POS. 6.8) *Flow rate range change inp.*   **[RANGE CHANGE=ON/OFF]**   *AL3*   **[SRCIE]**

Range change external command enable. When this function is enabled, applying a voltage on the on/off input terminals the meter switches to the second measuring range (Fs2).
N.B.: the autorange doesn't allow to use the manual range change see (POS. 4.4 see page 26).

MENU 7 - OUTPUTS

| (POS. 7.1) *Output 1 function selection* | **[Out1=XXXXXX]** | *AL3* **[OUT1F]** |

Function choice corresponding to digital Output 1. The functions are listed in the table below.

| (POS. 7.2) *Output 2 function selection* | **[Out2=XXXXXX]** | *AL3* **[OUT2F]** |

Function choice corresponding to digital Output 2. The functions are listed in the table below.

FUNCTIONS FOR OUTPUTS 1 AND 2

- ❑ **OFF:** DISABLE
- ❑ **MAX AL. +:** MAX DIRECT FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- ❑ **MIN AL. +:** MIN DIRECT FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- ❑ **MAX AL.-:** MAX INVERSE FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- ❑ **MIN AL.-:** MIN INVERSE FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- ❑ **MAX/MIN-:** MAX/MIN INVERSE FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- ❑ **MAX/MIN+/-:** MAX/MIN DIRECT FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- ❑ **P.EMPTY:** EMPTY PIPE ALLARM OUTPUT (ENERGIZED = AL. OFF)
- ❑ **AL.SYSTEM:** SUM OF ALL ALARMS "energized interrupted " AND "error input signal "
- ❑ **OVERFLOW:** OUT OF RANGE ALLARM OUTPUT (ENERGIZED = FLOWRATE OK)
- ❑ **ALL ALARMS:** SUM OF ALL ALARMS POSSIBLE
- ❑ **MANUAL:** OUTPUT MAY TAKE A STATE EMPLOYEE FROM AN EXTERNAL CONTROL (MCP,MODBUS,ecc)
- ❑ **FLOW RATE SIGN.:** FLOW DIRECTION (ENERGIZED WHEN FLOW IS NEGATIVE)
- ❑ **SCALE:** INDICATION SCALE
- ❑ **FREQ.+:** FREQUENCY POSITIVE FLOWRATE
- ❑ **FREQ.-:** FREQUENCY NEGATIVE FLOWRATE
- ❑ **FREQ.+/-:** FREQUENCY POSITIVE/NEGATIVE FLOWRATE
- ❑ **PULSES.+:** PULSE POSITIVE FLOW RATE
- ❑ **PULSES.-:** PULSE NEGATIVE FLOW RATE
- ❑ **PULSES+/-:** PULSE NEGATIVE/POSITIVE FLOW RATE

| (POS. 7.3-4) *Current output option and range* **[Out mA1/2=X_XX XXX]** *AL3* **[AO1CF] [AO2CF]** |

This function sets the current output 1 and 2. This function is optional and will not appear unless the option has been requested. There are three fields to modify for this function:
- ❑ Scale zero: 4 or 0mA
- ❑ Full scale: 20 or 22mA
- ❑ Field: + = positive, - = negative, blank = both, -0+ = central zero scale

The values corresponding to the scale points are shown in the following chart:

CURRENT VALUES IN mA ASSOCIATE TO THE % FULL SCALE VALUE					
POSSIBLE FIELD	**REVERSE FLOW VALUE**		**ZERO**	**DIRECT FLOW VALUE**	
	≤-110%	-100%	0%	+100%	≥+110%
Out.mA = 0 ÷ 20 +	0	0	0	20	20
Out.mA = 0 ÷ 22 +	0	0	0	20	22
Out.mA = 4 ÷ 20 +	4	4	4	20	20
*Out.mA = 4 ÷ 22 +	4	4	4	20	21.6
Out.mA = 0 ÷ 20 -	20	20	0	0	0
Out.mA = 0 ÷ 22 -	22	20	0	0	0
Out.mA = 4 ÷ 20 -	20	20	4	4	4
Out.mA = 4 ÷ 22 -	21.6	20	4	4	4
Out.mA = 0 ÷ 20	20	20	0	20	20
Out.mA = 0 ÷ 22	22	20	0	20	22
Out.mA = 4 ÷ 20	20	20	4	20	20
Out.mA = 4 ÷ 22	21.6	20	4	20	21.6
Out.mA = 0 ÷ 20 −0+	0	0	10	20	20
Out.mA = 0 ÷ 22 −0+	0	1	11	21	22
**Out.mA = 4 ÷ 20 −0+	4	4	12	20	20
Out.mA = 4 ÷ 22 −0+	2	4	12	20	22

In hardware alarm conditions "HARDW AL." (interrupted coils, empty pipe, measure error) the current value is programmed by the function "mA v.fault" (pos. 4.4) and it is expressed as percentage of a fixed current range, where: 0% = 0mA and 110% = 22mA.

* Example 1: out 4-22 +   ** Example 2: out 4-20 −0+
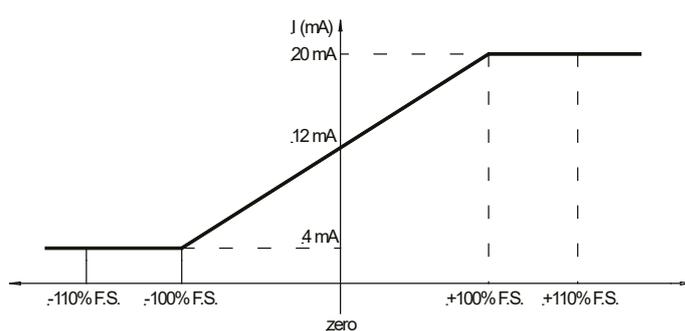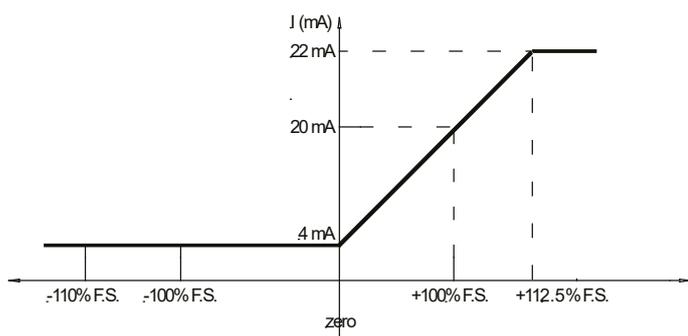
(POS. 7.5) Analog Output1 full scale   **[A1S= dm/s x.xxxx]**   *AL3* **[AO1FS]**

It allows to set the full scale value for analog output 1 **independently** from the main scale of the instrument.

(POS. 7.6) Analog Output2 full scale   **[A2S= dm/s x.xxxx]**   *AL3* **[AO2FS]**

It allows to set the full scale value for analog output 2 **independently** from the main scale of the instrument.

MENU 8 - COMMUNICATION

(POS. 8.1) *Hart Preamble*	**[HART pr.=XXXXXX]**	*AL3*	**[HARTP]**

Number of preamble (Hart function)

(POS. 8.2) *Hart O.C*	**[HART O.C=ON/OFF]**	*AL3*	**[HRTOC]**

Hart bus output control 4-20mA.

(POS. 8.3) *Device Address*	**[Dev. Addr=XXXXXX]**	*AL3*	**[DVADD]**

Device communication address number.

(POS. 8.4) *Modbus Speed*	**[Speed=XXXXXX]**	*AL3*	**[MDBSP]**

Modbus link speed.

(POS. 8.5) *Modbus Parity*	**[Parity=XXXXXX]**	*AL3*	**[MDBPA]**

Modbus link parity.

(POS. 8.6) *Modbus Delay*	**[Delay=XXXXXX]**	*AL3*	**[MDBDL]**

Modbus replay delay.

(POS. 8.7) *Modbus chars Timeout*	**[C. timeout=X]**	*AL3*	**[MDBCT]**

Maximun delay between chars (frames).

MV110 MODBUS PROTOCOL

All data are sent in group of 16 bits registers. The format used is BIG ENDIAN, MSB byte is sent first, LSB is sent last. When a variable is more than 16 bits in size, it uses two adjacent registers. The totalizer values are expressed as integer numbers. For the correct representation of the value in case there is a fractional part, the decimal dot must be placed in the position specified by the next variable register following the totalized value. All values relative to the flow rate are averaged. The number of samples that compose the average value varies depending on the measure sample rate and the MODBUS reading requests. Example: measure sample rate = 50 Hz, MODBUS reading frequency = 10 Hz, Number of samples used for average calculation = 50/10 = 5.

Read process variable : COMMAND 04.

ADDRESS	SIZE	TYPE OF DATA	MEANING
0000-0001	2 REGISTERS 32 BITS	FLOAT	full scale flow rate in the unit of measure chosen (as can be seen in the display of the instrument)
0002-0003	2 REGISTERS 32 BIT	FLOAT	flow rate value in percentage
0004-0005	2 REGISTERS 32 BITS	FLOAT	flow rate value in the unit of measure chosen
0006-0007	2 REGISTERS 32 BITS	FLOAT	Flow speed in the unit of measure chosen (m/s or ft/s)
0008-0009	2 REGISTERS 32 BITS	UNSIGNED LONG	Totalizer T+ value
0010	1 REGISTER 8+8 BITS	TWO BYTES	First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places
0011-0012	2 REGISTERS 32 BITS	UNSIGNED LONG	Totalizer P+ value
0013	1 REGISTER 8+8 BITS	TWO BYTES	First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places
0014-0015	2 REGISTERS 32 BITS	UNSIGNED LONG	totalizer T- value
0016	1 REGISTER 8+8 BITS	TWO BYTES	First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places
0017-0018	2 REGISTERS 32 BITS	UNSIGNED LONG	Totalizer P- value
0019	1 REGISTER 8+8 BITS	TWO BYTES	First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places
0020	1 REGISTER 8+8 BITS	TWO BYTES	first byte (MSB): process flags 1, (LSB): process flags 2
0021	1 REGISTER 16 BITS	UNSIGNED SHORT	Number of measure samples used for to calculate the latest read average value of flow rate
0022	1 REGISTER 16 BITS	UNSIGNED SHORT	Equivalent resistance measured between electrode E1 and the common point, in kilo ohm
0023	1 REGISTER, 16 BITS	UNSIGNED SHORT	equivalent resistance measured between electrode E2 and the common point, in kilo ohm
0024	1 REGISTER, 16 BITS	SIGNED SHORT	voltage measured between electrode E1 and the common point, in millVolts
0025	1 REGISTER, 16 BITS	SIGNED SHORT	voltage measured between electrode E2 and the common point, in millVolts
0026	1 REGISTER, 16 BITS	UNSIGNED SHORT	voltage measured at rechargeable terminals, in milliVolts
0027	1 REGISTER, 16 BITS	UNSIGNED SHORT	residual battery capacity in percentage
0028	1 REGISTER, 16 BITS	SIGNED SHORT	CPU temperature in the unit of measure chosen
0029	1 REGISTER, 16 BITS	SIGNED SHORT	Board temperature T1 the unit of measure chosen
0030	1 REGISTER, 16 BITS	SIGNED SHORT	Board temperature T2 the unit of measure chosen
0031	1 REGISTER, 16 BITS	SIGNED SHORT	Flow sensor coil's temperature the unit of measure chosen
0032	1 REGISTER, 16 BITS	UNSIGNED SHORT	latest sensor test result code
0033	1 REGISTER, 16 BITS	UNSIGNED SHORT	number of alarms currently active

