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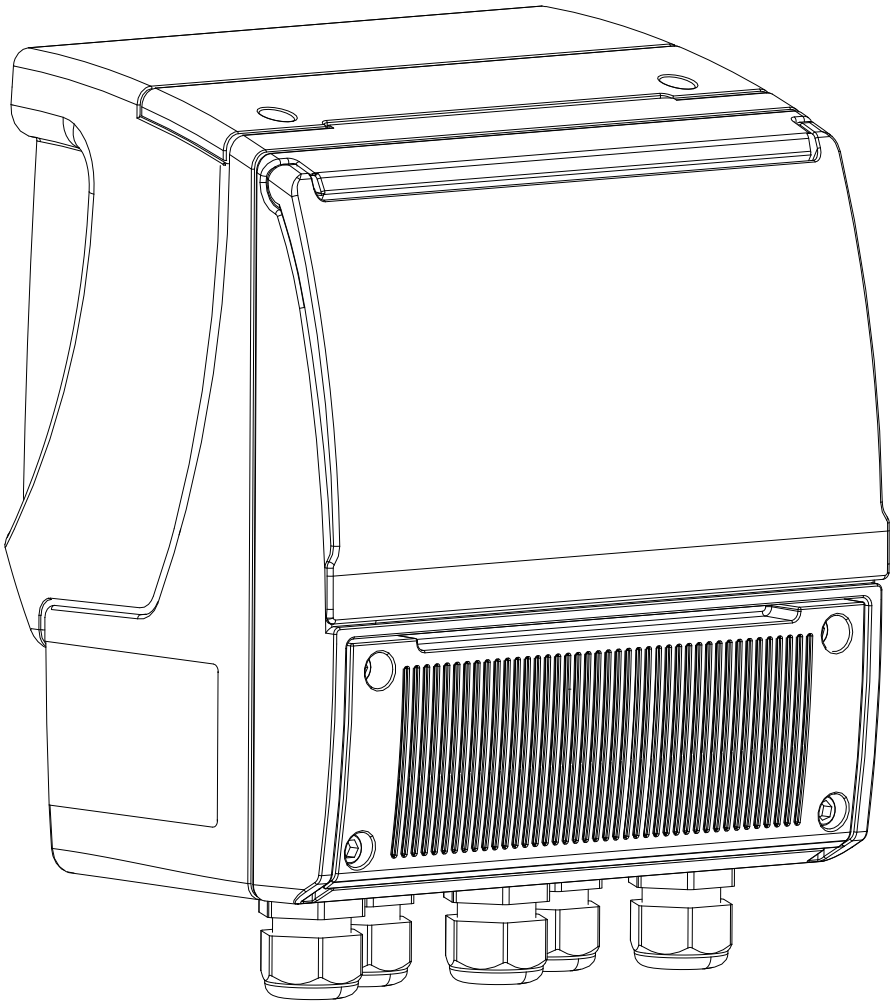

FM700 Transmitter

Operations and Maintenance Manual

Version 2026/02
www.stssensors.com

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Contents

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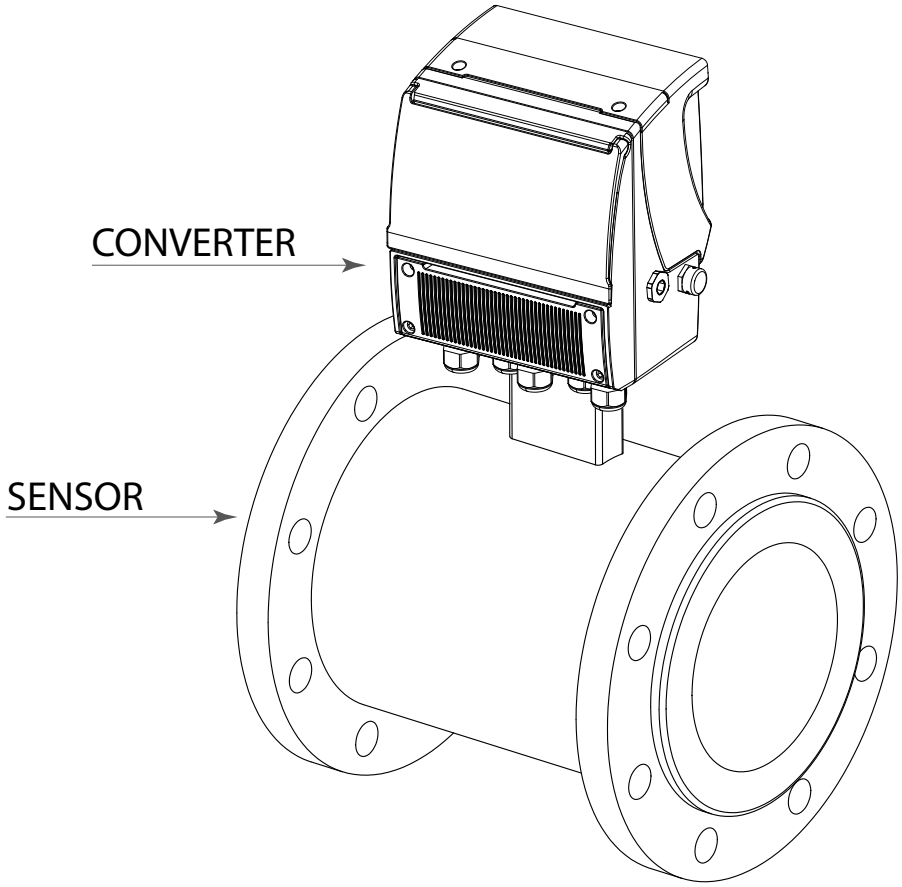
Contents

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).



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

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 transmitter housing integrity
- The suitable tightness of the sealing elements
- The front panel integrity (display and keyboard)
- The mechanical fixing of the transmitter to the pipe or wall stand

Safety Convention

Danger Electric Shock

Warning

Precautions

Attention

First Power-Up of the Instrument Following Commissioning

Follow the procedure below:

- Connect the USB port of the instrument to a PC or other equivalent device capable of delivering at least 500 mA from the USB interface;
- Make sure that both status LEDs on the instrument are flashing;
- Use the MCP interface to send a hardware reset command; and
- Wait for operation to resume and for all current operations on the modem to complete
- Send the "ATSIC" command and verify that the instrument has restarted correctly

Follow this procedure also whenever battery power is completely disconnected.

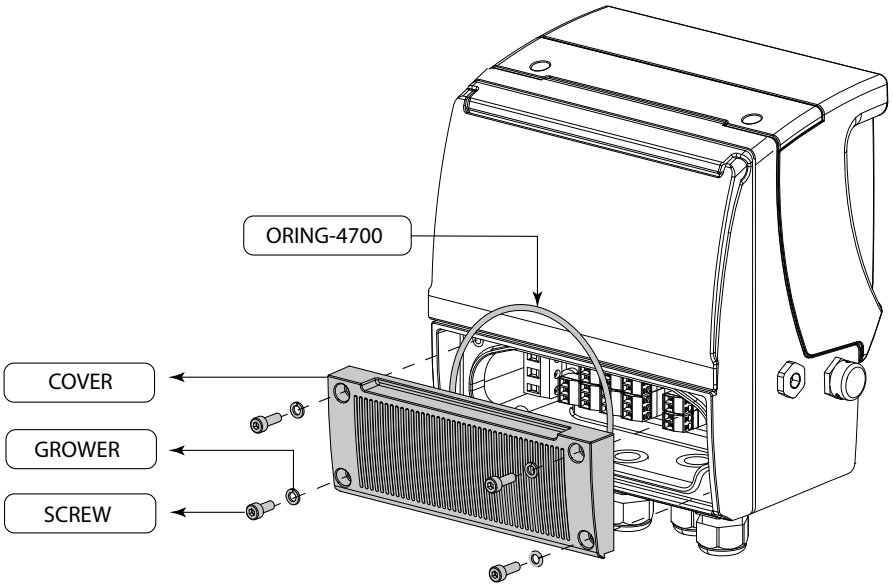
Switching Off the Instrument

Follow the procedure below:

- Connect a PC or other equivalent device to the USB port and start the MCP interface.
- Disconnect any external power supply.
- Send the command "SSTBY" and wait for all the current operations on the modem to complete (it may take up to 2 minutes). A message appears on the MCP interface display indicating that the USB cable can be disconnected. If the cable is not disconnected, the instrument will NOT enter standby mode and both status LEDs will then remain lighted. If there are modem operations in progress, the status LED of the communication CPU will be flashing and will turn steady red only when all operations are completed.
- Once the USB cable is disconnected, make sure BOTH LEDs turn off and remain off.
- Disconnect the batteries from the device

Conditions Delivery of the Converter

WARNING! The converter is supplied with the batteries disconnected so it is necessary to remove the terminal block cover, as shown below, and connect them according to the indications given in the section POS. converter power supply pag. 20



Programming is allowed in two ways:

- Connecting a power bank ≥0.5 Ah to the USB jack. (Programming from converter keyboard)

Connecting a computer to the USB socket using the MCP program see section POS. Access Via Mcp interface (Virtual Display) pag. 44

Technical Characteristics

Electrical Characteristic

Converter classification: class I, IP67/68 for aluminum, 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	1,5 W (Sensor only)	12 W (all Loads)
LLV	24-36V ⎓	//		
Lithium Battery Primary	7,2 V	//	40 mW	200 mW
Alkaline Battery 6 Size D x 15v	9 V	//	40 mW	200 mW

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

Environmental Use Conditions

- The instrument is suitable for indoor and outdoor weather conditions
- Altitude: from –200m to 4000m
- Humidity range: 0-100%

Ambient Temperature		
	Aluminium	
	Min*	Max
°C	-20	+ 60
°F	-4	+140

If the converter is supplied in compact version, consider the most restrictive ambient temperatures between converter and sensor, otherwise refer to the respective manuals.* For discontinuous use install a heating resistor.

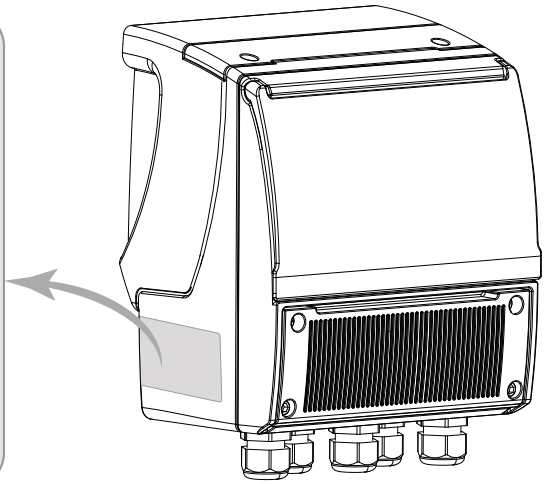
Measurements Tolerance

- Flow rate (volume) = ±0,1% o.r
- Out 4/20 mA = ± 0,2 % o.r
- Frequency Out = ± 0,2% o.r

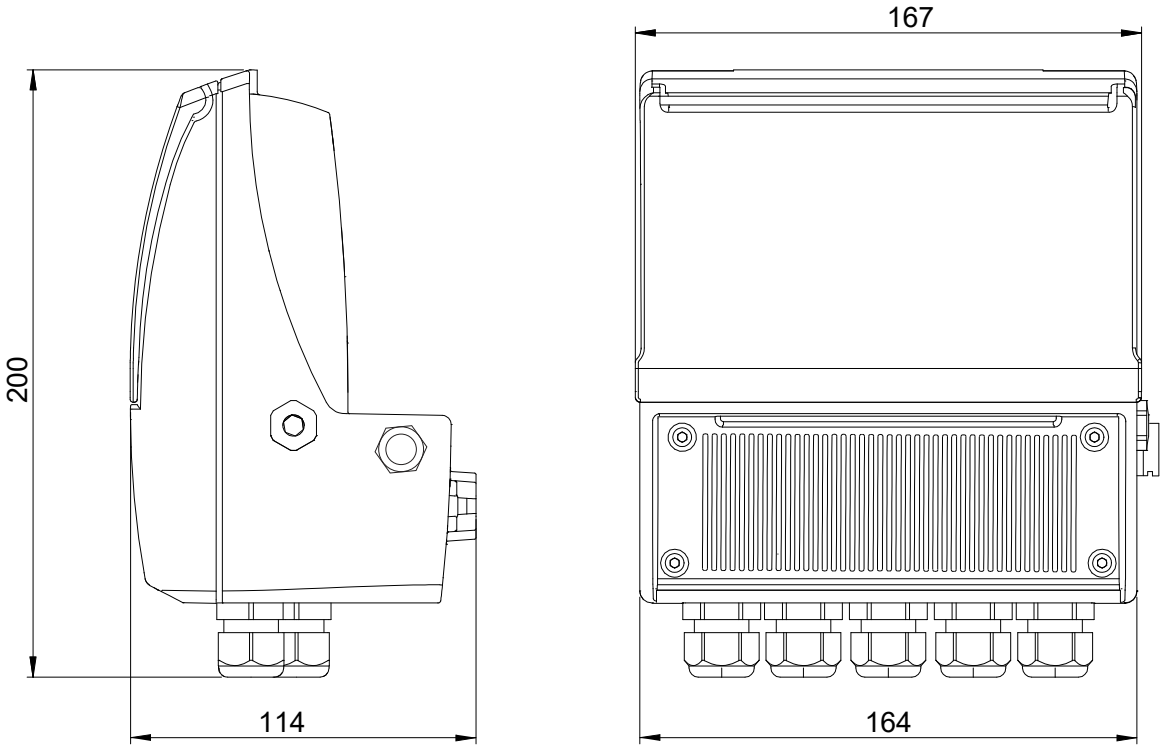
Data Plate

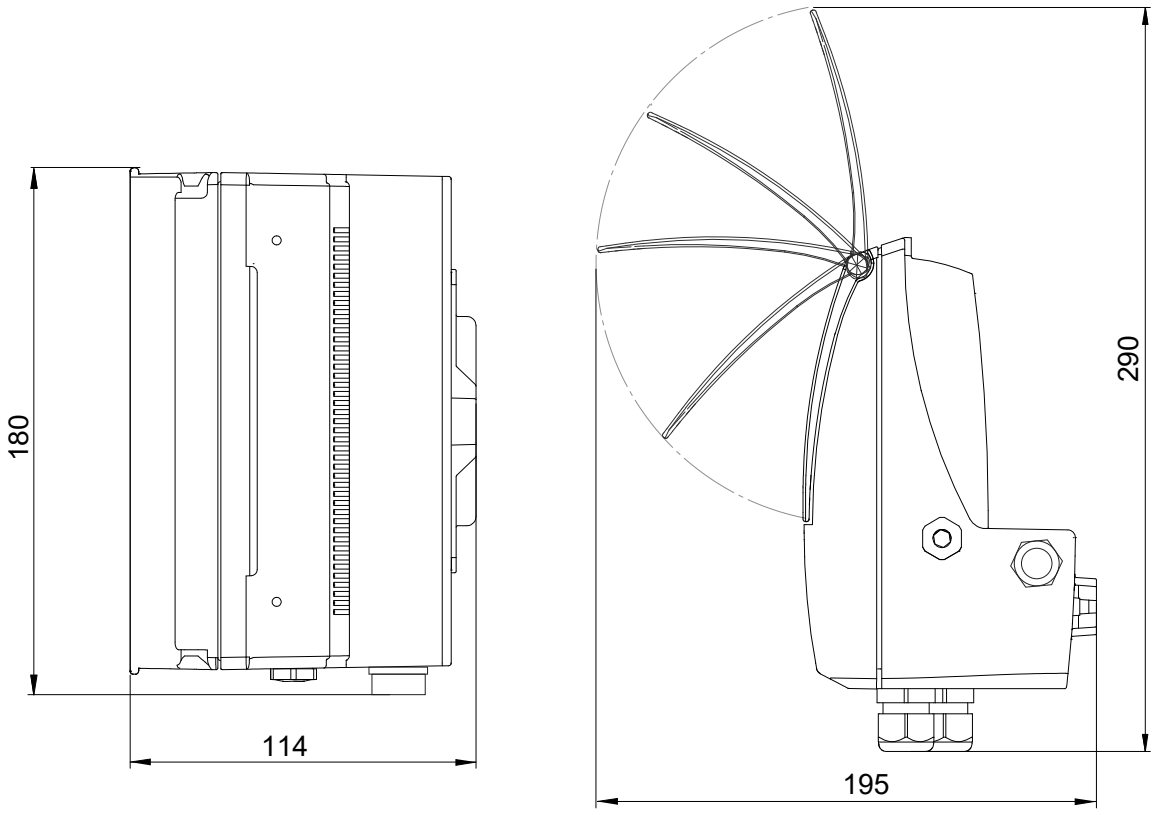
The instrument label contain the following information:

- ❑ 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

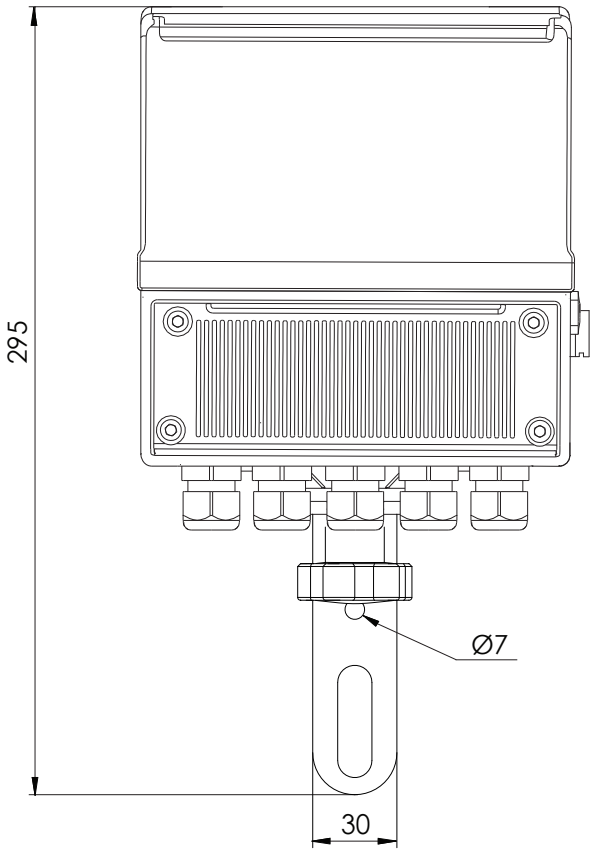


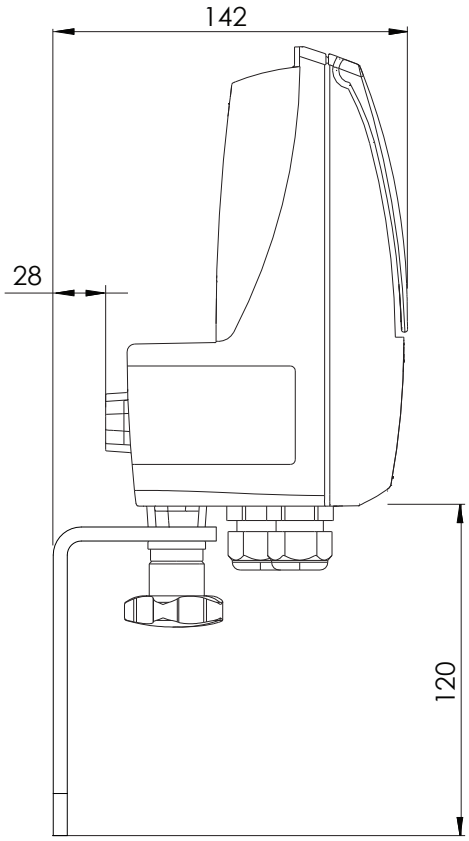
Overall Dimensions Without Battery Case



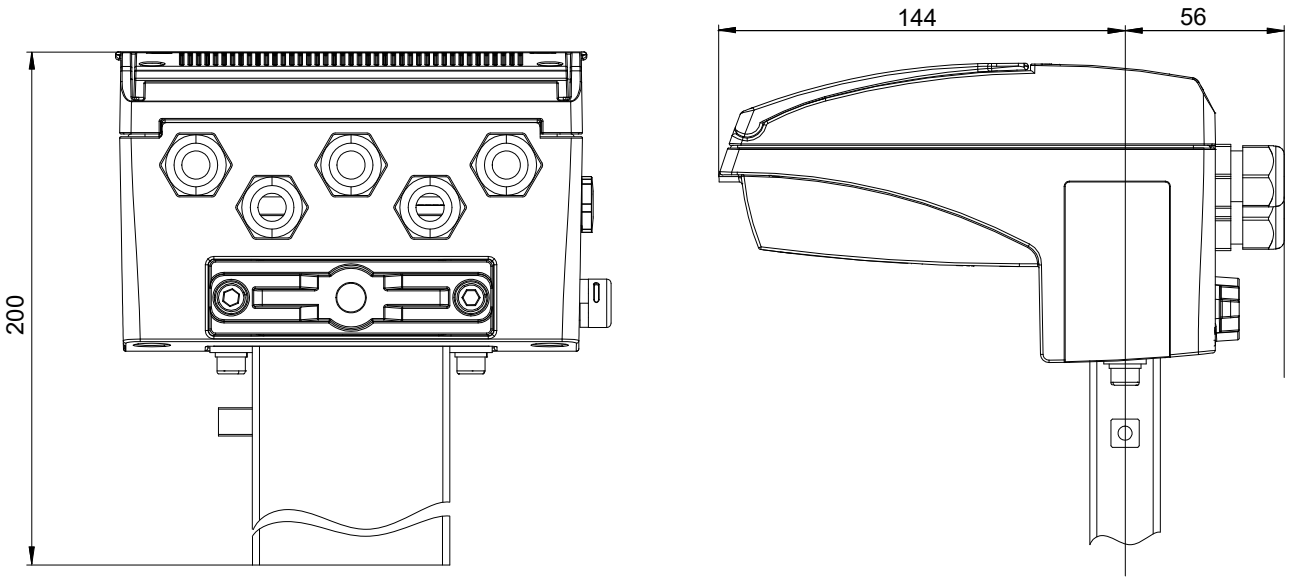


Separate Version

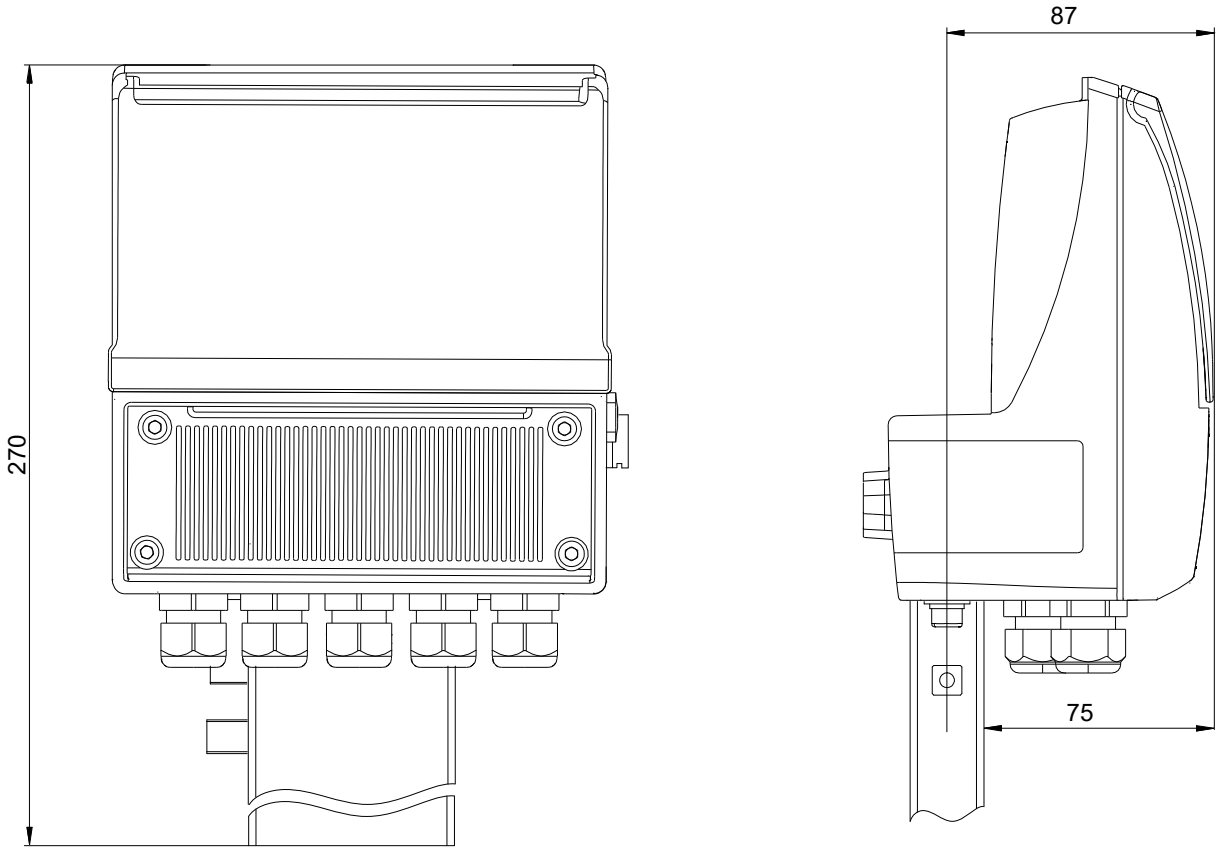




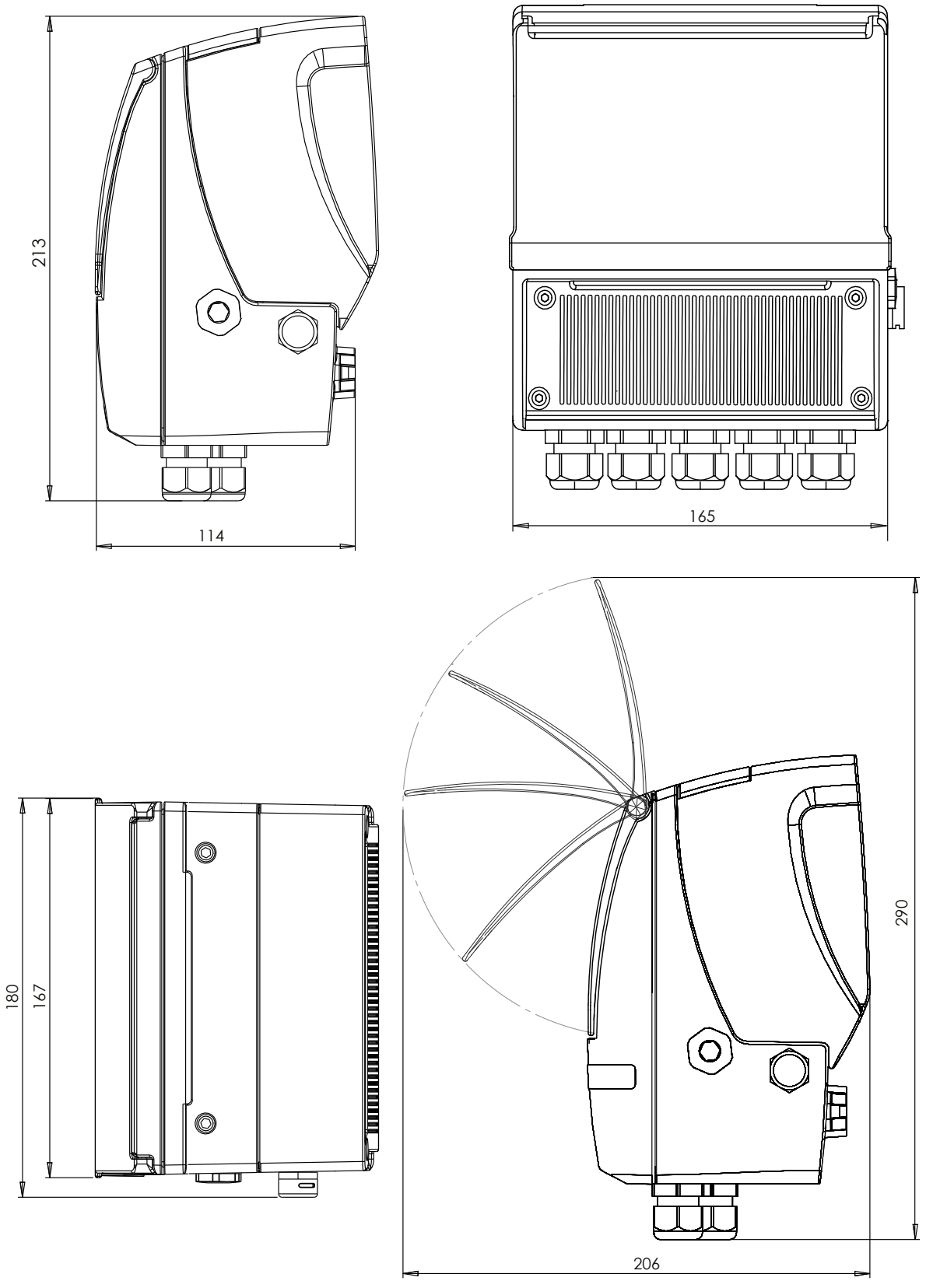
Horizontal Version



Vertical Version



Overall Dimensions With Battery Case



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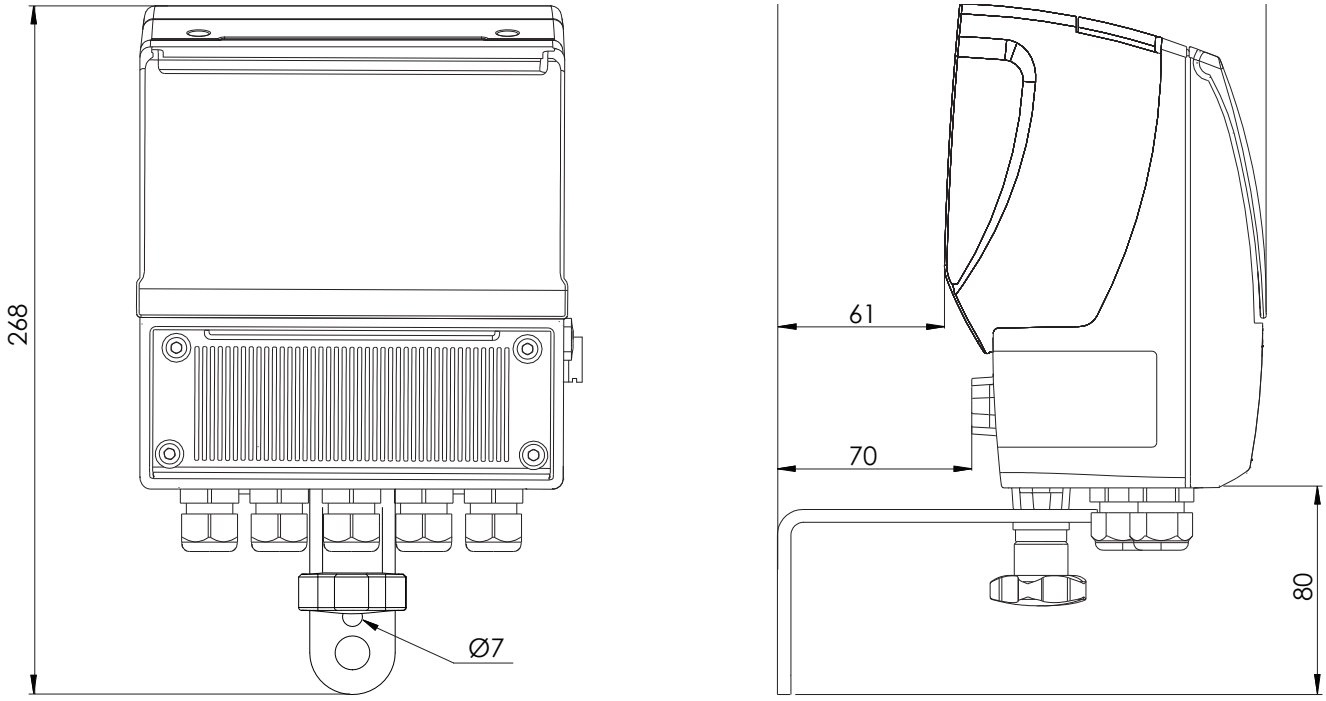
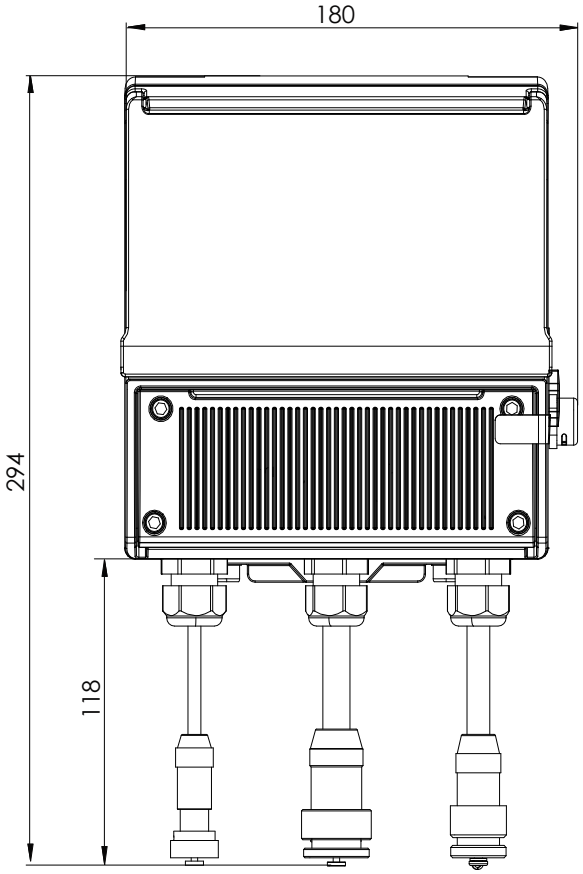
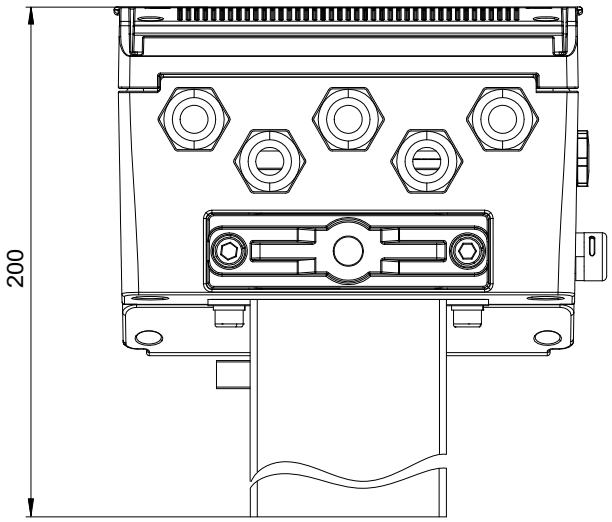