Meaning and value of the process flags 1 returned with the register 0020 (MSB):
- ❑ bit 7 (MSB): flow rate alarm MIN (flow rate below the minimum threshold set)
- ❑ bit 6: flow rate alarm MAX (flow rate over the maximum threshold set)
- ❑ bit 5: flow rate sign (1 = negative)
- ❑ bit 4: flow rate below the cut-off value
- ❑ bit 3: measure range active (0= range 1, 1= range 2)
- ❑ bit 2: flow rate measure reset value status (1= measure is forcibly reset to zero)
- ❑ bit 1: volume counters lock status (1= counters are locked)
- ❑ bit 0 (LSB) : internal use, no meaning

Meaning and value of the process flags 2 returned with the register 0020 (LSB):
- ❑ bit 7 (MSB): flow rate overflow (value greater than full scale)
- ❑ bit 6: pulse channel #2 overflow (frequency greater than maximum possible for the given parameters)
- ❑ bit 5: pulse channel #1 overflow (frequency greater than maximum possible for the given parameters)
- ❑ bit 4: measure signal amplitude out of A/D converter range
- ❑ bit 3: measure signal amplitude out of amplifier capability
- ❑ bit 2: input signal error (out of input chain capability)
- ❑ bit 1: coils excitation error
- ❑ bit 0 (LSB) : pipe empty

Meaning and value of the sensor test flags returned with the register 0021:

- ❑ bit 15 (MSB): resistance at electrode E2 is outside the limits respect to the reference value
- ❑ bit 14 : resistance at electrode E1 is outside the limits respect to the reference value
- ❑ bit 13: coil time B is outside the limits respect to the reference value
- ❑ bit 12: coil time A is outside the limits respect to the reference value
- ❑ bit 11: coil temperature is outside the limits respect to the reference value
- ❑ bit 10: coil leakage current is outside the limit
- ❑ bit 09: coil driver output 2 voltage is out of tolerance during test phase 3
- ❑ bit 08: coil driver output 1 voltage is out of tolerance during test phase 3
- ❑ bit 07: coil driver output 2 voltage is out of tolerance during test phase 2
- ❑ bit 06: coil driver output 1 voltage is out of tolerance during test phase 2
- ❑ bit 05: coil driver output 2 voltage is out of tolerance during test phase 1
- ❑ bit 04: coil driver output 1 voltage is out of tolerance during test phase 1
- ❑ bit 03: coil driver power generator voltage is out of tolerance during test phase 2
- ❑ bit 02: coil driver power generator voltage is out of tolerance during test phase 1
- ❑ bit 01: coil driver power generator value is out of tolerance during test phase 2
- ❑ bit 00 (LSB): coil driver power generator value is out of tolerance during test phase 1

Reset totalizers: COMMAND 05.

ADDRESS	SIZE	TYPE OF DATA	COMMAND VALUE	MEANING
0000	1 REGISTER, 16 BITS	UNSIGNED SHORT	0XFF00 (HEX)	Reset the enabled totalizers (same totalizer enabled for reset from digital input).

Diagnostics: COMMAND 08.

ADDRESS	SIZE	TYPE OF DATA	FUNCTION / VALUE
0001	1 REGISTER, 16 BITS	UNSIGNED SHORT	Return query data
0004	1 REGISTER, 16 BITS	SIGNED SHORT	Restart communication from listen mode
0010	1 REGISTER, 16 BITS	SIGNED SHORT	Activate listen mode

ADDRESS	SIZE	TYPE OF DATA	FUNCTION / VALUE
0011	1 REGISTER, 16 BITS	UNSIGNED SHORT	Clear diagnostic counters
0012	1 REGISTER, 16 BITS	UNSIGNED SHORT	Number of total received packets
0013	1 REGISTER, 16 BITS	UNSIGNED SHORT	Number of received packets with CRC error
0014	1 REGISTER, 16 BITS	UNSIGNED SHORT	Number of addressed or broadcast received packets
0015	1 REGISTER, 16 BITS	UNSIGNED SHORT	Number of broadcast received packets
0016	1 REGISTER, 16 BITS	UNSIGNED SHORT	Number of received packets with NAK flag
0017	1 REGISTER, 16 BITS	UNSIGNED SHORT	Number of received packets with BUSY flag
0018	1 REGISTER, 16 BITS	UNSIGNED SHORT	Number of received packets with OVERRUN flag

110_EN_IT_IS_R3_1.00.0

MENU 9 - DISPLAY

(POS. 9.1) *Language for all msn*   [Language=   ITA/EN]   *AL1*   [LLANG]

Choice of the language. There are 8 languages available: **GB** = English, **IT** = Italian, **TR** = Turkish, **PL** = Polish, **DE** = German, **FR** = French, **PT** = Portuguese, **ES** = Spanish.

(POS. 9.2) *Display Contrast*   [Contrast=   x]   *AL1*   [DCNTR]

Display contrast set. The contrast can change according to the room temperature. The allowed range is from 0 to 9.

(POS. 9.3) *KeyBoard Timeout Time*   [Disp. time=s   xxx]   *AL1*   [KBTMT]

This function set dispay/keyboard inactivity. The set values are from 020 to 255 second.

(POS. 9.4) *Display refresh Frequency*   [D.rate=Hz   xx]   *AL1*   [DISRF]

Frequency of the display data update. This parameter effects only the display layout and not the response time of the meter itself. The possible choices are: 1/2/5/10 Hz.

(POS. 9.5) *Display function number*   [Disp.fn=   x]   *AL2*   [DISFN]

This function sets the display of the page making it visible when you start the display. For each display page is associated with a number that corresponds to the position see POS. 9.5 see page 27).

(POS. 9.6) *Display function lock*   [Disp.lock=   x]   *AL2*   [DLOKE]

This function locks the scrolling of the display pages selected by the setting POS. 9.5 see page 27 function.

(POS. 9.7) *Partial totalizer*   [Part. tot=   ON]   *AL2*   [PTOTE]

This function enables the display of partial totalizer in visualization pages

(POS. 9.8) *Negative totalizer*   [Neg. tot=   ON]   *AL2*   [NEGTE]

This function enables the display of negative totalizer in visualization pages

(POS. 9.9) *Net totalizer*   [Net. tot=   ON]   *AL2*   [NVTTE]

This function enables the display of net totalizer in visualization pages

(POS. 9.10) *Date and Time*   [Disp.Date=   ON]   *AL2*   [DATDE]

This function enables the display of date and time in visualization pages

(POS. 9.11) *Quick start menu*   [Quick start=   ON]   *AL2*   [QSTME]

This function enables the quick start menu.

MENU 10 - DATA LOGGER

(POS. 10.1) *Data logger enable* **[D.logger en= /OFF]** *AL3* **[DLOGE]**
This function enables data loger.

The following functions are activated by [D.loger en= ON]

(POS. 10.2) Unite of *Measure* **[Meas. units= ON]** *AL3* **[DLUME]**
Measure unit recording enable

(POS. 10.3) *Field separator character* **[Field separ.= ;]** *AL3* **[DLFSC]**
This function will set the separator character between data logger data.

(POS. 10.4) Sample *Interval* **[Interv.= xx:xx:xx]** *AL3* **[DLGSI]**
Sampling interval. This function set the log frequency. [Interv.= Hours : Minutes: Seconds]

(POS. 10.5) *Totalizer Total positive* **[Log T+= ON]** *AL3* **[DTTPE]**
Enable logging of total direct totalizer.

(POS. 10.6) *Totalizer Partial positive* **[Log P+= ON]** *AL3* **[DTPPE]**
Enable logging of partial direct totalizer.

(POS. 10.7) *Totalizer Total Negative* **[Log T-= ON]** *AL3* **[DTTNE]**
Enable logging of total reverse totalizer

(POS. 10.8) *Totalizer Partial Negative* **[Log P-= ON]** *AL3* **[DTPNE]**
Enable logging of partial reverse totalizer

(POS. 10.9) *Totalizer Total Net* **[Log TN= ON]** *AL3* **[DLTNE]**
Enable logging of total net totalizer

(POS. 10.10) *Totalizer Partial Net* **[Log PN= ON]** *AL3* **[DLPNE]**
Enable logging of partial net totalizer

(POS. 10.11) *Log Flow rate in measure unit* **[Log Q(UM)= ON]** *AL3* **[DFTUE]**
Enable logging of flow rate in measure unit

(POS. 10.12) *Log Flow rate in percentage* **[Log Q(%)= ON]** *AL3* **[DFPCE]**
Enable recording of the flow rate as a percentage of full scale value set.

(POS. 10.13) *Alarm events* **[Log AL.EV= ON]** *AL3* **[DALEE]**
Enable logging of alarm events

(POS. 10.14) *Sensor test result* **[Log STR= ON]** *AL6* **[DSTRE]**
Enable logging of sensor test results

| (POS. 10.15) *Board temperatures* | [Log BTS= ON] | *AL6* | [DBTSE] |

Enable logging of board temperature

| (POS. 10.16) *Internal board voltages* | [Log IBV= ON] | *AL6* | [DIBVE] |

Enable logging of internal board voltage

| (POS. 10.17) *Electrodes DC voltages* | [Log EDC= ON] | *AL6* | [DEDVE] |

Enable logging of electrodes DC voltage

| (POS. 10.18) *Electrodes AC voltages* | [Log AEC= ON] | *AL6* | [DEAVE] |

Enable logging of electrodes AC voltage

| (POS. 10.19) *Electrodes source impedance* | [Log EIZ= ON] | *AL6* | [DESIE] |

Enable logging of electrodes impedance

| (POS. 10.20) *Sensor coils values* | [Log SCV= ON] | *AL6* | [DSCVE] |

Enable logging of sensor coils value

MENU 10 - DATA LOGGER: ONLY MCP FUNCTIONS

| *LoG All Information Enable* | [MCP ONLY] | *AL6* | [LGAIE] |

Log all events information. This function save in the event file all MCP commands.