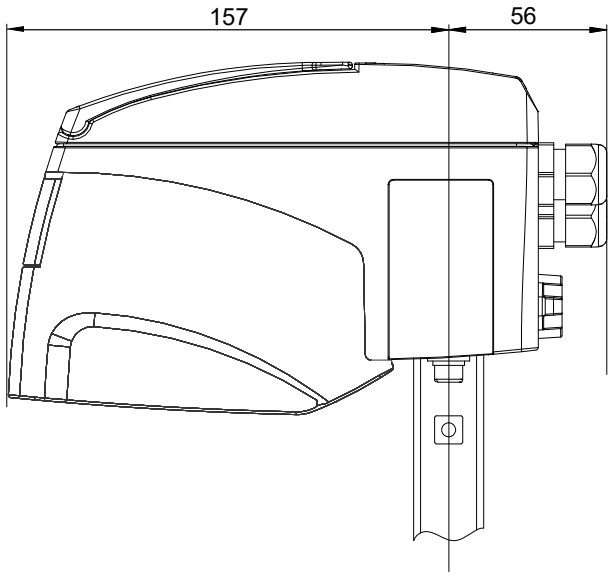
MIL connector version

For details of connections with MIL connectors, refer to the manual: FM700_MIL CONNECTOR POSITION.

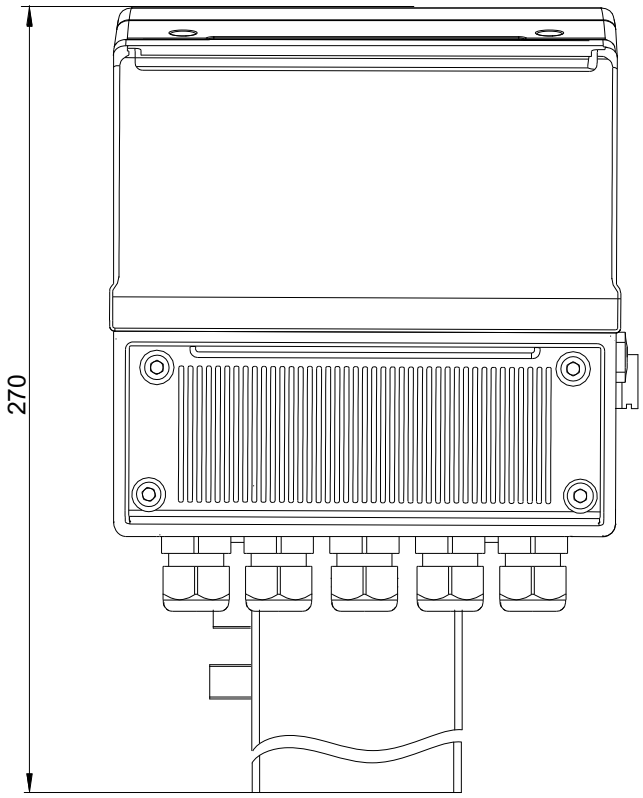


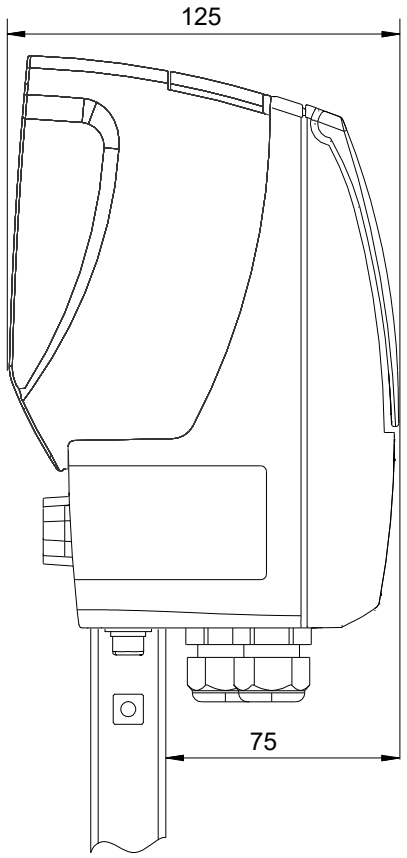
Horizontal Version





Vertical Version



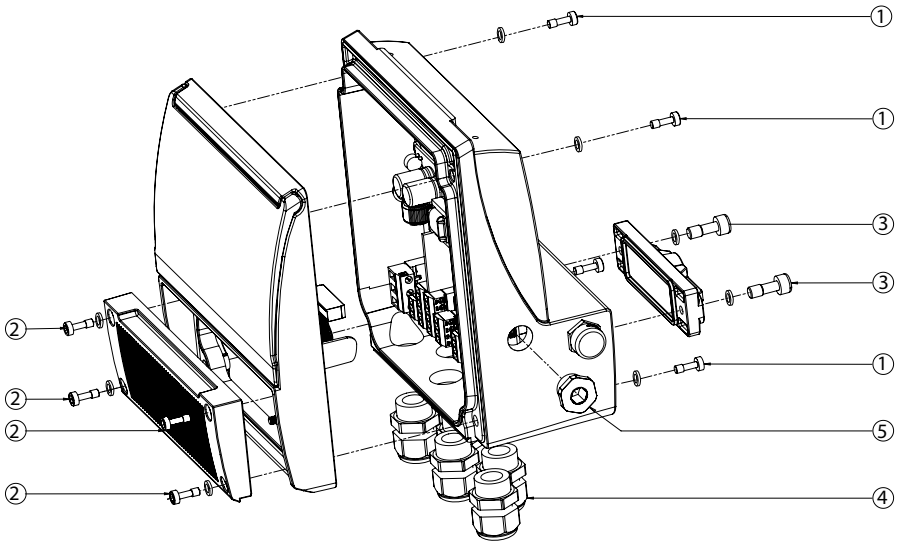


Torques

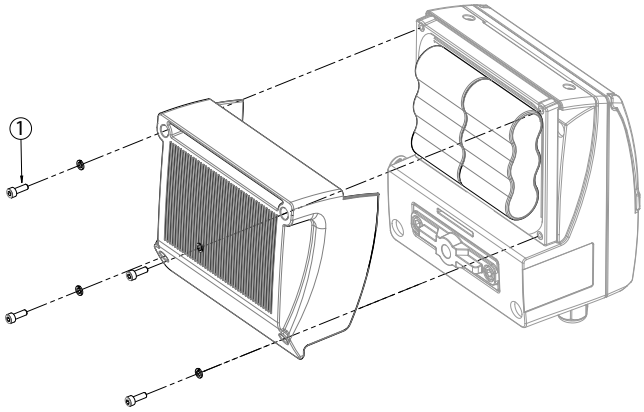
To guarantee the housing's IP degree the following torques are required:

Housing Material	Housing Screws (1)	Cover Terminal Block Screw (2)	Fixing Display Frame	PCB Screws	Version Cap (3)	Cable Glands (4)	Cap USB-B (5)
Aluminum Housing	6 Nm	5.5 Nm	3 Nm	0.8 Nm	8 Nm	4 Nm	4 Nm
Battery Housing	2 Nm	2 Nm	2.5 Nm	0.8 Nm	7 Nm	4 Nm	4 Nm

Housing Converter



Battery Case Cover

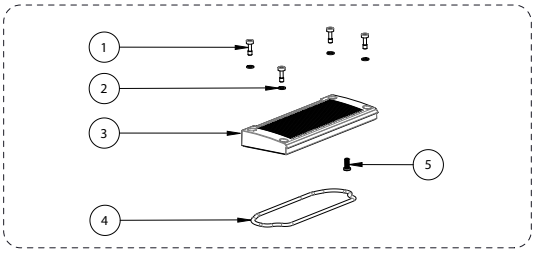


Case Weight Converter and Batteries

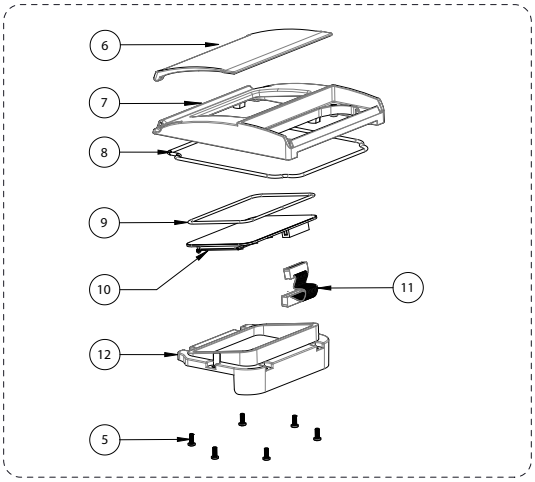
Housing Material	Weight Converter	Battery Weight Lithium	Battery Weight Alkaline
Aluminum	3 kg	Each Lithium Battery Weighs 0.1 kg; Expected Maximum: 6 Batteries	Each Alkaline Battery Weighs 0.15 kg Expected Maximum: 6 Batteries

FM700 Construction

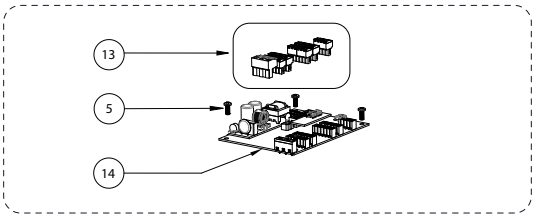
Terminal Block Cover



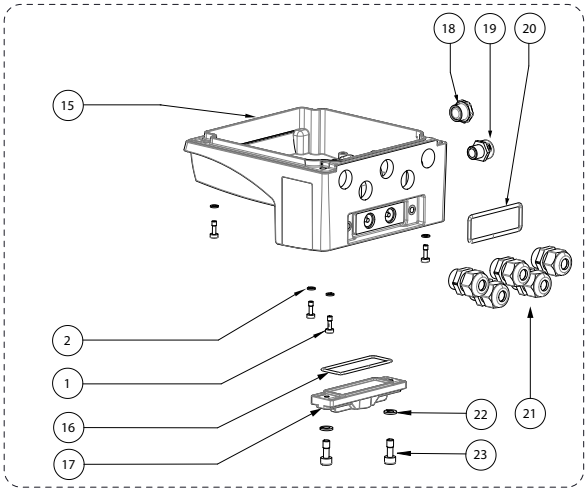
Main Housing Cover



PCB FM700



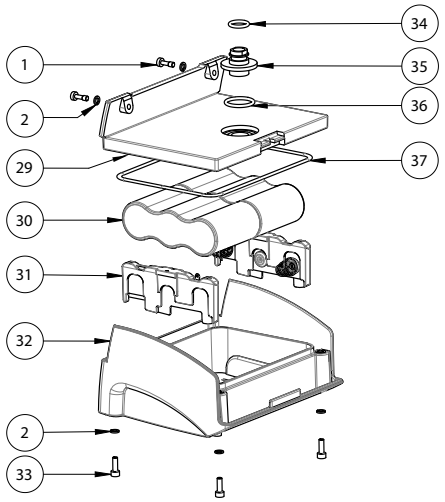
Main Housing



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	Self-Tapping Screw 4x10	Self-Tapping Screw 4x10
6	Protection Cover	
7	Housing Cover	Housing Cover
8	O-Ring-4700	
9	O-Ring-117x3	
10	Display	
11	Flat Cable	
12	Fixing Display Frame (Material PA06)	
11	Self-Tapping Screw 4x10	Trilobo Screw 4x10
12	Self-Tapping Screw 4x10	Trilobo Screw 4x10
13	Grower Ø4	Spring Washer Ø4
14	PCB FM700	
15	Pa6 Main Housing	Aluminium Main Housing
16	O-Ring-155	
17	Version Cap (Material Pa06)	
18	Pg9 Cap	
19	Pressure Compensation Plug	
20	O-Ring-155	
21	Pg11 Cable Gland Cable Diameter: Ø5-Ø10mm	
22	Grower Ø4	
23	Screw M6x16	