USING DATA LOGGER BY MCP INTERFACE

Data are stored on micro SD card; the organization is based on "tree-structure": the system create a daily folder where it save events and data logger . The data can be downloaded by MCP interface.

MCP INTERFACE
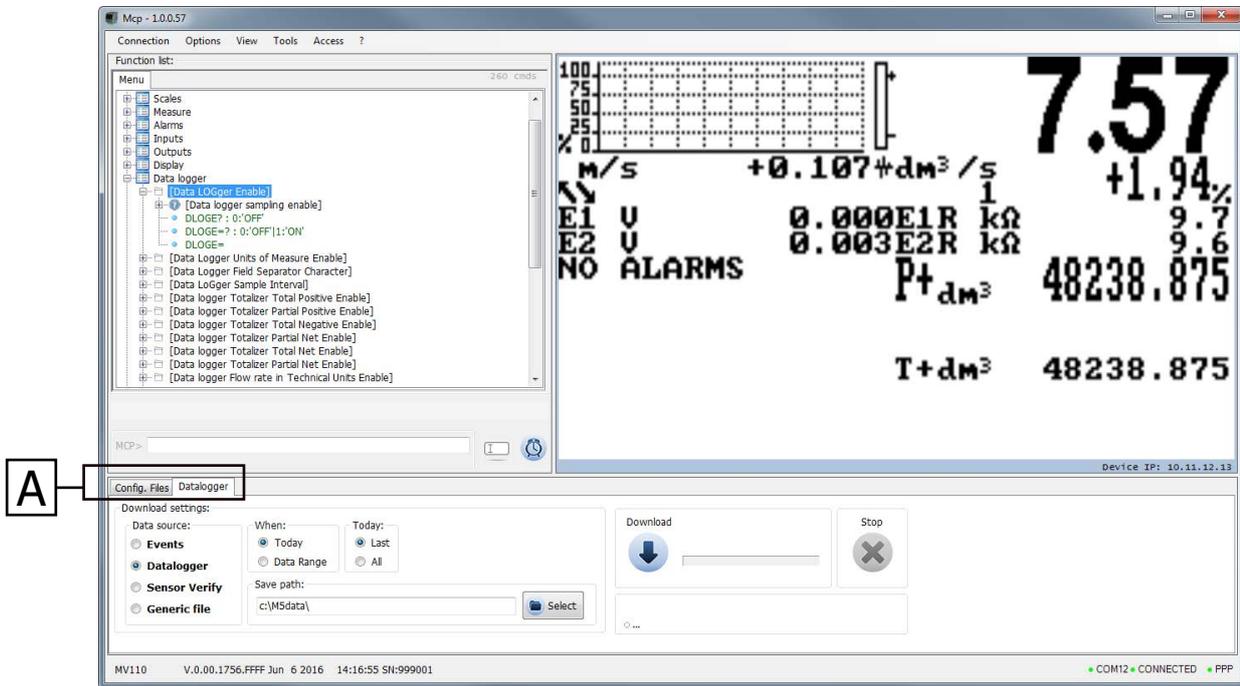
Click tab-control data logger to view files.
The sampling data backup depends on the value set by the POS function 10.4 page 25.
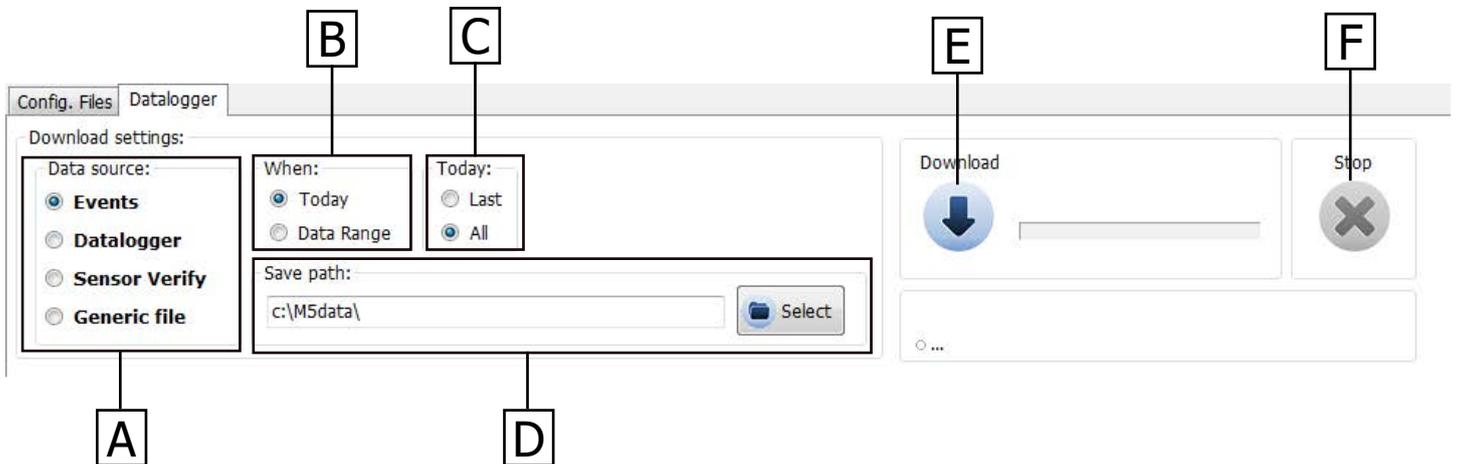
A=Data source

Events: Save the file system events (Example F-RAM hardware data [WORKING AREA] [SUCCESSFULLY LOADED])
Data logger: Save files of the enabled data logger function.
Sensor Verify: data logged by BIV function
Generic file:

B=When

Today; It indicates the download file for the current day
Data range; this option allows you to select the date range for download.

C=Today

Last; this option allows to download the latest files, recordered after the laat download
All; this option allows the download of all the current day of the file

D=Save path:

This option allows you to save files to the folder on your PC

E=Download:

Button to start the download process

F=Stop:

Button to stop the download process

Example: Download Events

To download all the events of the current day in a specific folder, set the below parameters as follows:
- Data source: Events
- When: Today
- Today: All
- Save path: C: / .....

The parameters are set then click the Download button.

Once the download is completed, a window containing the list of today's events appears. The file is saved in the specified folder in .txt format .

Example: Download Data Logger

Note: it is recommended the date synchronization between converter and PC to perform correctly the events and logger reading operations.

To download all the data of the current day in a specific folder, set the below parameters as follows:
- Data source: DATALOGGER
- When: Today
- Today: All
- Save path: C: / .....

The parameters are set then click the Download button.

110_EN_IT_IS_R3_1.00.0

View downloaded files setting download data logger.
Note: The fields are in a fixed position, regardless if the above fields are active or not. The disabled fields are empty (delimited by the separator but without data).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
	N.RECORD	DATE	HOURS	U.M.	T+	U.M.	P+	U.M.	T-	U.M.	P-	U.M.	TN	U.M.	PN	U.M.	FLOWRATE	U.M.	FLOWRATE %	U.M.	N.ACTIVE ALLARM	U.M.	CPTI	U.M.	T.RISE A	U.M.	T.RISE B	U.M.	CETS
2	n°	dd/mm/yy	00:00:00	dm3	0	dm3	0	dm3	0	dm3	0	dm3	0	dm3	0	dm3/s	0	%	0	AL	0	mA	0	ms	0	ms	0	ERR	0
1	n°	dd/mm/yy	00:00:00	dm3	0	dm3	0	dm3	0	dm3	0	dm3	0	dm3	0	dm3/s	0	%	0	AL	0	mA	0	ms	0	ms	0	ERR	0

N°Record. View progressively the number of registered records.

Date. The recording date viewing for each record.

Hours. Time recording viewing for each record.

Total positive totalizer value. Form Fields when the send flag is active on the totalizer T+.

Partial positive totalizer value. Form Fields when the send flag is active on the totalizer P-.

Total negative totalizer value. Form Fields when the send flag is active on the totalizer T-.

Partial negative totalizer value. Form Fields when the send flag is active on the totalizer P-.

Total net totalizer value. Form Fields when the send flag is active on the totalizer TN.

Partial net totalizer value. Form Fields when the send flag is active on the totalizer PN

Flow rate. Form Fields present when the send flag is on the flow in units of measurement.

Flow rate %. Form fields present when the flag of alarm recording is active (only N ° of present total alarms)

N ° active alarms. Form fields present when the flag of alarm recording is active (only N ° of present total alarms)

Loss of current measured during insulation test. Available value when recording the sensor test data is active.

Time rise A. Available value when recording the sensor test data is active.

Time rise B. Available value when recording the sensor test data is active.

Sensor test error code. Available value when recording the sensor test data is active.

Visualization of downloaded file. Access Level 5 (diagnostic level) is required in order to download this type of file.

Description	Value	UM (field)	Cols
Voltage measured on electrode E1. Form fields when is active the recording of data on the input voltage (diagnostic value).	< 0	E1V	AD / AE
Voltage measured on electrode E2. Form fields when is active the recording of data on the input voltage (diagnostic value).	< -0.023	E2V	AF / AG
Differential voltage between the two electrodes. FForm fields when is active the recording of data on the input voltage (diagnostic value)	< 0	VD (E1-E2)	AH / AI
Common mode voltage in the electrodes. Form fields when is active the recording of data on the input voltage (diagnostic value).	< 0	VC (E1+E2)/2	AJ / AK
Noise at low frequency measured on the electrodes. FForm fields when is active the recording of data on the input signal noise levels (diagnostic value).	< 0	CM LF NOISE	AL / AM
Differential low frequency noise measured on the electrodes. Form fields when is active the recording of data on the input signal noise levels (diagnostic values).	< 0	DIF LF NOISE	AN / AO
Low-frequency noise measured input ADC. Form fields when is active the recording of data on the input signal noise levels (diagnostic values).	mV 0	ADC LF NOISE	AP / AQ
High frequency noise measured input ADC. Form fields when is active the recording of data on the input signal noise levels (diagnostic values).	mV 0	ADC HF NOISE	AR / AS
Measured equivalent resistance on the electrode 1. Form fields when is active the recording of data on the electrode resistance measurements (diagnostic values).	kohm 0	E1 R	AT / AU
Measured equivalent resistance on the electrode 2. Form fields when is active the recording of data on the electrode resistance measurements (diagnostic values).	kohm 0	E2 R	AV / AW
Coils excitation current. Form fields when is active the recording of data related to the sensor excitation circuit measures (diagnostic value)	mA 0	EXCITATION CUR	AX / AY
Measured resistance of the excitation circuit (coil + cable). Form fields when is active the recording of data relative to the sensor excitation circuit measures (diagnostic values).	ohm 0	R COILS	AZ / BA
Temperature measured on the sensor coils (indirect measurement). Form fields when the data transmission flag is active relative to the sensor excitation circuit measures (diagnostic values).	°C 0	T COILS	BB / BC
Temperature T1 (sheet sensor 1). Form fields when the data transmission flag on board the internal temperature measurement is active (diagnostic values).	°C 0	T1	BD / BE
Temperature T2 (sheet sensor 2). Form fields when the data transmission flag on board the internal temperature measurement is active (diagnostic values).	°C 0	T2	BF / BG
CPU temperature. Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic value).	°C 0	T CPU	BH / BI
Primary power supply of CPU. Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic value).	< 0	V CPU	BJ / BK
Positive supply voltage of analog circuits. Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic values).	< 0	AVCC+	BL / BM
Negative supply voltage of the analog circuits. Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic values).	< 0	AVCC-	BN / BO
Voltage measured on the battery B1 (NOT rechargeable battery). Fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic values).		BATT1 V	BP / BQ
Voltage measured on the battery B2 (or rechargeable battery). Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic values).	< 0	BATT2 V	BR / BS
% Battery charge. Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic values).	% 0	% BATTERY CHARG	BT / BU

110_EN_IT_IS_R3_1.00.0

Example: Sensor Verify

The function "Sensor Verify" creates the "STESTLOG.CSV" file, according to the following conditions:
1) Activate the SDC / RTC option in group "HW Config" (by factory see the order code)
2) Activate the "BIV" in the group "PRODUCT CODE" (by factory see the order code)
3) Activate the "Sens.verify" function in the "Sensor" menu
Activated such conditions, the converter will perform every hour a measure of sensor's parameters and record a line of the file "STESTLOG.CSV"; it is possible even a manual verification by the command "sens.verify" on the menu "Diagnostic" or through the MCP command "SVERC".

To download all the sensor measure for the current day in a specific folder, set the below parameters as follows:
- Data source: Sensor Verify
- When: Today
- Today: All
- Save path: C: / .....
The parameters are set then click the Download button.

Example: Generic File

This function allows to select a file in the SD memory and download it.
In the "Generic file path" specify the file name contained in the SD and indicate "Save path" where to save the file. Set these values to proceed with the download by clicking the "download".

MENU 11 - FUNCTION

The following functions are activated by first pressing the "ENTER" and then the "ESC" when the screen appears "confirm" to start the function.

(POS. 11.1) *Totalizer Total Positive reset* **[T+ RESET= ON]** *AL3* **[VTTPR]**

Reset total direct totalizer for direct flow rate (+)

(POS. 11.2) *Totalizer Par. Positive reset* **[P+ RESET= ON]** *AL3* **[VTPPR]**

Reset total partial totalizer for direct flow rate (+)

(POS. 11.3) *Totalizer Total Neg. reset* **[T- RESET= ON]** *AL3* **[VTTNR]**

Reset total reverse totalizer for direct flow rate (-)

(POS. 11.4) *Totalizer Partial Neg. reset* **[P- RESET= ON]** *AL2* **[VTPNR]**

Reset partial reverse totalizer for direct flow rate (-)

(POS. 11.5) *Load factory default sensor* **[Load sens.f.def= ON]** *AL3* **[LFDSD]**

This function resets the parameters of the sensor factory default. To Load the saved files see function (11.7).

(POS. 11.6) *Load factory default converter* **[Load conv.f.def= ON]** *AL3* **[LFDCD]**

This function resets the parameters of the converter factory default. o Load the saved files see function (11.8).

(POS. 11.7) *Save sensor factory default* **[Save sens.f.def= ON]** *AL6* **[SFDSD]**

This function save the parameters of the sensor factory default.

(POS. 11.8) *Save convert factory default* **[Save conv.f.def= ON]** *AL6* **[SFDCD]**

This function loads the data from a converter to another.

(POS. 11.9) *Calibration Immediate* **[Calibration]** *AL5* **[CALIC]**

Perform manually a board's calibration. Press Enter and the message " EXECUTE?" will be visualized on the display then press long the key Enter to proceed. Press any other key to delete the operation.

If the sensor table is valid, the calibration is performed also when one of the following paramenter has been change:

1. SENSOR DIAMETER -> Menu Sensor1
2. SENSOR MODEL -> Menu Sensor1
3. Exc. CURRENT -> Menu Sensor1
4. S. Freq. -> Menu Sensor1

To check the calibration status, active or inactive, type the command MCP Calic? and check as follows:

❑ CALIC = 1 calibration in progress
❑ CALIC = 0 calibration terminated

MENU 11 - FUNCTION: ONLY MCP FUNCTIONS

Save sensor reference data **[MCP ONLY]** *AL4* **[SRFDS]**

Save conv.f.def= ON. "meter data" page 68

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INDUSTRIA

MENU 12 - DIAGNOSTIC

(POS. 12.1) *Self Test Diagnostic*   [Self Test]   *AL3*   [ATSIC]

Meter auto-test function. This function stops the normal functions of the meter and performs a complete test cycle on the measure input circuits and on the excitation generator. To activate this function, after select it, push key Enter, at the question: "CONFIRM EXEC.?" Long Push the same key to start auto-test, or any other key for delete operation. At the end of operation the converter will revert to one of the initial visualization pages. This function is automatically performed when switching on the device. This function restarts the converter.

(POS. 12.2) *Test display*   [Test display]   *AL1*   NO MCP COMMAND

This function allows to do a physical test the graphic display. During this operation, 4 sequences are displayed to test the correct functioning of the device.

(POS. 12.3) *Sensor verify*   [Sens. verify]   *AL3*   [SVERC]

This function perform a manual sensor verification (if BIV is active)

(POS. 12.4) *Flow rate simulation*   [Flow sim=ON]   *AL3*   [MSIEN]

Flow rate simulation enabling. With this function it is possible to generate an internal signal that simulates the flow rate, allowing the outputs and all the connected instruments test. After enabling it, a '▲▼' appears in the top left of the screen and the flow rate simulation can be:
❑ set: by pushing the key Enter from one of visualization pages, to set the required % flow rate (Fl. rate=%) and the same key to confirm the value;
❑ finished: by pushing the key Enter from visualization pages and then by long pushing the same key.

(POS. 12.5) *Diagnostic measures*   [Display measures]   *AL5*   DMVLS

This Function shows the values of the various internal parameters as listed below :

```
VCPU:V        5.01   LFN_COM:V      0.000
VPS:V         5.41   LFN_DIF:V      0.000
VUSB:V        4.53   HFN_ADC:mV     0.000
+AVCC:V      +10.1   LFN_ADC:mV     0.001
-AVCC:V       -9.9   MEAS_NB:           0
VBATT:V      0.000   CAL_I:mV      16.503
IBATT:A      0.000   CAL_U:mV     530.778
VIN1:V      -8.071   CAL_G:        32.1622
VIN2:V      -8.065   CAL_O:mA      -0.055
VIN_C:V     -8.068   CAL_C:mA      -0.055
VIN_D:V     -0.006   CAL_R0:       1.00000
C_C:mA       25.00   CAL_R1:       1.00000
C_U:V          5.0   CAL_R2:       1.00000
C_VPK:V        5.5   CAL_R3:       1.00000
C_R:Ω        201.9   SYS_F:MHz     50.0512
C_PWR:W      0.126   CURR_K:       0.00000
C_T:°C         -.-   PROC1:%         46.4
C_RT:ms       0.00   PROC2:%          7.3
C_LK:mA      0.000   PROC3:%          3.8
C_ST:            1   PROC4:%         29.8
S_VER.RSLT:   0000   PROC5:%         12.6
E1R:kΩ         0.0   CPU_T:°C      +33.12
E2R:kΩ         0.0
```

(POS.12.6) *Disp, comm. Diagnostic values*   [Disp. comm. vars]   *AL5*   DCVLS

Create a list of diagnostic values on the instrument communication.

PPP link status ──────➤
MCPI socket status ──────➤

```
PPP_STATUS:    NETW   E_IP_HDR5:        3
MCPI_S: ESTABLISH   E_IP_HDR6:        0
RxCNT:      1477149   E_IP_HDR7:        0
TxCNT:      6515456   E_IP_HDR8:        0
E_SR_LINK:        0   E_IP_HDR9:        0
E_PAKTLEN:        0   E_TCPHDR1:        0
E_NETLAYR:        0   E_TCPHDR2:        0
E_TSPLAYR:        0   E_UDPHDR1:        0
E_ARPHDR1:        0   E_UDPHDR2:        0
E_ARPHDR2:        0   E_UDPHDR3:       92
E_IP_HDR1:        0   E_ICMPHDR:        0
E_IP_HDR2:        0
E_IP_HDR3:        0
E_IP_HDR4:        0
```

Following are the states for the PPP link and MCPI to connect the device.

PPP link status:

"UNDT" = undetermined
"DEAD" = dead, link down, persistent condition
"LCP"   = LCP phase, transition condition
"AUTH" = Authentication phase, transition condition
"IPCP"   = IP and DNS addressess assign phase, transition condition
"NETW" = network established (normal persistent condition when the link is UP)
"TERM" = link termination request, transition condition

MCPI link status:

"CLOSED" = socket closed
"ACCEPT" = socket awaiting for new connection
"ESTABLISH" = link established
"CLS_WAIT" = waiting for closure
"LAST_ACK" = lask ACK sent
"FIN_WAIT" = (see TCP/IP RFC documentation)
"TIME_WAIT" = (see TCP/IP RFC documentation)

(POS. 12.7) Display graphs   **[Display graphs]**   ***AL5*** **NO MCP COMMAND**

This function displays graphs of input Z, C. current, C. Volt, C.Load, Input 1, Input 2, Input1-Input 2, Analog to Digital Converter.
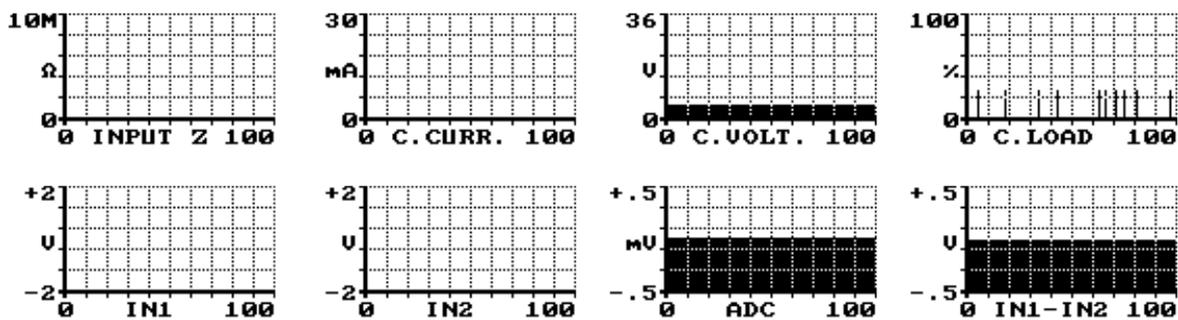
(POS. 12.8) Generic sensor set   **[Gen.sens. set]**   ***AL5*** **NO MCP COMMAND**

Automatic finding of a parameter set for a generic sensor.