FM700 Construction

Battery Housing

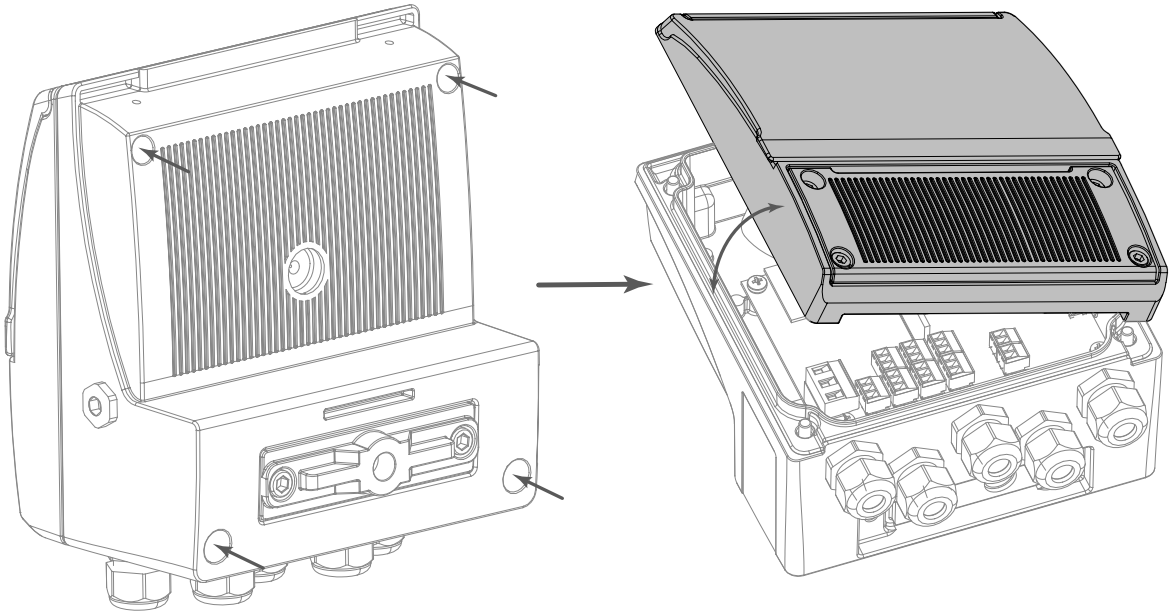


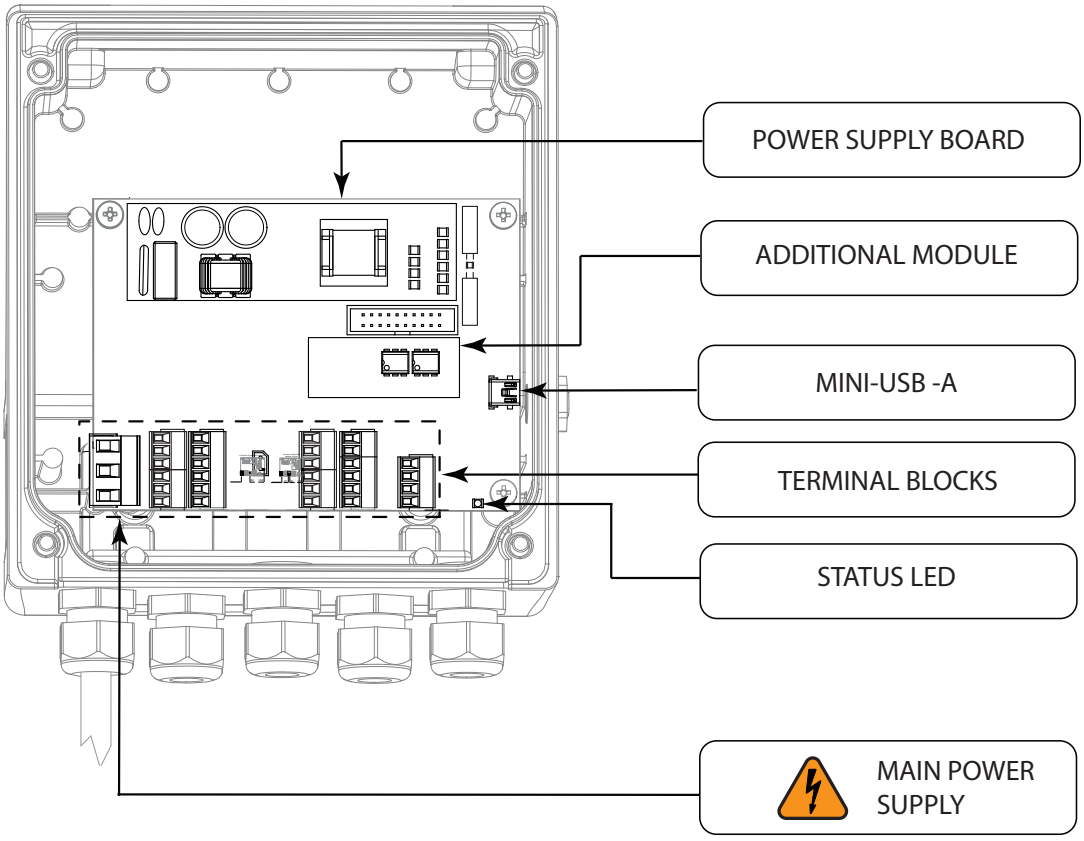
POS.	Description	
	PA6 Version	Aluminium Version
29	CAP Battery Housing PA6	
30	Lithium or Alkaline Battery	
31	Support Contacts Alkaline Battery MV	
32	Battery Housing PA6	
33	Screw M4x12	
34	O-Ring-3050	
35	Seal Bush	
36	O-Ring-3081	
37	O-Ring-4575	

Internal Layout

Internal Transmitter Views

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





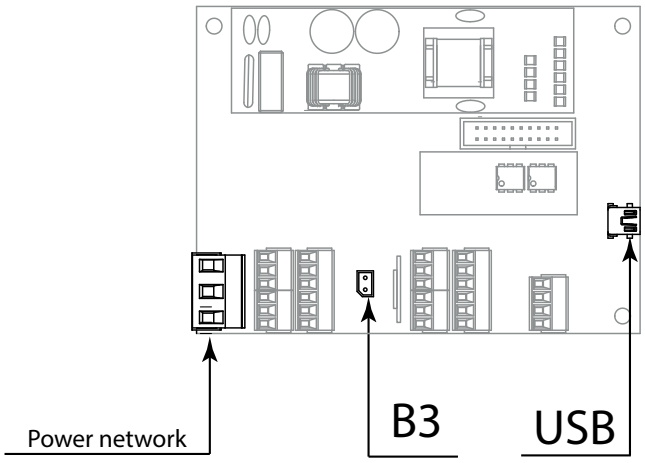
Converter Power Supply

FM700 can be powered in different modes

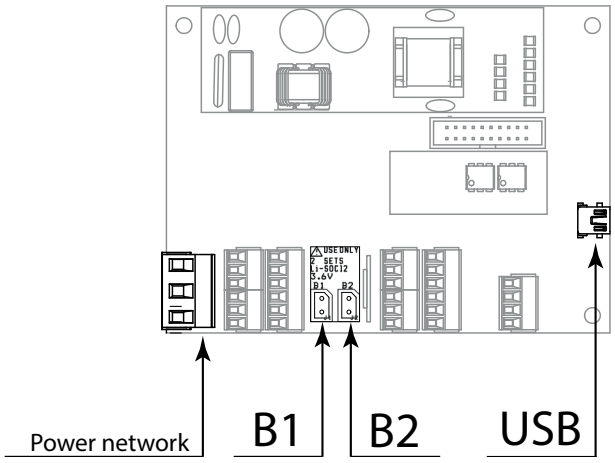
- Powered by lithium batteries in slots B1 / B2
- Power supply from alkaline batteries slot B3
- Power supply from the mains

Below are the positions of the terminal blocks for the different types of power supply.

PCB FM700 FOR BATTERIES ALKALINE



PCB FM700 FOR BATTERY PRIMARY LITHIUM



Notes about converter power supplies

- The converter can have different power combinations. However, all versions are able to operate at 100% of the possibilities even with only the power coming from the USB cable, transmission included. However, note that these devices are seen by the USB controller that supplies the energy as a 500 mA class device, so not all devices are able to power these electronics correctly (for example tablets and cell phones unless they are rare).
- With the USB connection there is no battery consumption.
- When NON-rechargeable batteries are provided and equipped with an external power supply module, they CANNOT be powered directly by solar panel because this type of power supply is not constant and in low light can result in very high battery consumption. Therefore, for proper operation of the instruments, it is necessary for the external power supply to be able to provide a constant power of at least 2 W. The minimum voltage under maximum load condition should NOT be less than 9V. The transition from a valid power supply state to one where the voltage/power can no longer support the consumption of the electronics is not sharp but being an analog value, it can remain in an ambiguous boundary condition. In addition, since the only input data for the electronics is the voltage, it happens that if the panel is dimly lit, the voltage AT VACUUM or in a condition of very low consumption of the electronics may also be sufficient, but as soon as the instrument goes into the active condition, the increased consumption causes the input voltage to drop immediately, causing the instrument to return to the low consumption mode. This causes the voltage to rise again, and the cycle repeats endlessly if the conditions remain. The continuous change of state causes a very high consumption of the batteries, which are called upon to make up for the lack of power from the panel, especially in the phase of shutting down and then returning to the low-power state. this reason it is necessary for the solar panel to feed a system with integrated voltage and power output regulation. Typically these systems include a battery and a regulator, so that the output voltage is stable and with well-defined cut-off in case of insufficient primary power.

Power Supply by Batteries

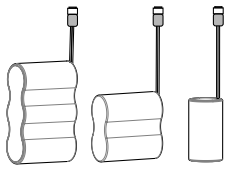
When the B1 and B2 batteries are connected for the first time or after a long period of inactivity of the instrument, the super-capacitors coupled to the batteries are completely discharged, therefore for a certain period of time the indications will be “B1 LOW” and “B2 LOW ”Until the nominal voltage of the batteries is reached. The time required depends on many factors (temperature, passivation status of the batteries, amount of battery charge remaining). The estimated time for this transition state is less than an hour.

Primary lithium batteries

For primary lithium batteries, connections to slots B1, B2 (see POS. converter power supply pag. 20) are prepared as follows:

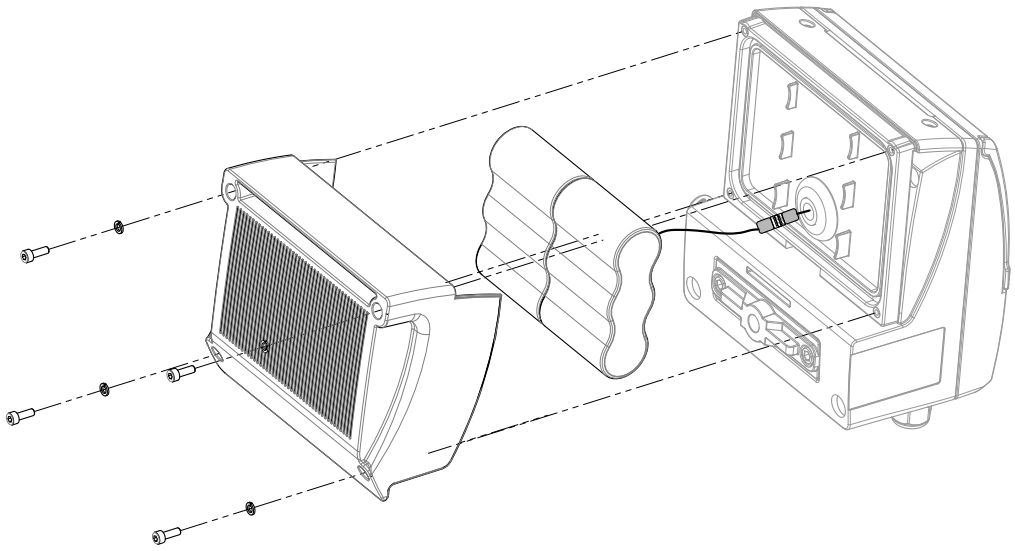
The assemblable battery packs are:

SLOT (B1 e B2) PRIMARY LITHIUM



The battery packs for slots, B1 and B2, can have different sizes (from one to three elements). When both batteries are installed on B1 and B2, the system alternately uses the battery with the highest voltage. As soon as a battery voltage falls below a predetermined value, the system switches to the other, both batteries are therefore used alternately. This guarantees a far greater autonomy, compared to the use of the single. When one or both batteries reach a minimum usage voltage, the low battery alarm is generated. It can be repeated for a long time, since the system passes continuously from one battery to another, allowing the weaker battery to partially regenerate the potential and return to normal operation. When a battery reaches the potential of “CUT-OFF”, it is disconnected and the system uses the remaining battery. At this point the remaining autonomy becomes critical.

The maximum number of battery elements housed in the battery holder is 6.



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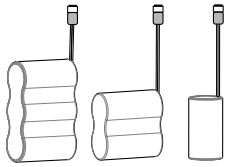

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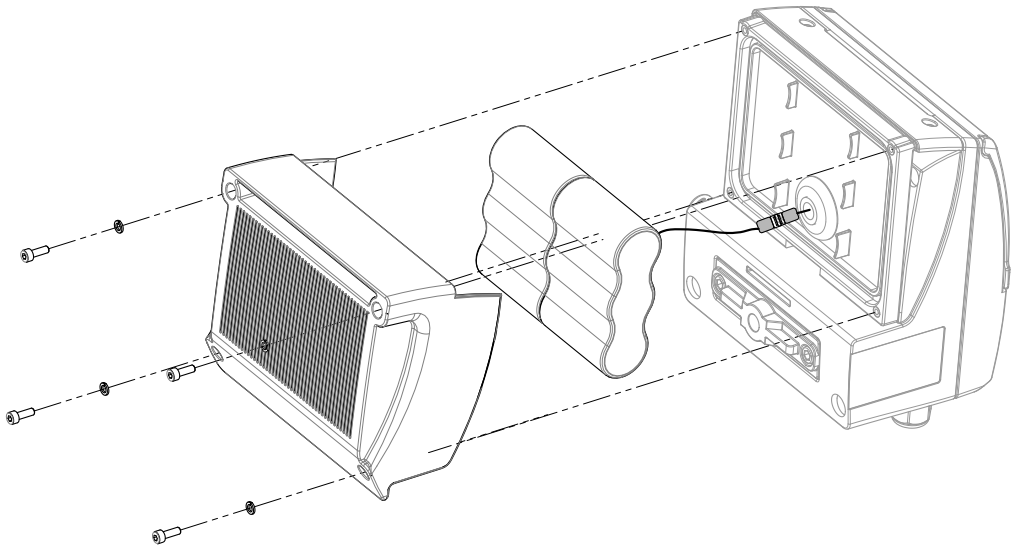
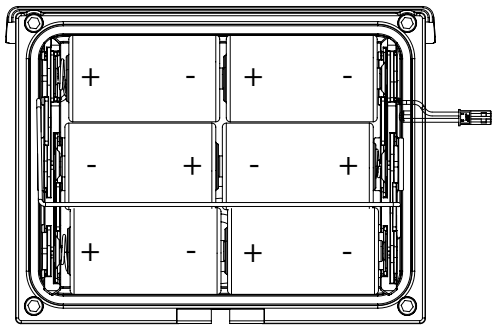
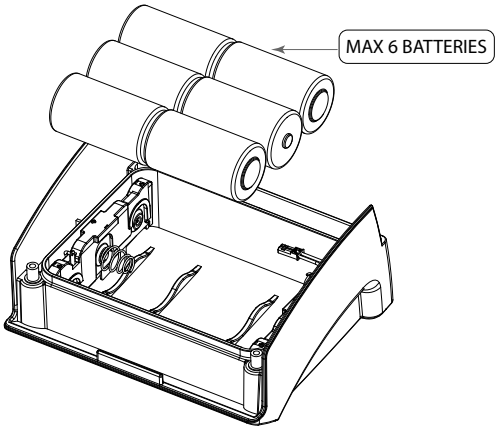
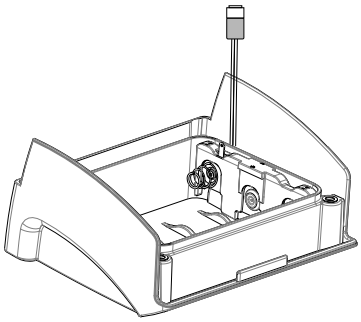


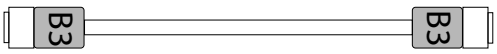
Alkaline Batteries

The alkaline batteries foreseen for the FM700 converter are 6 Size D elements. The alkaline battery pack is connected in the B3 slot of the converter (POS. converter power supply pag. 20)

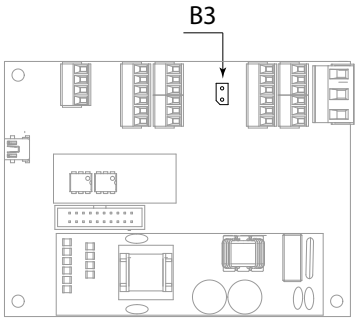








CABLES CONNECTION BATTERIES



PCB BOARD

Connections to B1 and B2 are not used and no other batteries must be connected to the instrument.

Operating notes:

- Always replace all batteries at the same time as indicated on the battery holder.
- Do not mix new and used batteries or batteries with different characteristics.
- To maintain valid time and date when replacing batteries, connect the unit with a USB power source capable of supplying at least 500 mA.

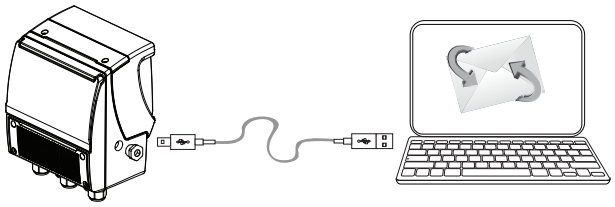
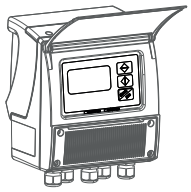
N.B: With fully discharged batteries, the instrument may operate abnormally because the internal voltages would not be stable, so operating the instrument in this state is to be avoided.