(POS. 12.9) *SD card status info.*   [SD card info]   *ALO*   **SDSTA**

This function shows the status of the SD card as shown in the following figure.

```
Size:  3858.8  MB    → Total Size
Free:  3822.3  MB    → Available memory
Cluster:    32  KB   → Cluster Memory
    5201:02:47:28    → Use time remaining SD card *
```

```
         Day  Hours  Minutes  Seconds
```

The statistical calculation is performed every time the command SDSTA is invoked. The statistical data are updated AUTOMATICALLY every day (24 hours) or manually each time the function is called to display or send the SDSTA command. However, given that for the detection is necessary a minimum of one hour, the data will not be recomputed before this time interval.

```
Size:  3858.8  MB          Size:  3858.8  MB
Free:  3822.3  MB          Free:  3822.3  MB
Cluster:    32  KB         Cluster:    32  KB
    5201:02:47:28        → 0158:21:23:13
```

minimum time of 1 hour for the new data update

The SD card must be replaced only by the service. The use of commercial cards could disable some functionality of the instrument.

(POS. 12.10) *Firmware info*   [Firmware info]   *ALO*   **MODSV**

Firmware info version/revision

```
MV110
V.0.00.1403.FFFF
 Apr 22 2016
12:35:47
```

(POS. 12.11) *Board Serial Number*   [S/N= xxxxxx]   *ALO*   **[SRNUM?]**

View Board serial number. (read only)

(POS. 12.12) *Working Time*   [WT= xxxx: xx: xx: xx]   *ALO*   **[TWKTM?]**

View Total working time instrument. (read only)

MENU 13 - SYSTEM

| (POS. 13.1) Daylight saving time | [Dayl. Saving= ON] | *AL2* | [DYSTE] |

Daylight saving time change.

| (POS. 13.2) Time zone | [Time zone=h+xx.xx] | *AL2* | [TZONE] |

Set time for geographic area

| (POS. 13.3) Date and Time | [xxxx/xx/xx-xx:xx] | *AL2* | [DTIME] |

Set to system date and time

| (POS. 13.4-5-6-7-8-9) Access level n° code | [Ln xxxxxxx] | --- | [L1ACD]-> [L6ACD] |

This function enables or disables, for each access level code, the main menu functions.
Each level unlocks the functionality of the lower level. (Function 13.10 Restricted access level see page 28)
L1 code= ******** Access level value code 1   L4 code= ******** Access level value code 4
L2 code= ******** Access level value code 2   L5 code= ******** Access level value code 5
L3 code= ******** Access level value code 3   L6 code= ******** Access level value code 6

| (POS. 13.10) Restricted access level | [Restr. access= ON] | *AL6* | [RSARE] |

Enable Or disable access level code. If active displays only the functions related to the level entered access.

IP ADDRESS SETTING (13.11-12-13)

| (POS. 13.11)Device IP address | [XXX.XXX.XXX.XXX] | *AL3* | [DIPAD] |

Device IP network edress

| (POS. 13.12) Client IP address | [XXX.XXX.XXX.XXX] | *AL3* | [CIPAD] |

Client IP network adress

| (POS. 13.13) Network mask | [XXX.XXX.XXX.XXX] | *AL3* | [NETMS] |

Network mask.

Caution: Changes to the functions of the points 13.11-13.12-13.13 are enabled after the drive device restart (see function 12.1 Self test for restart converter).

PC/SERVER

DEVICE IP ADDRESS   CLIENT IP ADDRESS
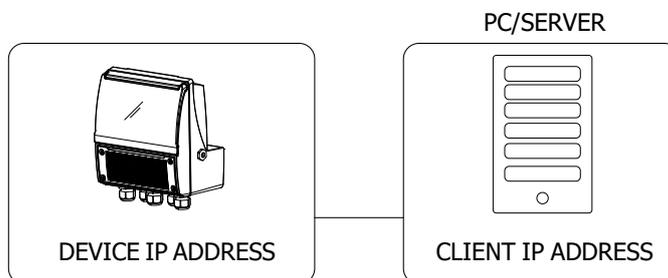
| (POS. 13.14) Coefficient KT | [KF=X.XXXXX] | *AL6* | [CFFKT] |

Gain correction coefficient (calculated automatically)

| (POS. 13.15) Coefficient KS | [KF=X.XXXXX] | *AL5* | [CFFKS] |

Correction coefficient constant instrumental

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| **(POS. 13.16) Coefficient KR** | **[KR=X.XXXXX]** | *AL5* | **[CFFKR]** |

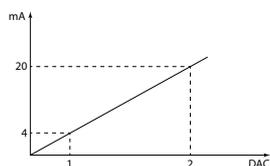Correction coefficient constant instrumental

DIGITAL ANALOG CONVERTER (Correction Parameters)(13.17-18-19-20)

The diagram shows how the DAC4-20mA parameters are setup. The DAC1 value corresponds to 4 mA corresponding to a zero flow rate, while the value of 20mA corresponds to a 100% of the flow rate.

| **(POS. 13.17) DAC1 4mA** | **[DAC1 4mA =XXXXX]** | *AL5* | **[C1CP1]** |

DAC1 out 4mA calibration point. (current output1 calibration point 1)

| **(POS. 13.18) DAC1 20mA** | **[DAC1 20mA=XXXXX]** | *AL5* | **[C1CP2]** |

DAC1 out 20mA calibration point. (current output1 calibration point 2)

| **(POS. 13.19) DAC2 4mA** | **[DAC1 20mA=XXXXX]** | *AL5* | **[C2CP1]** |

DAC2 out 4mA calibration point. (current output2 calibration point 1)

| **(POS. 13.20) DAC2 20mA** | **[DAC2 20mA=XXXXX]** | *AL5* | **[C2CP2]** |

DAC2 out 4mA calibration point (current output2 calibration point 2)

| **(POS. 13.21) Stand-BY** | **[STAND-BY]** | *AL3* | **[SSTBY]** |

Enable the converter standby state. It is enable by selecting chargeable battery in hw confing.

| **(POS. 13.22) Firmware Update** | **[FW update]** | *AL4* | **[FWUPD]** |

Enable firmware update. The firmware can be upload to the SD card (name.file).
MCP interface is activated by the command FWUPD = name.file

MENU 13 - SYSTEM: ONLY MCP FUNCTIONS

Unique Identity KEY	**[MCP ONLY]**	*AL0*	**[UIKEY]**

Device Unique Identity key

HardWare SET	**[MCP ONLY]**	*AL0*	**[HWSET]**

Device hardware configuration

HardWare CODe	**[MCP ONLY]**	*AL0*	**[HWCOD]**

Device hardware code

Calibr. Exec. status Memory	**[MCP ONLY]**	*AL6*	**[CALXM]**

Calibration Execution status Memory. This function checks the instrument's internal calibration status.
CALXM=1 valid calibration in execution.
CALXM=0 invalid calibration (If the function is zero, start the calibration function [MCP command CALIC])

RTC Real time clock	**[MCP ONLY]**	*AL2*	**[RTCAC]**

RTC is used to set a correction factor for the internal clock.
For setting the correction date and time with MCP press

Function CODe Selection	**[MCP ONLY]**	*AL0*	**[FCODS]**

Select the function code

FuNction Enable State Selection	**[MCP ONLY]**	*AL6*	**[FNESS]**

Select the enable state of function

All FuNctions State Selection	**[MCP ONLY]**	*AL6*	**[AFNSS]**

Select enable state of ALL function

Quick Start FuNction Selection	**[MCP ONLY]**	*AL6*	**[QSFNS]**

Select function for quick start menu

Quick Start All Functions Selection	**[MCP ONLY]**	*AL6*	**[QSAFS]**

Select ALL function converter for quick start menu.

Quick start function Status LiST	**[MCP ONLY]**	*AL6*	**[QSLST]**

List quick start group functions

Function enable Status LiST	**[MCP ONLY]**	*AL6*	**[FSLST]**

List enable status of functions

| **Access CODE** | **[MCP ONLY]** | *AL0* | **[ACODE]** |

Input the right access code

Exemple set quick start menù function for mcp.
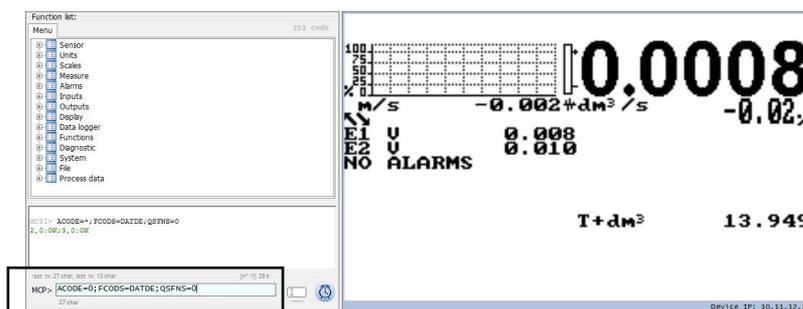
ACODE=0; FCODS=[MCP COMMAND]; QSFNS=1

Access Code   INSERT MCP Command   Quick Start FuNction Selection
of the function to be
activated in the QS menu.

| **LINK Terminate** | **[MCP ONLY]** | *AL0* | **[LTERM]** |

Terminate the PPP data link

| **MCPI session QUIT** | **[MCP ONLY]** | *AL0* | **[MQUIT]** |

Quit the MCPI connection

| **Functions LIST** | **[MCP ONLY]** | *AL0* | **[FLIST]** |

View list of all available converter functions.

| **Functions LISt Compact** | **[MCP ONLY]** | *AL0* | **[FLISC]** |

View compact list of all available converter functions.

| **Functions Menu SELection** | **[MCP ONLY]** | *AL0* | **[FMSEL]** |

Select menu for functions list

| **ConFiguration LiST** | **[MCP ONLY]** | *AL0* | **[CFLST]** |

Configuration parameter list. The list with the status / values of the converter parameter.

| **Volume Totalizer Total Positive Set** | **[MCP ONLY]** | *AL4* | **[VTTPS]** |

Totaliz.T+ value set

| **Volume Totalizer Partial Positive Set** | **[MCP ONLY]** | *AL4* | **[VTPPS]** |

Totaliz.P+ value set

Volume Totalizer Total Negative Set	**[MCP ONLY]**	*AL4*	**[VTTNS]**
Totaliz.T- value set			
Volume Totalizer Partial Negative Set	**[MCP ONLY]**	*AL4*	**[VTPNS]**
Totaliz.P- value set			
Volume Total Positive Overflow Set	**[MCP ONLY]**	*AL4*	**[VTPOS]**
Totaliz.T+ overflow value set			
Volume Partial Positive Overflow Set	**[MCP ONLY]**	*AL4*	**[VPPOS]**
Totaliz.P+ overflow value set			
Volume Total Negative Overflow Set	**[MCP ONLY]**	*AL4*	**[VTNOS]**
Totaliz.T- overflow value set			
Volume Partial Negative Overflow Set	**[MCP ONLY]**	*AL4*	**[VPNOS]**
Totaliz.P- overflow value set			
CPU MaX.recorded temperature	**[MCP ONLY]**	*AL6*	**[CPUMX]**
CPU max.recorded temperature			
CPU MiN.recorded temperature	**[MCP ONLY]**	*AL6*	**[CPUMN]**
CPU min.recorded temperature			
Board T1 MaX.recorded temperature	**[MCP ONLY]**	*AL6*	**[BT1MX]**
T1 max.recorded temperature			
Board T1 MiN.recorded temperature	**[MCP ONLY]**	*AL6*	**[BT1MN]**
T1 min.recorded temperature			
Board T2 MaX.recorded temperature	**[MCP ONLY]**	*AL6*	**[BT2MX]**
T2 max.recorded temperature			
Board T2 MiN.recorded temperature	**[MCP ONLY]**	*AL6*	**[BT2MN]**
T2 min.recorded temperature			
Calibration OFset Register 0	**[MCP ONLY]**	*AL6*	**[COFR0]**
Calibration offset register 0			
Calibration OFset Register 1	**[MCP ONLY]**	*AL6*	**[COFR1]**
Calibration offset register 1			

| *Calibration GAin Register 0* | **[MCP ONLY]** | *AL6* | **[CGAR0]** |

Calibration gain register 0

| *Calibration GAin Register 1* | **[MCP ONLY]** | *AL6* | **[CGAR1]** |

Calibration gain register 1

| *Calibration GAin Register 2* | **[MCP ONLY]** | *AL6* | **[CGAR2]** |

Calibration gain register 2

| *Calibration GAin Register 3* | **[MCP ONLY]** | *AL6* | **[CGAR3]** |

Calibration gain register 3

| *Calibration GAin Register C* | **[MCP ONLY]** | *AL6* | **[CGARC]** |

Calibration gain register C

MENU 14 - FILE (ONLY MCP)

File Transfer ABoRt	**[MCP ONLY]**	*AL2*	**[FTABR]**
Abort the current File Transfer			
File Transfer STAte	**[MCP ONLY]**	*AL0*	**[FTSTA]**
Show the File Transfer state			
Read Last EVenTs	**[MCP ONLY]**	*AL2*	**[RLEVT]**
Read the latest system events			
Read All EVenTs	**[MCP ONLY]**	*AL2*	**[RAEVT]**
Read all current system events			
Read Last Logged DaTa	**[MCP ONLY]**	*AL2*	**[RLLDT]**
Read the latest logged data			
Read All Logged DaTa	**[MCP ONLY]**	*AL2*	**[RLLDT]**
Read all current logged data			
Read Last Sensor Verify Data	**[MCP ONLY]**	*AL2*	**[RLSVD]**
Read the latest sensor ver. data			
Read All Sensor Verify Data	**[MCP ONLY]**	*AL2*	**[RASVD]**
Read all sensor verify data			
File SEND	**[MCP ONLY]**	*AL2*	**[FSEND]**
Set file name for read operation			
File ReCeiVE	**[MCP ONLY]**	*AL5*	**[FRCVE]**
Set file name for write operation			
File ReCeive APpend mode	**[MCP ONLY]**	*AL5*	**[FRCAP]**
Set file name for write-append			
File OFFSet position	**[MCP ONLY]**	*AL2*	**[FOFFS]**
Set file offset position			
ConFiGuration file WRite	**[MCP ONLY]**	*AL2*	**[CFGWR]**
Save the configuration to a file			
ConFiGuration file ReaD	**[MCP ONLY]**	*AL2*	**[CFGRD]**
Read the configuration from file			

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| **FuNCtion list file WRite** | [MCP ONLY] | *AL2* | **[FNCWR]** |

Save the functions list to file

| **Function Enable Status WRite** | [MCP ONLY] | *AL6* | **[FESWR]** |

Save function enable status to file

| **Quick Start function Status WRite** | [MCP ONLY] | *AL6* | **[QSSWR]** |

Save quick start function enable.

110_EN_IT_IS_R3_1.00.0

MENU 15 - PROCESS DATA (ONLY MCP)

OUTput 1 Set Set value for digital output 1	**[MCP ONLY]**	*AL0*	**[OUT1S]**
OUTput 2 Set Set value for digital output 2	**[MCP ONLY]**	*AL0*	**[OUT2S]**
Digital INput 1 Status Digital input 1 status read	**[MCP ONLY]**	*AL0*	**[DIN1S]**
Flow Rate Full Scale in chosen Units F.rate f.scale in chosen units	**[MCP ONLY]**	*AL0*	**[FRFSU]**
Flow Rate Value PerCentage Flow rate value in percentage	**[MCP ONLY]**	*AL0*	**[FRVPC]**
Flow Rate Value Percentage without cut-off F.rate in perc.without cut-off	**[MCP ONLY]**	*AL0*	**[FRVPX]**
Flow Rate Value Binary without cut-off F.rate in binary.without cut-off	**[MCP ONLY]**	*AL0*	**[FRVBX]**
Flow Rate Value Technical Unit F.rate value in unit of measure	**[MCP ONLY]**	*AL0*	**[FRVTU]**
Volume Totalizer Total Positive Value Totaliz.T+ read value	**[MCP ONLY]**	*AL0*	**[VTTPV]**
Volume Totalizer Partial Positive Value Totaliz.P+ read value	**[MCP ONLY]**	*AL0*	**[VTPPV]**
Volume Totalizer Total Negative Value Totaliz.T- read value	**[MCP ONLY]**	*AL0*	**[VTTNV]**
Volume Totalizer Partial Negative Value Totaliz.P- read value	**[MCP ONLY]**	*AL0*	**[VTPNV]**
Volume Totalizer Total Positive Overflow Totaliz.T+ number of overflows	**[MCP ONLY]**	*AL0*	**[VTTPO]**
Volume Totalizer Partial Positive Overflow Totaliz.P+ number of overflows	**[MCP ONLY]**	*AL0*	**[VTPPO]**
Volume Totalizer Total Negative Overflow Totaliz.T- number of overflows	**[MCP ONLY]**	*AL0*	**[VTTNO]**

|			
Volume Totalizer Partial Negative Overflow	**[MCP ONLY]**	*AL0*	**[VTPNO]**
Totaliz.P- number of overflows			
Board TeMPeratures	**[MCP ONLY]**	*AL0*	**[BTMPS]**
Board temperatures			
CPU temperature	**[MCP ONLY]**	*AL0*	**[CPUTP]**
CPU temperature			
Sensor CoiLs TemPerature	**[MCP ONLY]**	*AL0*	**[SCLTP]**
sensor's coils temperature			
LiQuid VELocity	**[MCP ONLY]**	*AL0*	**[LQVEL]**
Liquid velocity			
AVeraGe process data Samples Number	**[MCP ONLY]**	*AL0*	**[AVGSN]**
N.of samples for averaged values			
ALARM status	**[MCP ONLY]**	*AL0*	**[ALARM]**
Active alarm(s) status			
Sensor TeSt Result Code	**[MCP ONLY]**	*AL0*	**[STSRC]**
Sensor test result code			
Main power status	**[MCP ONLY]**	*AL0*	**[MPWRS]**
Status of main power supply			
INput RESistance	**[MCP ONLY]**	*AL0*	**[INRES]**
Equivalent Input resistance			
INput VoLtageS	**[MCP ONLY]**	*AL0*	**[INVLS]**
Electrodes input voltages			
System Battery Voltage	**[MCP ONLY]**	*AL0*	**[SBVLT?]**
View battery voltage			
System Battery Charge Status	**[MCP ONLY]**	*AL0*	**[SBCHS?]**
View system battery charge status			
Measure BUFFers	**[MCP ONLY]**	*AL0*	**[MBUFF]**
Measure buffers data read			
SEQuence NumBer	**[MCP ONLY]**	*AL0*	**[SEQNB]**
Sequence number			

METER DATA

This function allows the import of data from one converter to another up to level 4 included.
The hardware configurations and the corresponding calibration values are not restored.
The "data import" procedure can be performed **one time only,** since the directory, according to the board's SERIAL NUMBER, will be renamed.

OPERATING PROCEDURE TO CHANGE THE CONVERTER BOARD

⚠️ Remove the 4 screws (see "MV110 construction" page10) to remove the main housing. Attention of any electrical cables.
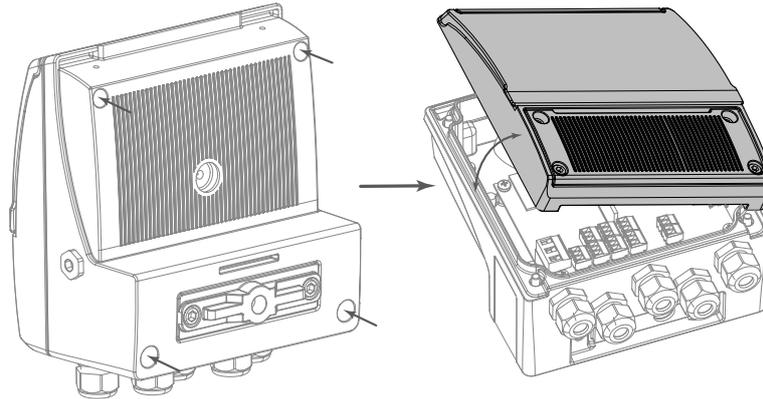
Remove the 4 screws (see "MV110 construction" page10) to remove the MV110 board. Attention of any electrical cables. Remove the SD card and insert the new MV110 board.