Estimated Consumption of Lithium Batteries

The consumption of lithium batteries depends mainly on:

- Sensor diameter.
- Data logger sampling interval.
- Number of connections to external loggers (4-20 mA or via MODBUS).
- Measurement profile (CONTINUOUS, ENERGY SAVING MODE).

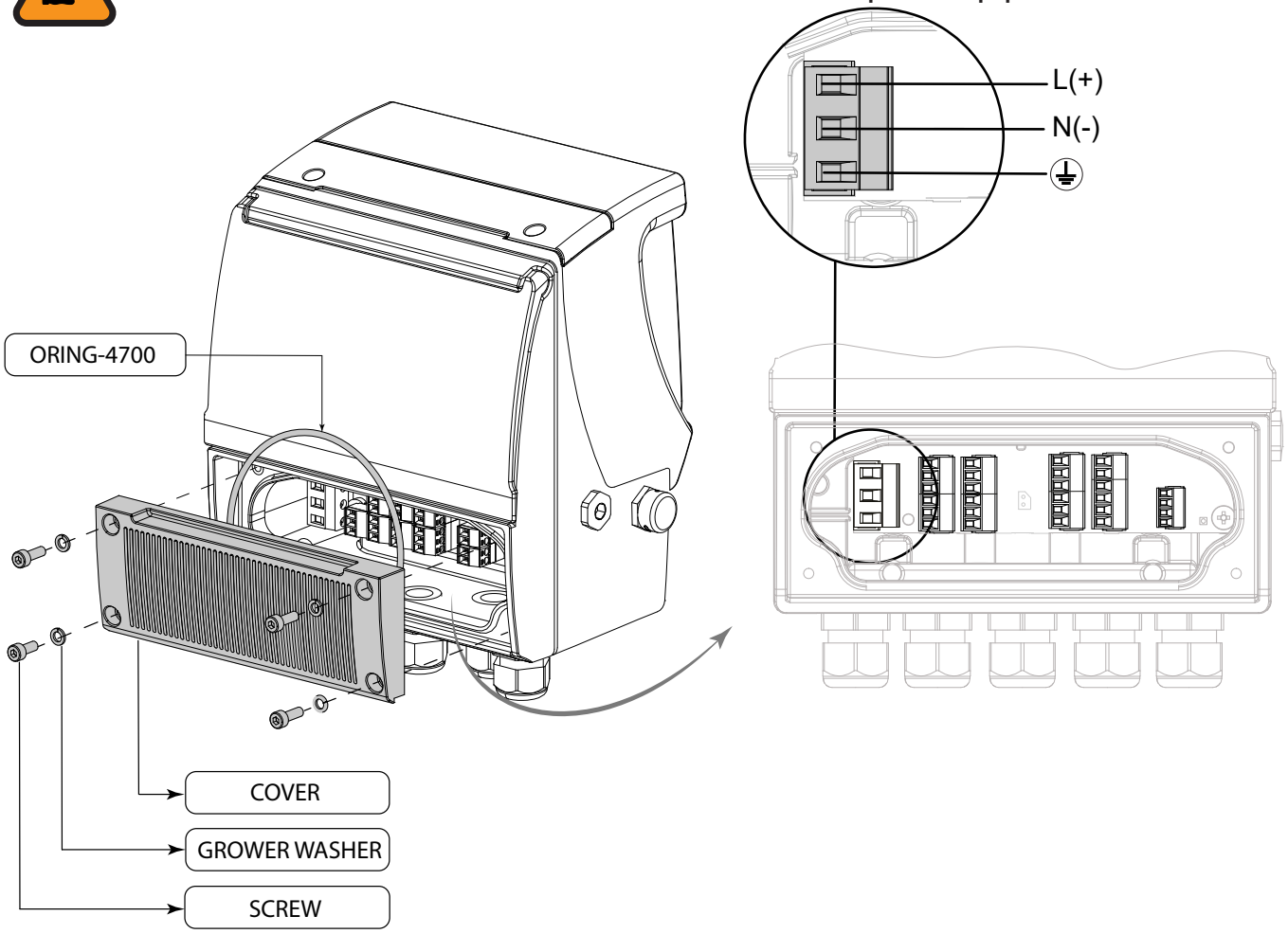
Note: for other configurations / type of batteries separate consumption cannot be estimated.

	LOW CONSUMPTION / MEDIUM CONSUMPTION / HIGH CONSUMPTION	
INTERFACE ACTIVITY AND STORAGE DATA		B1/B2 BATTERY
ACTIVITY OF THE DISPLAY		B1/B2 BATTERY
INTERVALS OF SAMPLING	ENERGY SAVING MODE	B1/B2 BATTERY
	POWER PROFILE OF THE CONTINUOUS POWER MEASUREMENT	B1/B2 BATTERY

For further details concerning the sampling interval and the management of the measurement power profiles see function POS. 4.1 pag. 50

Power Supply From Main Line

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



- 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 0.25 mm^2 to 1.50 mm^2, 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, hard wired 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 hard wire connection of the converter to external equipment, including the sensor.

Power Supply From Main Line

Operation note for mains power supply

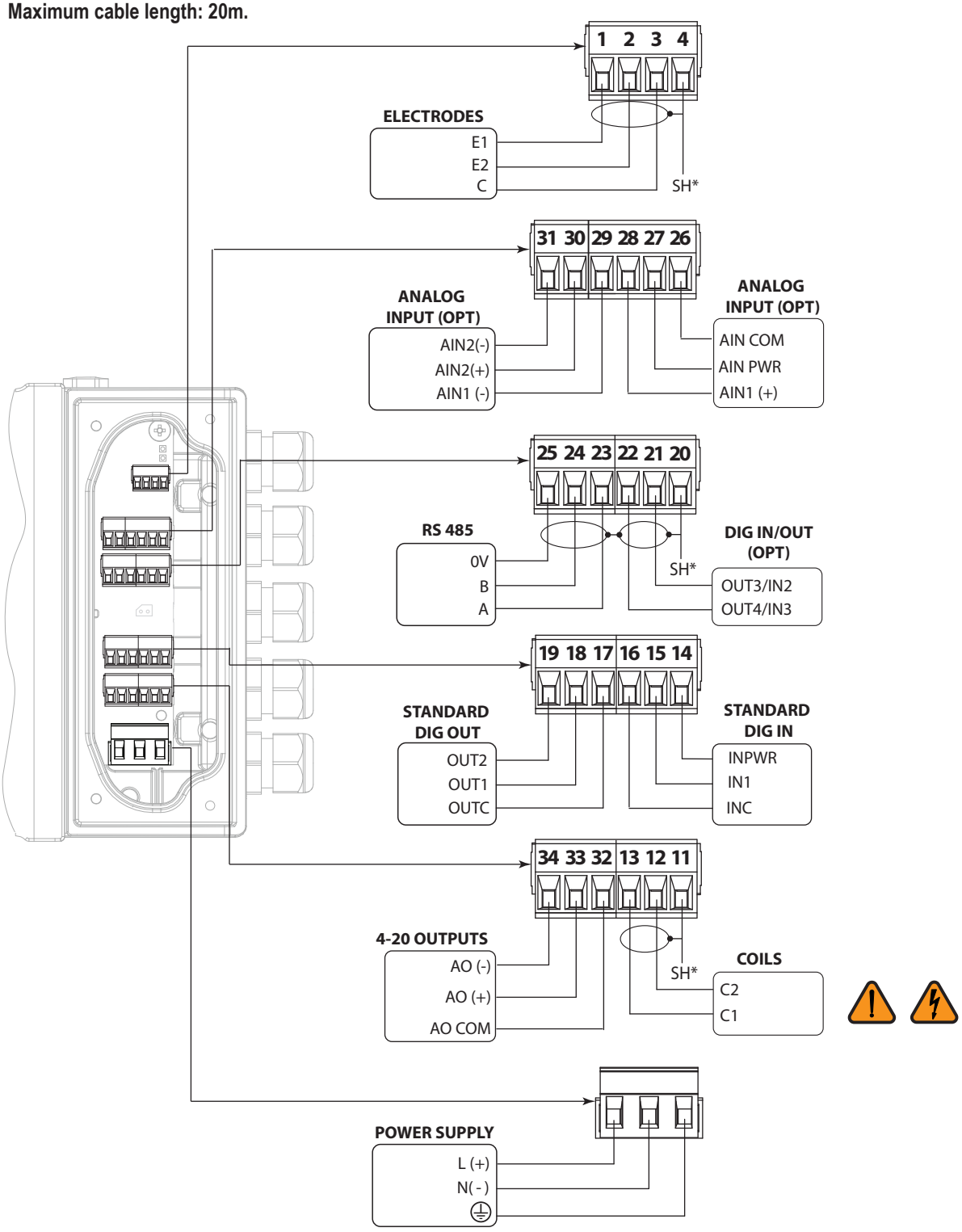
- To start the instrument with mains power it is necessary to connect the USB cable. Condition to be repeated every time the instrument is no longer powered by batteries and mains.
- The system cannot work with the battery disconnected or completely discharged, even if it is powered by an external power source (network or USB).

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

Terminal block converter

Sudden movements of the electrodes cable could introduce noise.
Maximum cable length: 20m.



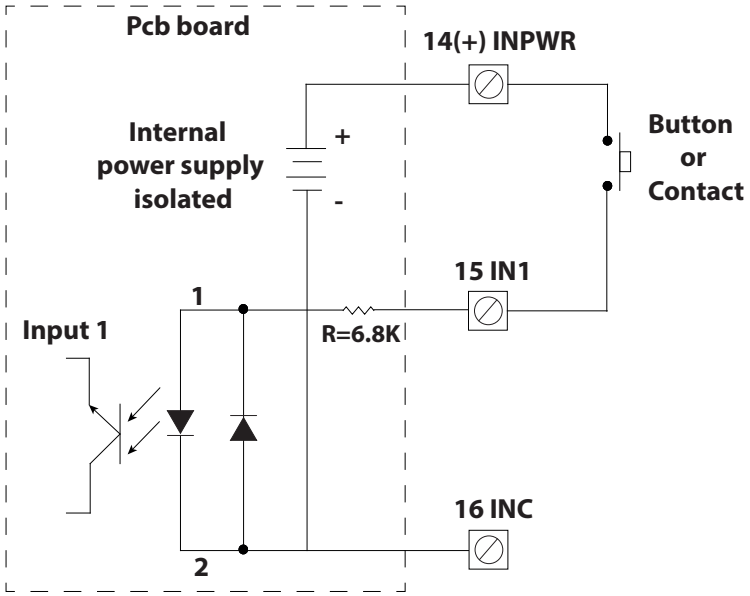
Input Connections

Digital input connections on a base card (INP COM, INP I1, INP V+)

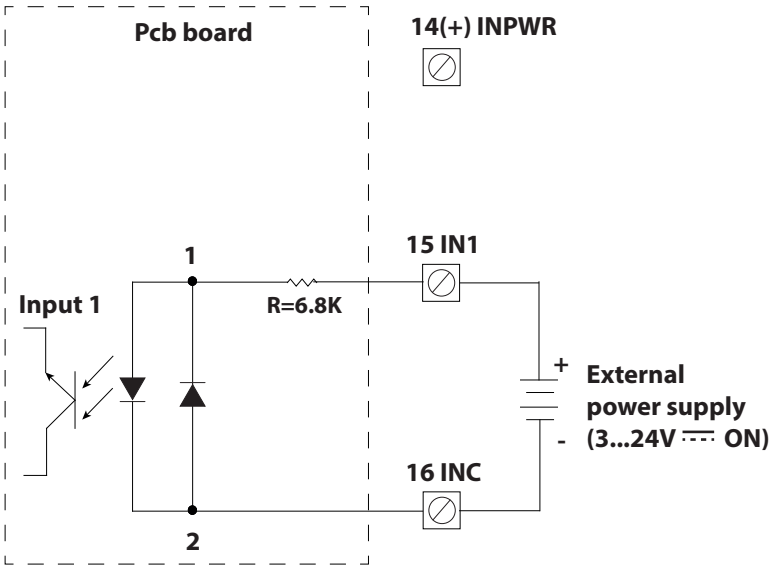
The digital input can be used in two ways as shown below:

- IN 1: input 1, positive terminal
- INC: common of all inputs
- INPWR: isolated voltage generator output for inputs power supply

Internal power supply



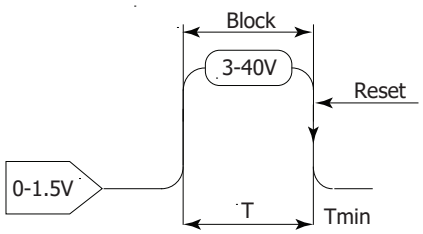
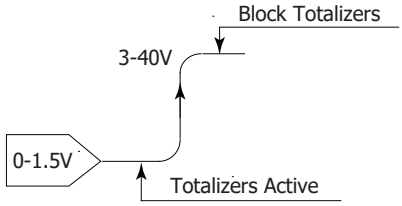
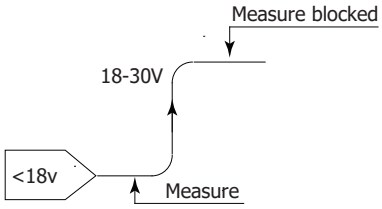
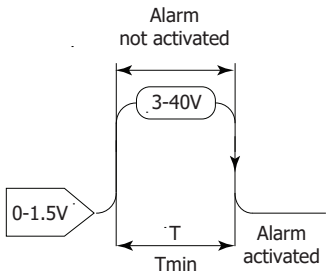
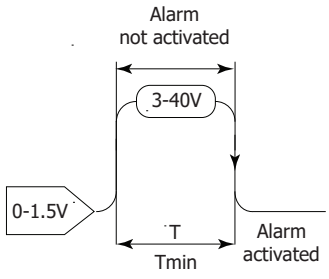
External Power Supply



Input Connections

Input on / off mode for operating inputs

In energy saving mode, the activation times of the Tmin input must be ≥15 seconds For electrical connections see pag. 26.