Push Remove SDcard   New board MV110
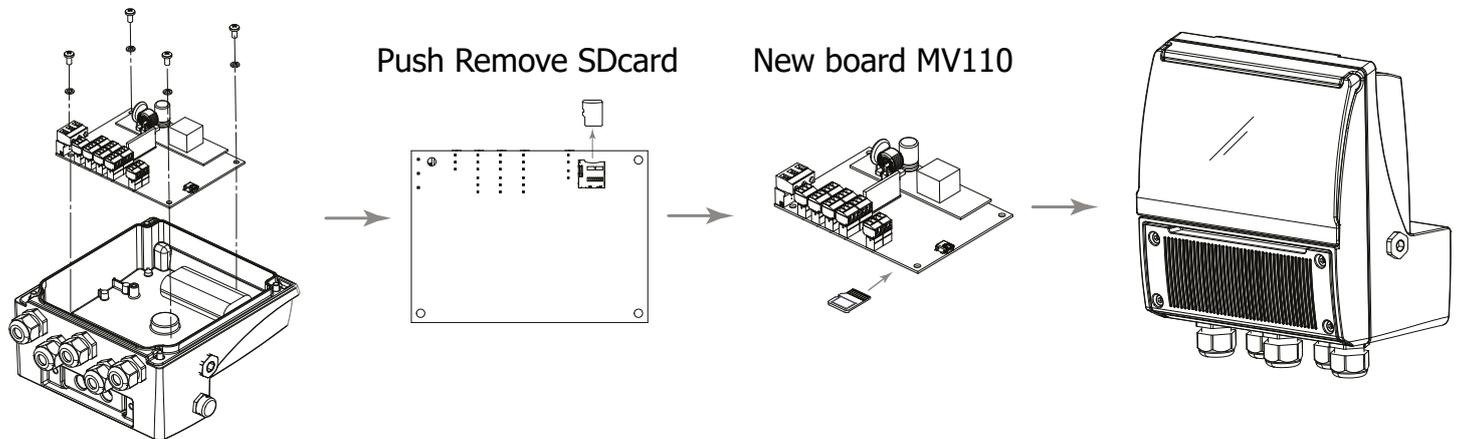
Assembled the card turn on the converter and enable [Save Conv. F. def.] function to restore data.


```
FUNCTIONS
I+ reset
P+ reset
T- reset
P- reset
Load Sens.f.def
Load Conv.f.def
Save Sens.f.def
Save Conv.f.def
Calibration
11-Functions
12-Diagnostic
13-System
```

View function "11.8   Save converter factory default values" page27.

B.I.V. (BUILT-IN VERIFICATOR)

BIV, abbreviation for Built In Verificator, is available as option for MV110 converters and must be enabled by the manufacturer. It is also necessary that the SD card is activated to store saved data. The analysis of collected data performed by a dedicated IsoBIV software running on another device (PC). The simplicity of test procedures minimize the risk of handling errors; maximum safety and reliability thanks to the traceable factory calibration and internal references complement the safety by design principle with minimal failure rates

IsoBIV allows to create and print a report as validation of device functionality/measure error.

Operation and Conditions of Use.

The system is based on periodic measurements performed every hour or using a manual command (MCP command = SVERC). The sensor parameters are measured and compared with previously measured and stored reference values. Each time the system performs a series of measurements on the sensor and records them in a file called "STESTLOG.CSV", which resides in the main directory of the SD memory of the converter.

The sensor test can also be carried out without the active BIV system, but in this case only the presence of isolation losses and the overall good functioning of the sensor such the coil resistance, the excitation current and the rising times of the current within the generic limits that guarantee operation.
Instead if BIV is active, the measurements are deeper and the measured values are tested by comparing them with a set of characteristic sensor parameters measured at the time of installation.

Saving Reference Values (Characteristic Parameters)

After sensor installation, the parameters that will be used as reference for the BIV system and the IsoBIV data analysis software must to be measured.
The characteristic values of the coil circuits are saved in the converter memory at the factory before to ship the instrument. For the reference measure of the electrodes circuits, there is a specific function that perform the measures of voltage and resistance at the installation site. This function is managed ONLY by the IsoBIV program, which through a simple wizard will set the converter to perform the measures in the specific measurement point where the meter is installed.

To activate BIV, these functions must be verified:

❑ **[ASVFE=1]** : It enable the sensor's automatic test every hour. The ASVFE function in Menu 1 with access level 3 can be also activated using the instrument's display.

This feature can be enabled even if the SD card is not installed and if the BIV function is not active; in such a case the sensor file is NOT created and any alarms will be generated either if the data deviation from the reference data is outside the sesnor's limits.
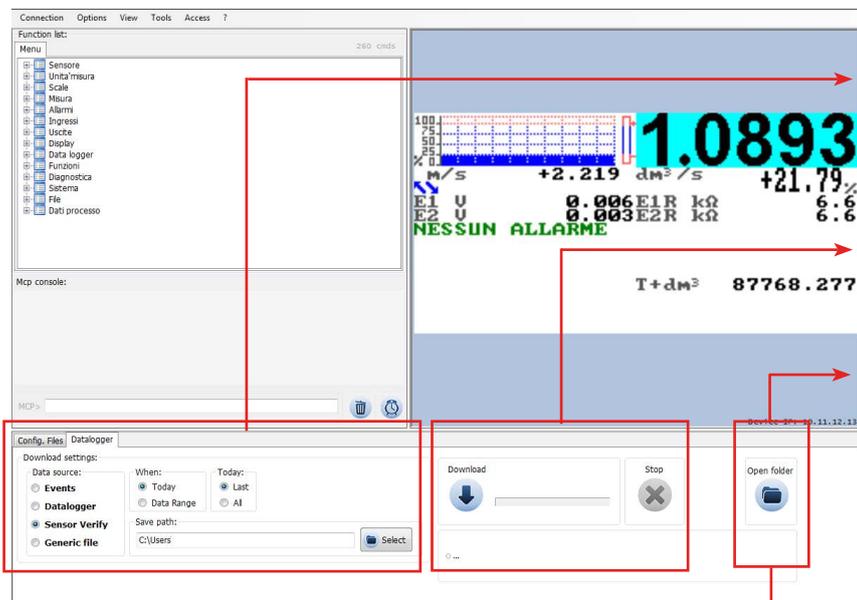Practically, in the absence of the necessary hardware permissions, this function is useful to test the insulation of the coils.

Opening and reading manually the files STESTLOG.CSV

The list below describes the steps for saving and reading STESTLOG.CSV file.

❑ OPEN INTERFACE STARTING THE PROGRAM MCP

❑ FOLLOW THE STEPS HERE BELOW

1
- Select Sensor Verify
- Choose the date or the period of which you want to make the data evaluation
- Choose the directory to save the file

2 Press Download to download the file. When the download will automatically open the file stestlog.csv program

3 Press open folder to see the saved files.

STRUCTURE OF THE TREE FOR RESEARCH FILE STESTLOG.CSV. IN SD CARD CONVERTER

FTP Address → Sensor Serial Number → Reference Year → Reference Month → Reference Day

110_EN_IT_IS_R3_1.00.0
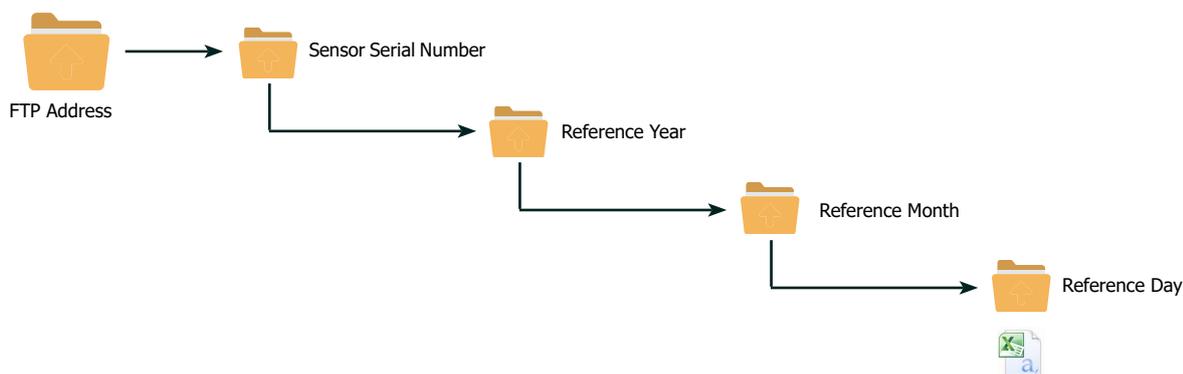
❑   READING AND MEANING OF FILE STESTLOG.CSV

Column	Meaning
A	Registration Number
B	Data
C	Hour
D	Error code in hexadecimal format (0 = no error)
E	The temperature unit (degrees F or C) (#) (*)
F	CPU temperature
G	The unit of voltage CPU (V) (#)
H	Voltage measured on the electrode E1
I	The unit of voltage E1 (V) (#)
J	Reference voltage electrode E2
K	The unit of voltage E2 (V) (#)
L	Differential voltage E1-E2
M	The unit of voltage (V) (#)
N	Common mode voltage (E1 + E2) / 2
O	The unit of resistance (ohm) (#)
P	Resistance measured between E1 and the common
Q	The unit of resistance (ohm) (#)
R	Resistance measured between E2 and the common
S	The unit of voltage (V) (#)
T	Common mode noise at low frequency
U	The unit of voltage (V) (#)
V	Differential mode noise at low frequency
W	The unit of voltage (mV) (#)
X	Mode ADC noise at low frequency differential
Y	The unit of voltage (mV) (#)
Z	Mode ADC noise high frequency differential
AA	The unit of voltage (V) (#)
AB	Analog circuitry positive supply voltage
AC	The unit of voltage (V) (#)
AD	Negative supply voltage analog circuits
AE	The unit of current (mA) (#)
AF	Excitation current of the coils
AG	The unit of resistance (ohm) (#)
AH	Measurement of the sensor coil resistance
AI	The temperature unit (degrees F or C) (#) (*)
AJ	Temperature of the sensor coils
AK	The unit of current (mA) (#)
AL	The coil leakage current (insulation fault)
AM	Unit of measure of time (ms) (#)
AN	Rise time current phase A
AO	Unit of measure of time (ms) (#)
AP	Rise time current phase B

NOTE:
(#): The units are registered only if the appropriate function of the DATA LOGGER is active. Otherwise the field is empty.
(*): The temperature values can be expressed in degrees F or C, depending on the drive configuration

Standard and internal check to the instrument limits

The measured data are compared with the reference values previously stored. The variation of different variable measured,shall be within the following range:

- ❏ Coil temperature (using resistance reading): within limits compatible with the lining material
- ❏ Current up times: change% detected resistance coils + 10% (tolerance range)
- ❏ Resistance between electrodes and common: between 0.3 and 3.0 times the reference early strength
- ❏ Leakage current (insulation test): less than 0.1 mA

If the values deviate beyond these limits it is generated and displayed a coded alarm.
The alarm remains active and visible on the display until next test (max. 1 hour).