Schemes	Conditions Requires to Perform the Function
	TOTALIZER RESET (Input 1): enable all or only the functions related to the totalizer to be reset. POS. 6.1 pag. 51 POS. 6.2 pag. 51 POS. 6.3 pag. 51 POS. 6.4 pag. 51 CALIBRATION (Input 1): T> 0.5 seconds POS. 6.7 pag. 51
	TOTALIZER LOCK (Input 1): enable the function if the counting of the totalizers is to be blocked. POS. 6.5 pag. 51
	MEASUREMENT BLOCK (Input 1): enable the function if desired flow measurement block. POS. 6.6 pag. 51
	SYSTEM VIOLATION (Input 1): enable the function if you want to activate the system violation alarm. This function disables the previous functions: POS. 6.8 pag. 51
	SYSTEM / FLOOD VIOLATION (Input 2 and / or 3 if enabled): enable the function if you want to activate the system violation and / or flood alarm. POS. 6.9 pag. 51 POS. 6.10 pag. 51

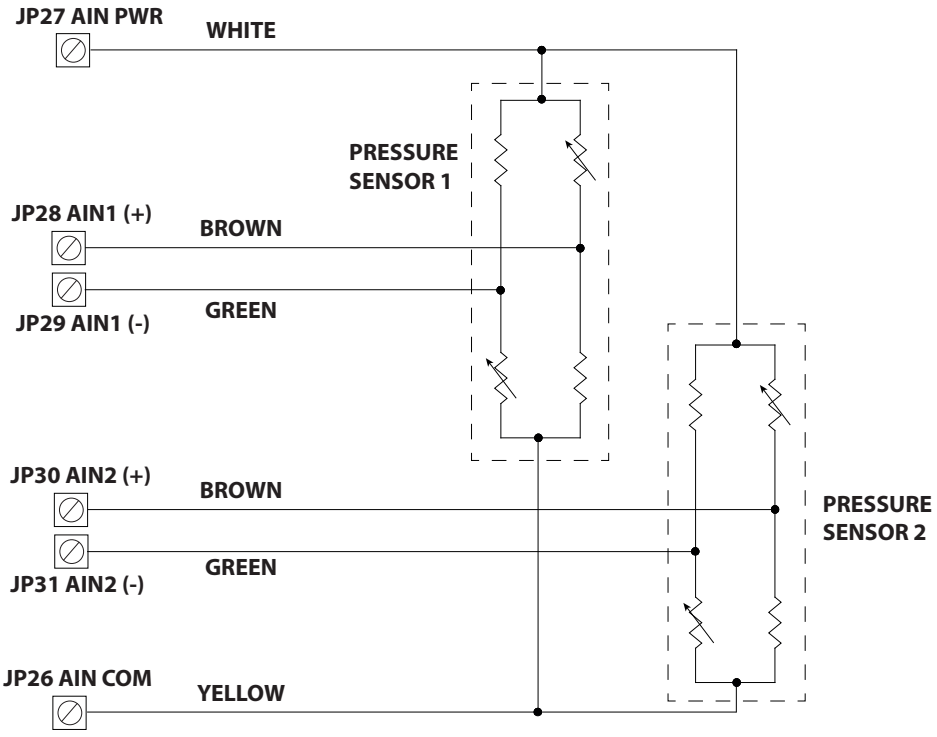
Input Connections

Analog input connections (AI1+, AI1-, AI2+, AI2-, AI3+, COM)

- AIN1 +, AIN1-: inputs (+) and (-) for acquisition of analogue channel 1 measurements
- AIN2 +, AIN 2-: inputs (+) and (-) for acquisition of analogue channel 2 measurements
- AIN PWR +: output voltage excitation of pressure sensors (+)
- 26 AIN COM: common terminal for pressure sensors (-), connected to the internal mass of the board

The optional analogue measurement acquisition module is able to perform potential measurements, temperatures (max 2) and pressures (max 2). The diagrams for the connections to the sensors are shown below:

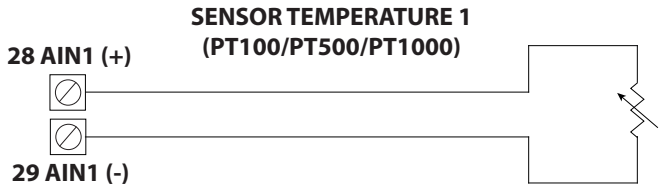
Pressure sensor connections:

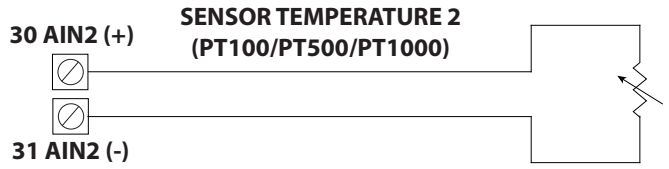


Input Connections

Temperature sensor connections:

Since there is no cable resistance compensation, it is recommended to use PT500 or PT1000 sensors if the cable length is more than one meter.
The recognition of the sensor type (PT100 / 500/1000) is automatic.

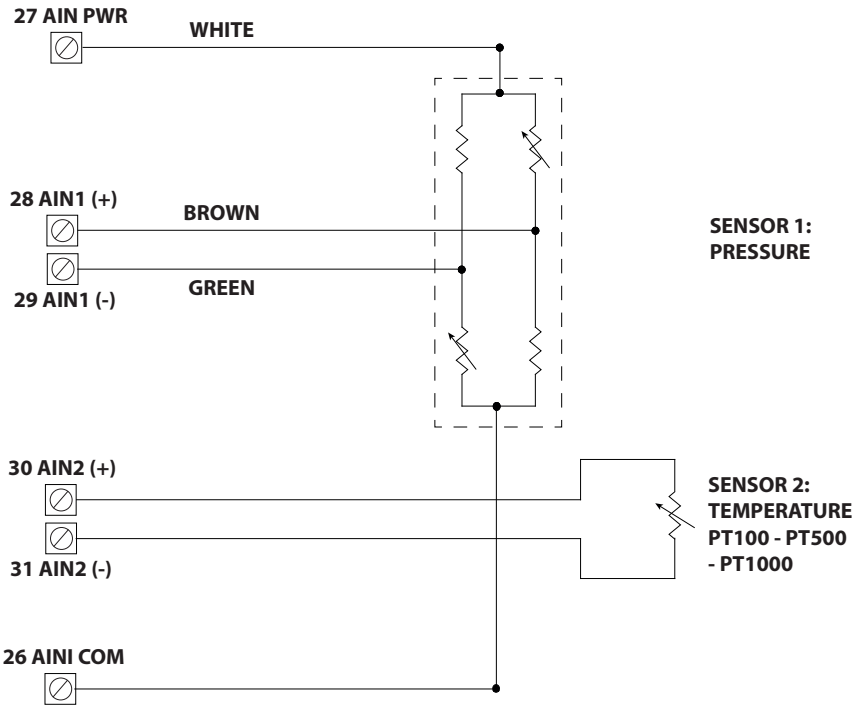




Connection of a pressure/temperature sensor:

Two different types of sensors can be connected, a pressure sensor and a temperature sensor.
For the temperature sensor, because there is no compensation of cable resistance, we recommend the use of PT500 or PT1000 sensors if the cable length is more than one meter. The recognition of the sensor type (PT100 / 500/1000) is automatic.

N.B: the pressure sensor MUST BE connected to input 1 and the temperature sensor MUST BE connected to Input 2!

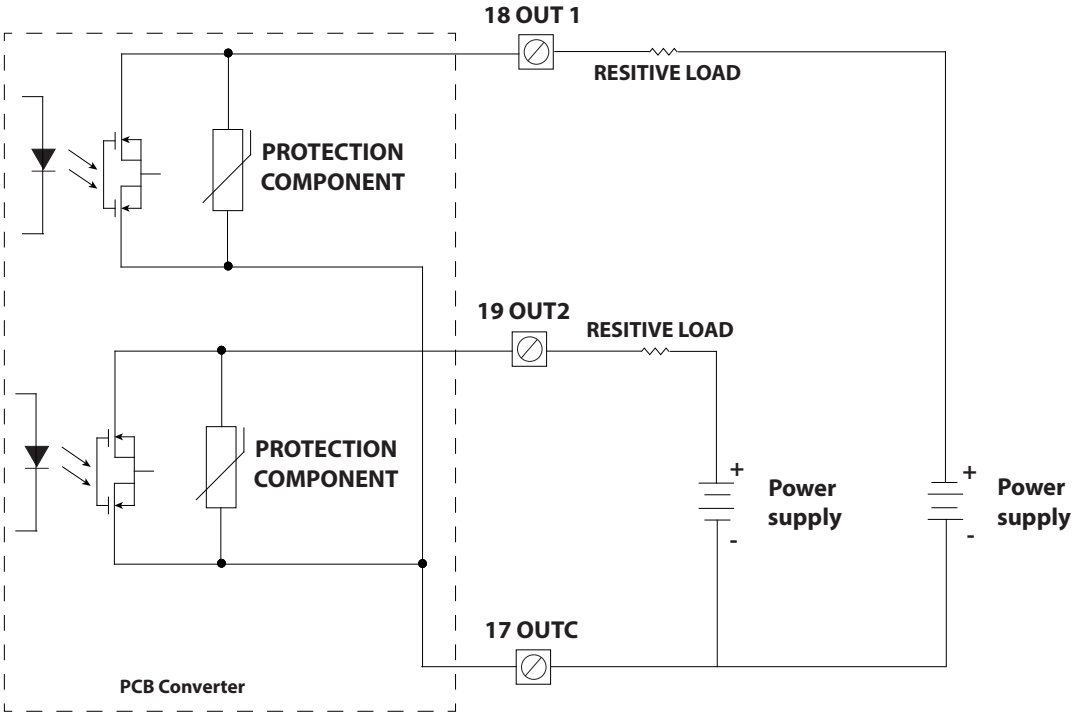


Outputs Connections

Digital output connections on the basic board (OUT01, OUT02, OUT COM)

The outputs are not polarized, therefore connection schemes can be adopted to positive or to common negative, as reported by the following diagram.

- OUT 01 = output 1
- OUT 02 = output 2
- OUT COM = common outputs



- Opto-insulated output (Opto-MOS)
- Maximum switching voltage: 40V ⎓ / 28V ~
- Maximum switching current:100mA
- Maximum Ron= 70 Ω
- Maximum switching frequency (load RL= 24 Ω, VOUT=24 ⎓): 50Hz
- Insulation from other secondary circuits: 500 V ⎓

Output 4-20mA

The 4-20 mA output can be passive (powered from outside) or active, only when the power supply is installed. There are 3 output terminals available, the passive output uses AO + and AO- (the minimum operating voltage is 5V). When the power supply is present, it is also possible to select the active mode by connecting the load between the AO- and AOCOM terminals. In this case, the loop should not be powered. The passive mode is always available even with the power supply installed, use the AO + and AO- terminals. For the connections to the terminal block see also POS. ELECTRICAL CONNECTION CONVERTER-SENSOR pag. 26

- AO-: OUTPUT current to the connected device (active or passive mode).
- AO+: INPUT current from the connected device (passive mode, loop supply from external source).
- AOC: return of the OUTPUT current (active mode)

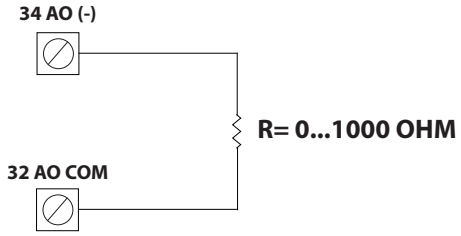
ATTENTION: the power supply of the loop supplies power only to the 4-20 mA output circuits and not to the whole device, which therefore remains active and consumes the batteries if it is not powered in any other way.

The 4-20mA output can have two operating modes:

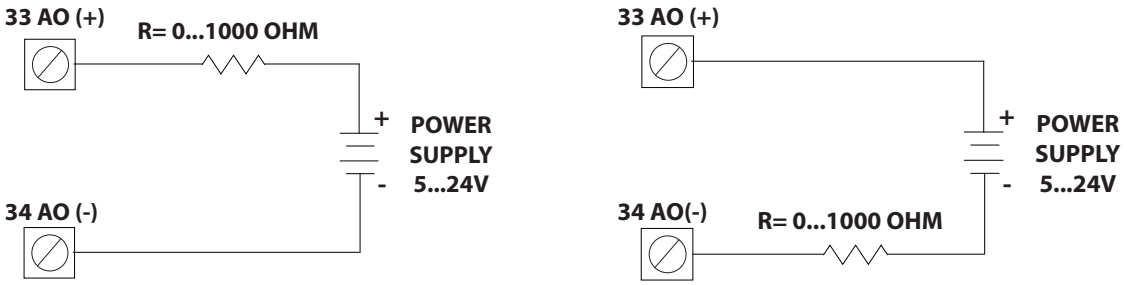
PASSIVE MODE: the power is supplied by an external source. Connect the POSITIVE of the external source to the AO + terminal. Connect the LOAD to the AO- terminal.

ACTIVE MODE: the power is supplied by the card power supply (if fitted). Connect the LOAD to the AO- terminal. Connect the RETURN to the AOC terminal.

ACTIVE CONNECTION



PASSIVE CONNECTION 1-2



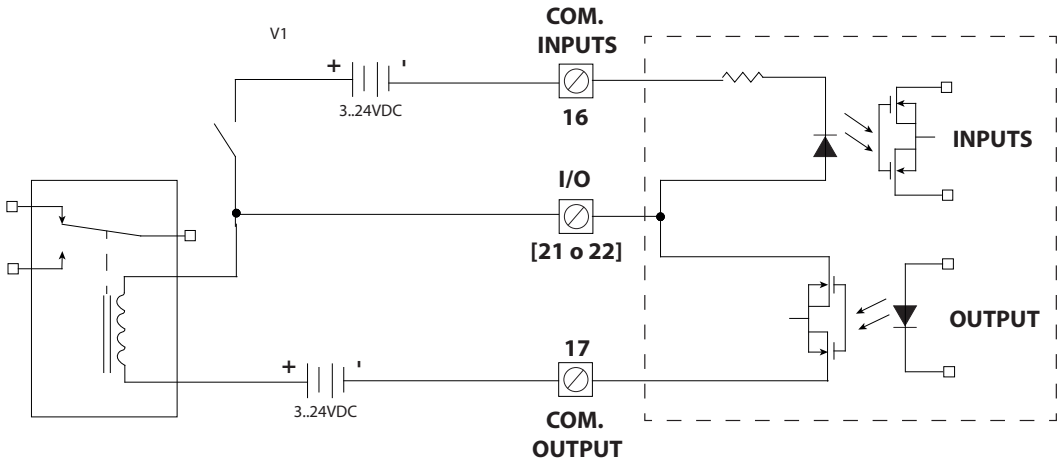
The maximum load value for the PASSIVE connection depends on the supply voltage supplied. The maximum 1000 ohms of load are guaranteed only with supply voltage> = 25V.

ATTENTION! This output isn't galvanically insulated

Externally supplied loop power gives power to the 4-20 mA output circuits only and not to the whole device. When power is applied to the 4-20 mA loop and the device is powered by the batteries alone, the device will come out of the low-power mode and remain active for the time set in the "display time" function to allow the current value on the loop to be read. During this phase, battery consumption is very high

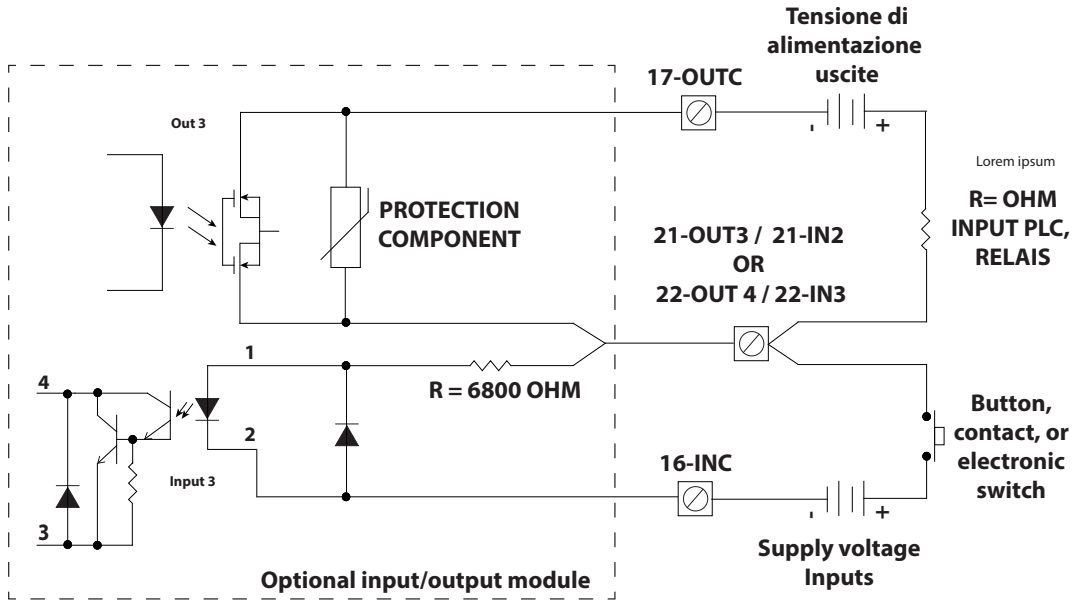
Simultaneous connection to digital input / output terminals on expansion module

The outputs and optional inputs on the expansion module share the same common terminals related to the card inputs and outputs. Since the input and output circuits have different common terminals, it is theoretically possible to use the same I / O terminal at the same time to read a signal via digital input and control a device via digital output. See the following diagram to understand how it works. The power supplies in this case must be separated if the possibility of simultaneous use of input and output is to be maintained.



Optional digital inputs / outputs connections (O4,IN3, O3, IN2, GND)

The digital output OUT 4 and the digital input INPUT 2 as the digital output OUT3 and the digital input INPUT 3 share the same terminal but have different municipalities, therefore the input and output circuits can be made independently 'from each other, as shown below for the OUT 3 / INPUT 3 scheme (OUT 4 / INPUT 2 are equivalent).