SOFTWARE ISOBIV

The IsoBiv software allows analysis and processing of STESTLOG.CSV file data.
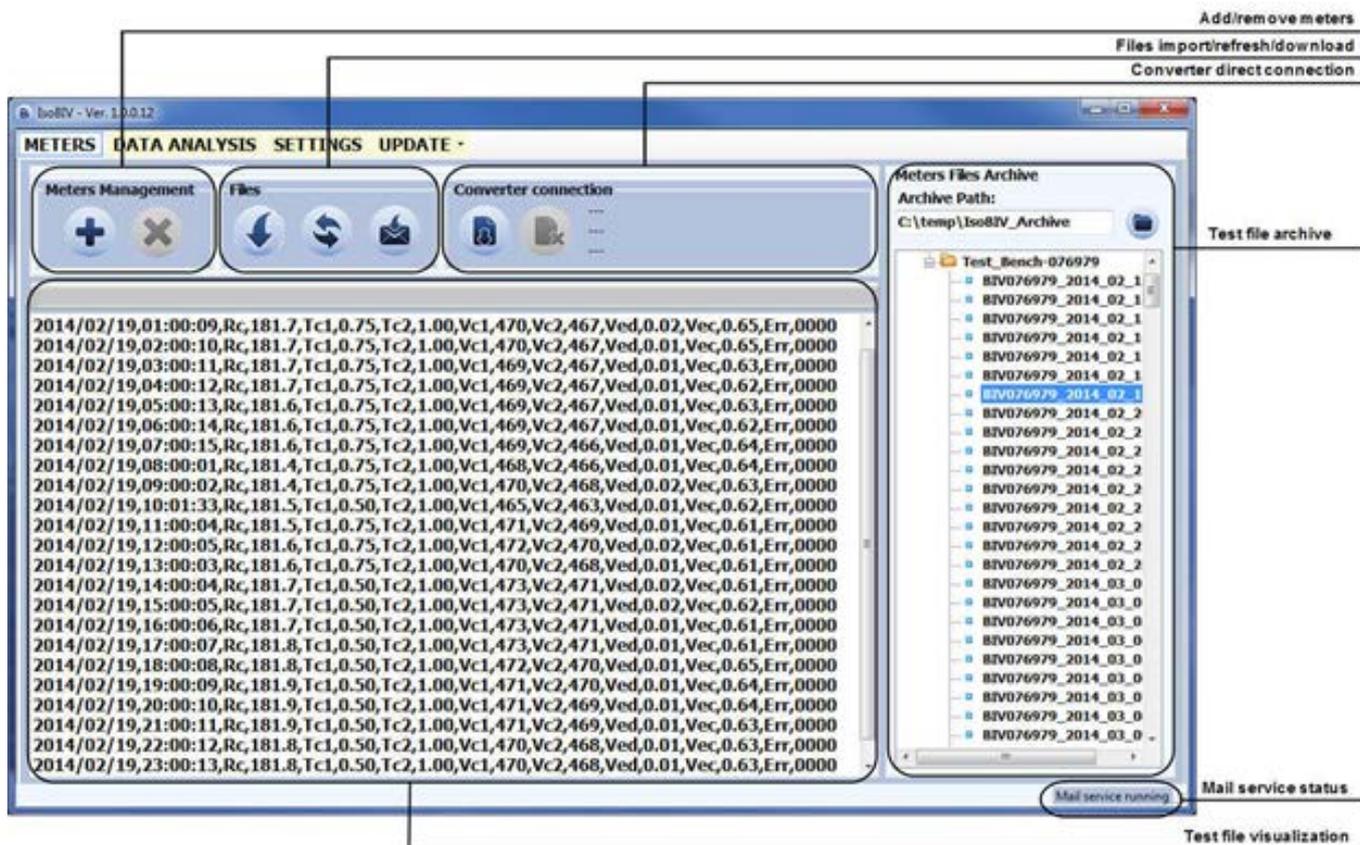
For further information, refer to the manual of ISOBIV software.

110_EN_IT_IS_R3_1.00.0

110_EN_IT_IS_R3_1.00.0

ALARM MESSAGES (CAUSES AND ACTIONS TO BE TAKEN)

MESSAGGIO	CAUSE	ACTION TO TAKE
NO ALARMS	All works regularly	---
[000] SYSTEM RESTART	---	---
[001] INTERNAL PS FAIL	Internal supply voltage error	Contact the service
[002] CLOCK NOT SET	System Clock not set	Set the system clock from the converter menu 13 (see also MCP function).
[003] SD CARD FAILURE	SD card not found or unreadable	check and/or replace SD card
[005] F-RAM ERROR	Error writing / reading Flash-RAM	Contact the service
[006] EXCITATION ERROR	The excitation of the sensor coils resulting from cable is interrupted	Check the connecting cables to the sensor.
[007] SIGNAL ERROR	The measure is strongly effected by external noise or the cable connecting the converter to the sensor is broken.	Check the status of the cables connecting the sensor, the grounding connections of the devices and the possible presence of noise sources.
[008] PIPE EMPTY	The measuring pipe is empty or the detection system has not been properly calibrated.	Check whether the pipe is empty or repeat the empty pipe calibration procedure.
[009] FLOW>MAX+	The flow rate is higher than the maximum positive threshold set.	Check the maximum positive flow rate threshold set and the process conditions.
[010] FLOW>MAX-	The flow rate is higher than the maximum negative threshold set.	Check the maximum negative flow rate threshold set and the process conditions.
[011] FLOW<MIN+	The flow rate is lower than the minimum positive threshold set.	Check the minimum positive flow rate threshold set and the process conditions.
[012] FLOW<MIN-	The flow rate is lower than the minimum negative threshold set.	Check the minimum negative flow rate threshold set and the process conditions.
[013] FLOW>FULL SCALE+	The flow rate is higher than the full scale positive value set on the instrument.	Check the full scale positive value set on the instrument and the process conditions.
[014] FLOW>FULL SCALE-	The flow rate is higher than the full scale negative value set on the instrument.	Check the full scale negative value set on the instrument and the process conditions.
[015] PULSE1>RANGE	The pulse generation output 1 of the device is saturated and cannot generate the sufficient number of impulses.	Set a bigger unit of volume or, if the connected counting device allows it, reduce the pulse duration value.
[016] PULSE2>RANGE	The pulse generation output 2 of the device is saturated and cannot generate the sufficient number of impulses.	Set a bigger unit of volume or, if the connected counting device allows it, reduce the pulse duration value.
[017] CALIBR.ERROR	Calibration Error	Contact the service
[018] SYSTEM FREQ.ERR	System Freq. Error	Contact the service
[019] B.DATA NOT INIT	Uninitialized data system	Contact the service
[020] FL.SENSOR ERROR	Flow rate sensor error	Contact the service
[021] BATTERY LOW	(Rechargeable) battery depleted	Contact the service to Replace the battery
[022] BATTERY V>MAX	Battery voltage (rechargeable)> max. Allowed	Contact the service to Replace the battery
[023] BATTERY I>MAX	Battery charge current> max. allowed	Contact the service to Replace the battery
[024] MAIN PS V.ERR	Main supply voltage (+ 5V) out of tolerance.	Contact the service
[025] USB VOLTAGE ERR	Voltage of USB connection out of tolerance.	Contact the service
[026] SDC ALMOST FULL	SD card space <500 MB.	For more information see function "12.9 Sd card status informations" page28.
[027] SDC FULL	SD card out of memory	Memory Full. You can not save logger. Contact the service to replace the SD memory.
[028] BATT.TEMP.CRIT	The battery can not be charged. The temperature is out of range (detected temperature <0 C° or temperature >50°)	Wait for the normal temperature reset. View Environmental Use Conditions "Environmental Use Conditions" page5.

ERROR CODE TEST SYSTEM OF SENSOR

The codes are in hexadecimal format, the meaning is given for each bit. There are several possible error simultaneous combinations (more bits active) then that will give the combined numerical codes.

CODE	ANOMALIES DESCRIPTION	ACTION TO TAKE
0000	NO ERROR	---
0001	SENSOR TEST INSULATION: Generator power too low	Contact the service
0002	SENSOR TEST INSULATION: Generator power too high	
0004	SENSOR TEST INSULATION: Phase 1 generator voltage too low	
0008	SENSOR TEST INSULATION: Phase 1 generator voltage too high	
0010	SENSOR TEST INSULATION: Phase 1 terminal voltage coils 1 too low	
0020	SENSOR TEST INSULATION: Phase 1 terminal voltage coils 2 too low	
0040	SENSOR TEST INSULATION: Phase 2 generator voltage too low	
0080	SENSOR TEST INSULATION: Phase 2 generator voltage too high	
0100	SENSOR TEST INSULATION: Phase 2 terminal voltage coils 1 too low	
0200	SENSOR TEST INSULATION: Phase 2 terminal voltage coils 2 too low	
0400	SENSOR TEST INSULATION: Insulation loss, leakage current out of tolerance	Check: ❑ wiring between sensor converter ❑ conditions of use ❑ set parameters If the problem persists contact the service
0800	TEST TEMPERATURE (RESISTANCE) COILS: Temperature (resistance) out of tolerance	
1000	TEST TIME GETTING ON CURRENT PHASE (A): Value out of tolerance	
2000	TEST TIME GETTING ON CURRENT PHASE (B): Value out of tolerance	
4000	TEST RESISTANCE INPUTS ELECTRODES: Input value 1 out of tolerance	
8000	TEST RESISTANCE INPUTS ELECTRODES: Input value 1 out of tolerance	

At the end of its lifetime, this product shall be disposed of in full compliance with the environmental regulations of the state in which it is located.

110_EN_IT_IS_R3_1.00.0

MANUAL REVIEWS

REVIEW	DATE	DESCRIPTION
MV110_EN_IT_R0_1.00.0	15/09/2016	First edition
MV110_EN_IT_R1_1.00.0	6/02/2017	Insert meter BIV interface
MV110_EN_IT_R2_1.00.0	09/10/2017	Inserted logos HART certification

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http://www.isoil.com/u_vendita.asp

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