- O4 IN3: digital output OUT 4 / digital input INPUT 3
- O3 IN2: digital output OUT 3 / digital input INPUT 2
- GND: terminal connected to the protective earth (chassis) for connecting cable shields

NOTES: The digital outputs OUT 4 and OUT 3 use the OUTC terminal as common. The digital inputs INPUT 2 and INPUT 3 use the INC terminal as common.

Notes on operation of out 4-20mA

The FM700 can be equipped with an analog output that provides a current signal proportional to the flow rate, in the standard range of 4 to 20 mA.

The analog output can operate in two power modes:

- Active mode: powered by the optional internal power supply, enabling a permanent connection to external devices.
- Passive mode: powered by an external device connected to the analog output.

Passive mode: functioning

The analog output provides a valid 4–20 mA signal only under the following conditions:

- When the device is powered via USB or via the optional internal power supply.
- When battery-operated, and a valid voltage is applied to the analog output pins (AO+ and AO-) during a specific time frame, which can be configured using the Display Time function (POS. 9.2 pag. 52).
- When battery-operated, and a valid voltage is applied to AO+ and AO- during the entire measurement cycle (typically 50 to 200 ms)

In all other cases, even if a correct voltage is applied to the output pins, the current remains fixed at approximately 24 mA, indicating that the device is connected, but the analog signal is not valid.

To minimize power consumption, the reading time of the 4–20 mA signal must be kept as short as possible.

This time is configurable via the Display Time function (MCP KBTMT command) POS. 9.2 pag. 52. For proper operation, it must be set between 5 and 59 seconds. **A value greater than 59 seconds disables the programmed 4–20 mA operation** but still allows reading the 4–20 mA signal during the measurement cycle (from 50 to 200 ms).

After the last valid acquisition of the 4–20 mA signal, and after the electronics have been appropriately woken up for this purpose (i.e., when the KBTMT time expires), the electronics will no longer respond to subsequent read requests for the next 60 seconds.

Note: In any case, it is recommended to use the shortest possible time to acquire the analog signal.

When the power applied to the 4–20 mA output is continuous, the device activates the output for the configured display time and remains off for the rest period (60 seconds). At the next valid measurement cycle, the interface is reactivated. **This is not the optimal scenario in terms of power consumption.**

When the power is applied intermittently, i.e., at defined intervals (for example, every 10 minutes), the duty cycle is much lower, thus reducing the energy required from the battery. In this case, the measurement cycle latency time (typically 15 seconds) must be taken into account, so the total measurement acquisition time for the connected device must be sufficiently long to cover the entire cycle time (typically 15 seconds) plus the analog signal reading time.

Parameters to be set for optimal operation

- **FM700: KBTMT= 5s (**POS.9.2: VISUALITATION TIM**)**
- **ACQUISITION DEVICE (MASTER):**
  - **minimum measurement acquisition time: 15 s + real acquisition time**
  - **acquisition interval: as long as possible compatible with performance**

The following is a diagram describing the operation and the values to be set

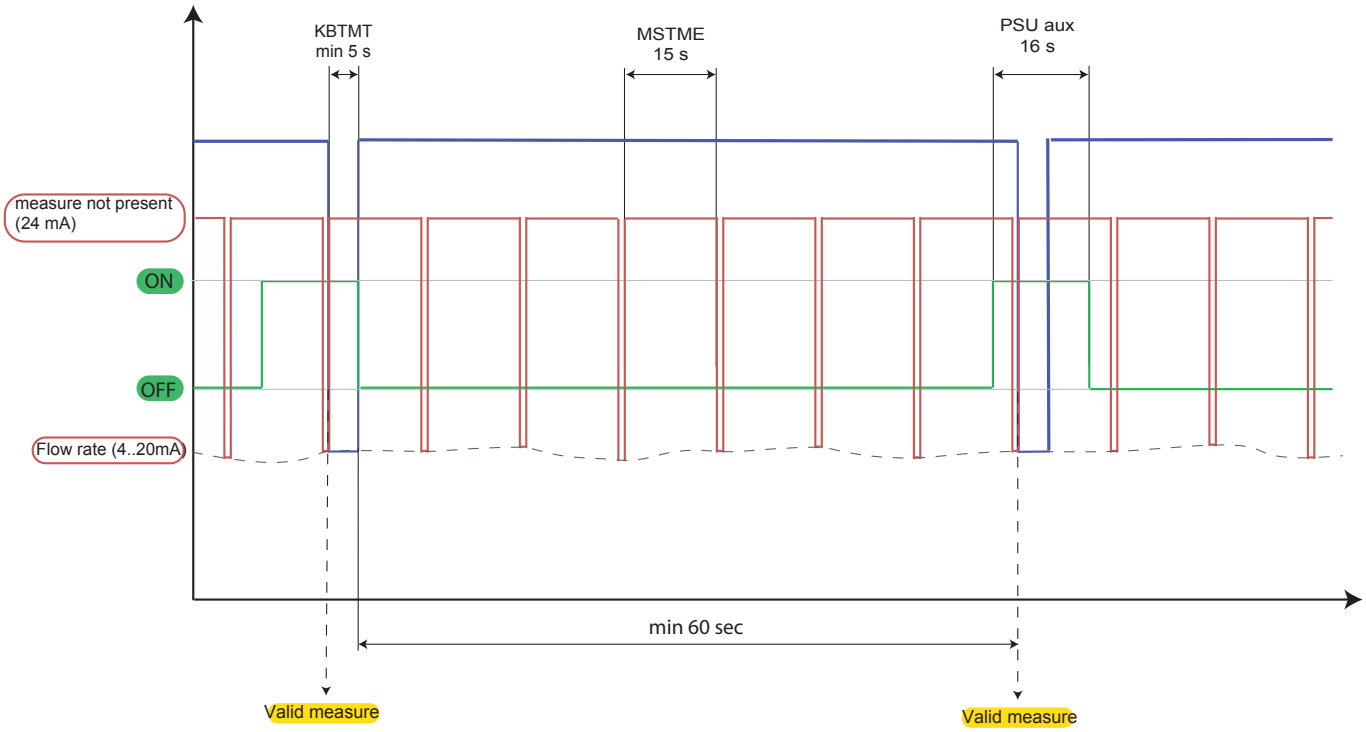
Legend:

- FM700 display time cycle
- FM700 measure cycle
- datalogger power supply activation window (PSU aux)

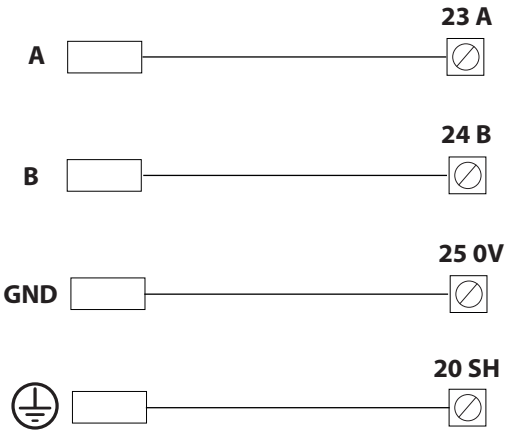
Value to set on MCP functions

FM700

KBTMT = 5s



RS485



- Response time to MODBUS queries when the device is ACTIVE: <20 ms.

ATTENTION! The RS485 port isn't galvanically insulated

Notes on operation of RS485 with external datalogger

The system is only able to receive data when it is in the ACTIVE state. The active state occurs during each measurement cycle (typically 15 seconds) for between 50 and 200 ms. However, the device is capable of recognizing incoming requests and thus remains active for communication during the time set via the “display time” function (MCP KBTMT command) POS. 9.2 pag. 52

As a result, it is unlikely that the first MODBUS request will generate a response from the meter.

Therefore, to achieve maximum system performance while saving as much energy as possible, it is necessary to set the display time to 5 seconds and send Modbus requests every 100 ms throughout the entire communication period, plus the measurement cycle time (typically 15 seconds). After the last response sent by the meter, once the KBTMT time has elapsed, the system returns to SLEEP mode and will no longer accept requests for the next 60 seconds.

If KBTMT < 60, the system remains active for the time set in the KBTMT function;
If KBTMT ≥ 60 s, the session ends upon receiving the first valid MODbus message.
The KBTMT < 60 s method is recommended when using a system that requires the transmission of **multiple data packets**.
The KBTMT ≥ 60 s method is recommended when using a system that requires the transmission of **a single data packet.**

The acquisition windows triggered by the master must last at least 15 seconds + data acquisition time. During this period, the master must continuously send requests to the meter, preferably every 100–200 ms (communication timeout), until a response is received from the meter.
The interval between two communication sessions should be as long as possible, depending on the desired performance of the system.

Extending the communication window (KBTMT time) increases energy consumption for both the master and the FM700.

Extending the acquisition interval reduces energy consumption for both the master and the FM700.

Parameters to be set for optimal operation

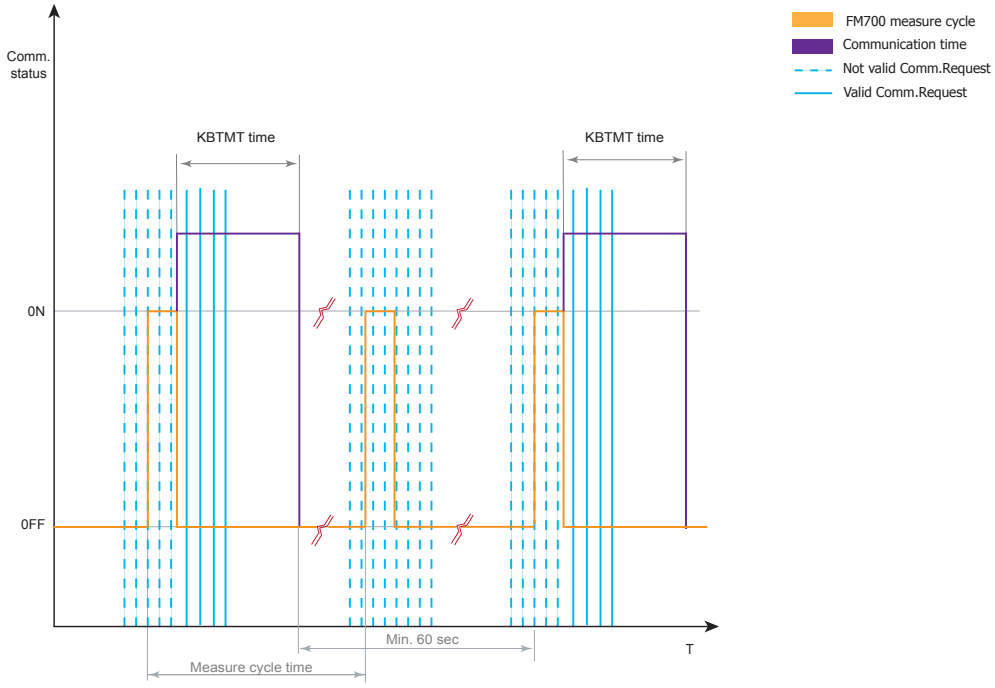
- FM700: KBTMT = 5s (POS. 9.2: display time)
- ACQUISITION DEVICE (MASTER):
    1. Minimum communication session duration: 15 seconds + actual acquisition time
    2. Acquisition interval: as long as possible, compatible with the required performance

A diagram follows, illustrating the device behavior and the values to be configured.

Below there is a diagram illustrating the timing and values

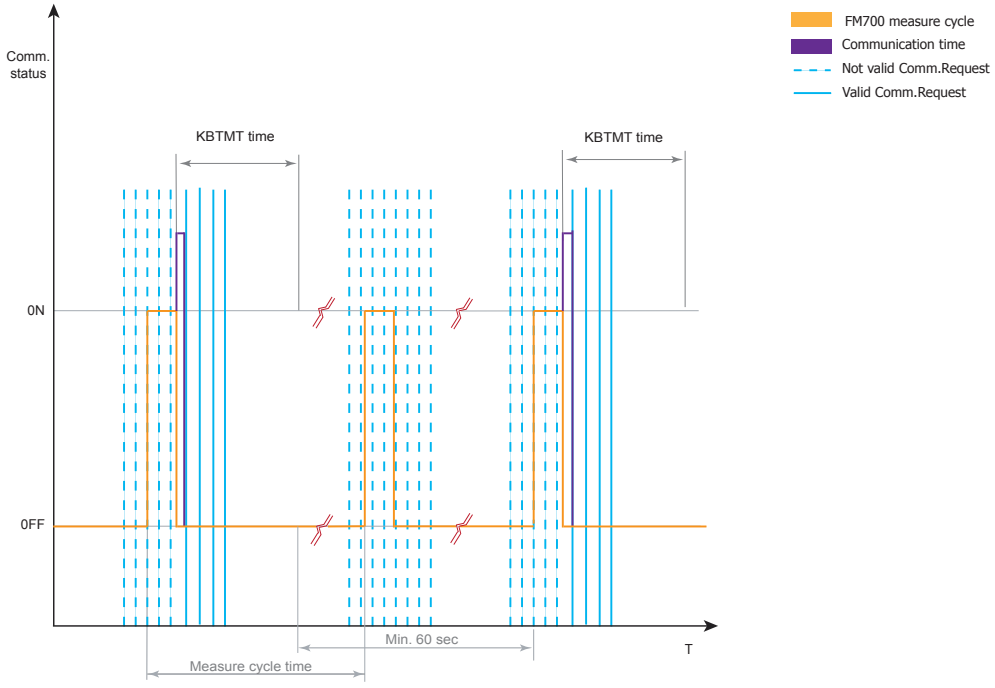
THE following are the links of the MIL connectors IP68

Diagram for KBTMT < 60s



N.B With continuous power supply, the interface works continuously

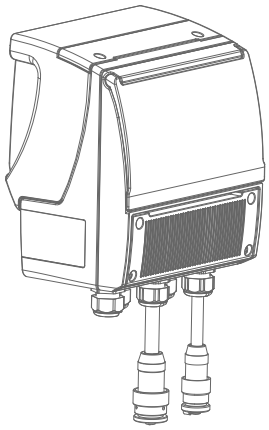
Diagram for KBTMT ≥ 60s



N.B With continuous power supply, the interface works continuously

Mil Connector

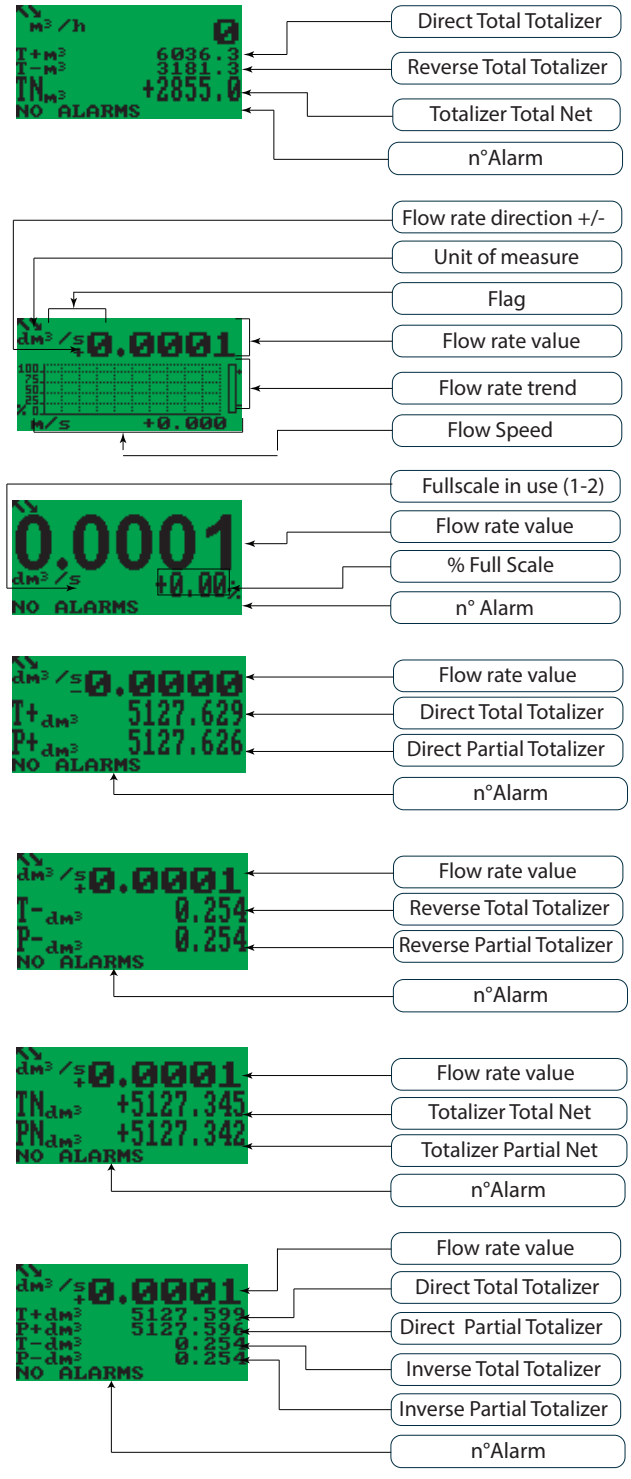
For details of connections with MIL connectors, refer to the manual:
FM700_MIL CONNECTOR POSITION.



Start Visualization Pages

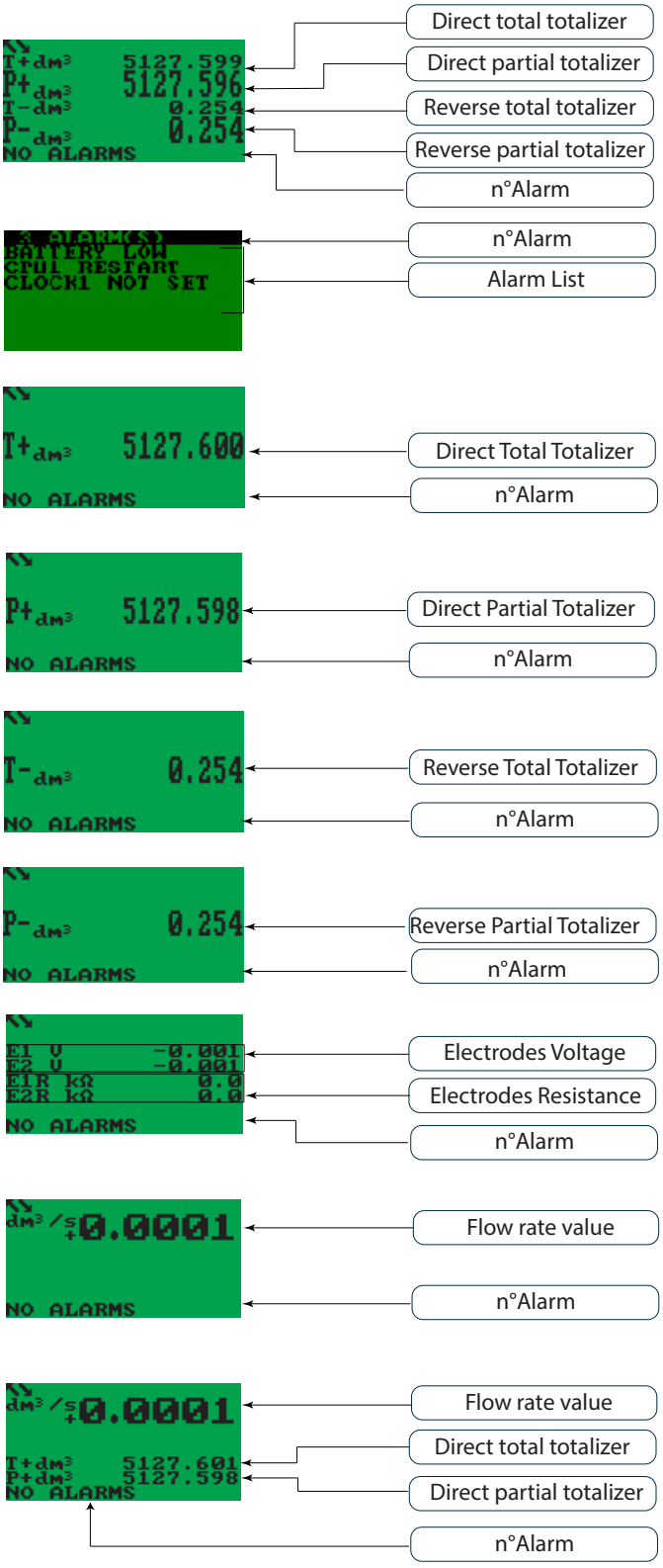
The direct exposure of the transmitter to the solar rays, could damage the liquid crystal display.
The visualization pages can be change according to instrument's setup.

Push to change visualization

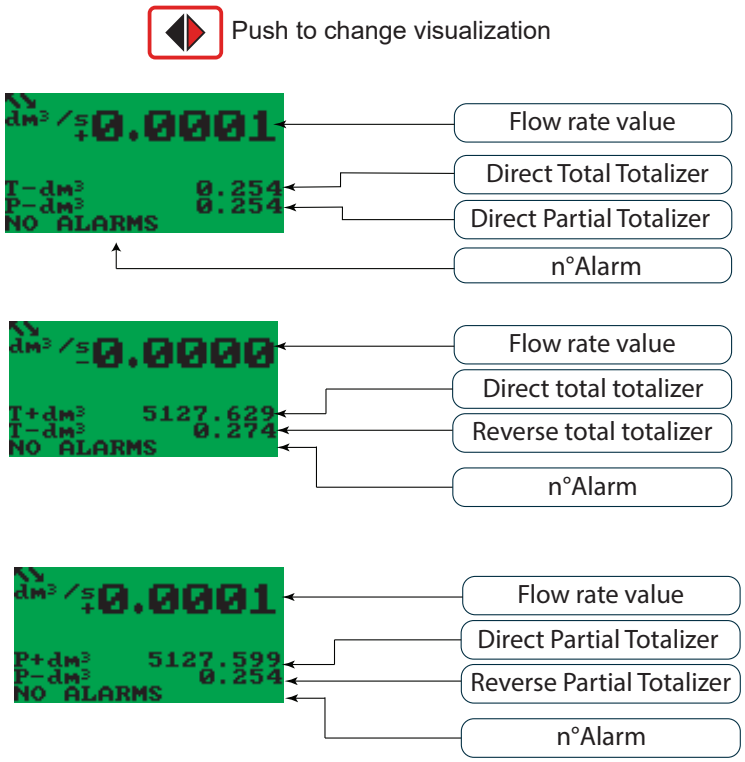


Start Visualization Pages

Push to change visualization



Start Visualization Pages

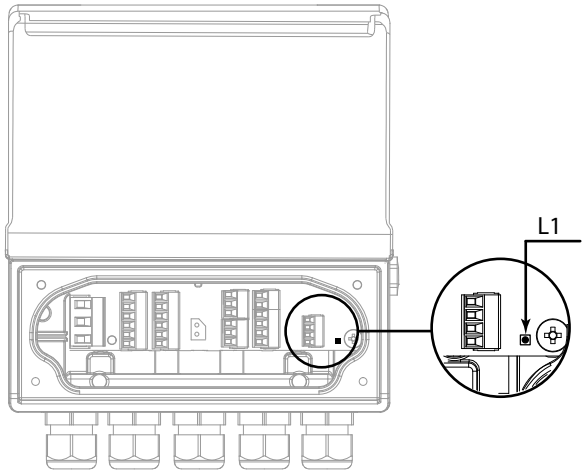


Access to the Converter

Meaning of Flags

Flag	Description	Flag	Description
	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)		Pulse 1 Overflow
	Calibration (Flashing)		Pulse 2 Overflow
	Generic Alarm (Flashing)		Signal Error
	General Alarm Only On Physical Display (Flashing)		Excitation Error

Meaning of LED Colors



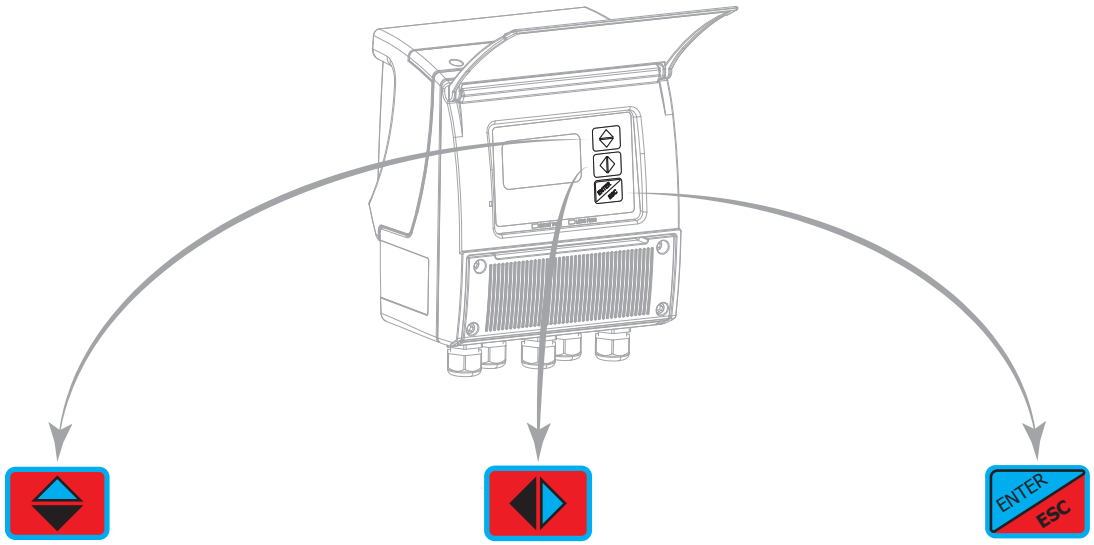
LED Red: Alarm signal
LED Blue: USB communication enable
LED Green: Functioning system correctly

Access to The Configuration Menu

The configuration can be done in two different ways:

- By MCP interface (Virtual display of instrument)
- By keypad's converter, with the converter is connected to an external energy source (pc or power bank)
- By keypad's converter with the function "programming" activated

Access Via Keypad (converter is connected to an external energy source)



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 Keypad (converter is connected to an external energy source)

ATTENTION! THIS FUNCTION LEADS TO AN HIGH ENERGY CONSUMPTION

To activate this function press the button "Enter" 

for >10 seconds. When the keypad becomes active, the following sentence will be shown on the display:

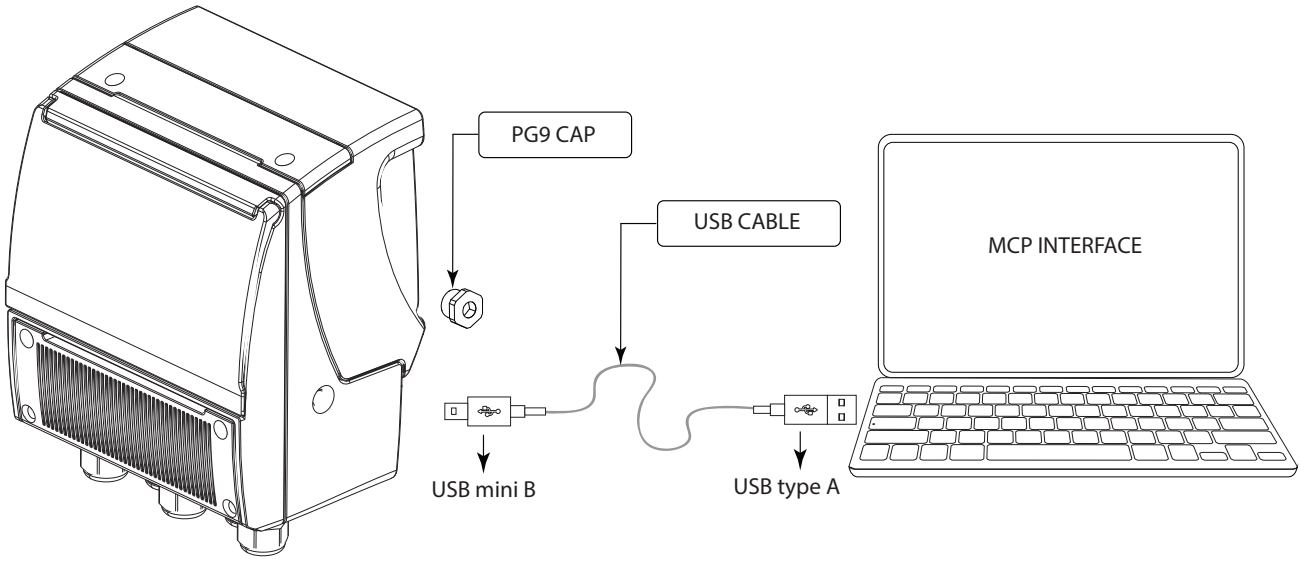
"Programming active. Attention: high power consumption"

With this option activated it's allowed use the converter as if it is connected to an external power supply.

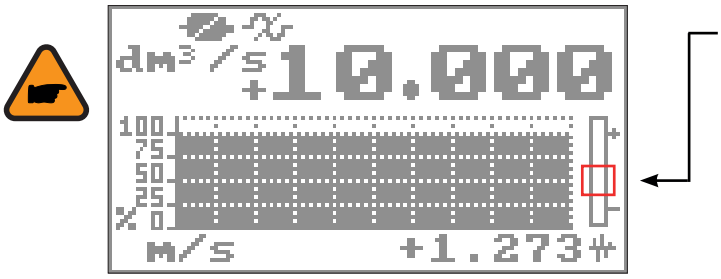
Access to The Configuration Menu

Access Via MCP Interface (Virtual Display)

MCP is a Windows® software that allows to set all the transmitter 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.



Flow Rate Visualization



This symbol appears (red color on the virtual display) only when the overall noise is over 2.5% of flow rate.

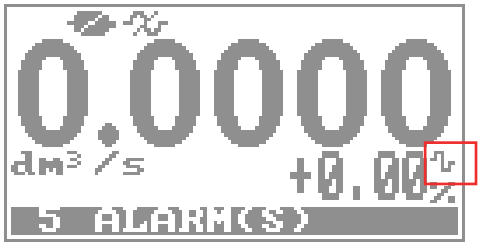
FM700 allows you to view the flow in 5 digits; this means that the maximum flow displayed on the display is equal to 99999 (regardless of the position of the decimal point). The minimum displayable value is instead limited to the number 0.0025. The unit of measurement that can be represented depends on the capacity / diameter of the sensor: the units allowed are those that, once the instrument's full-scale value is set, can be represented with a numeric field whose maximum value does not exceed 99999.

Example for DN 300:

- Full scale value: 3m / s
- Allowed units of measure (examples): l / s (216.00); m3 / h (777.60); m3 / s (0.2160) ...
- Measurement units NOT allowed (examples): l / h (777600)

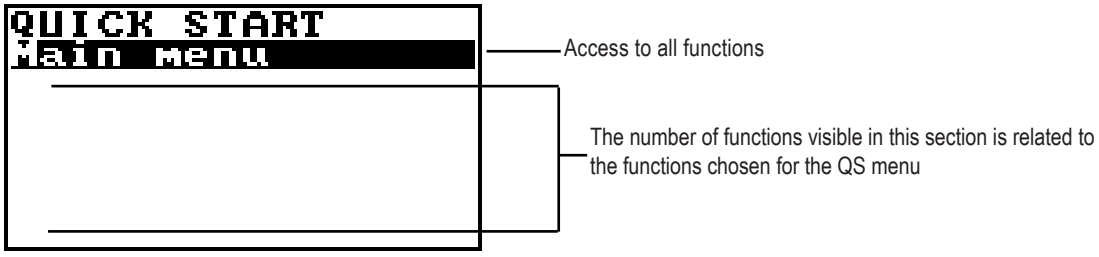
Flow Rate Alert

Symbol that is activated when there is a dynamic variation of the flow measurement. It indicates that the measurement shown in the display is stabilizing.



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.



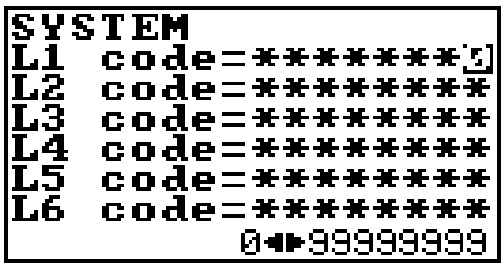
Pressing the enter button from the display pages, access to the Quick Start menu is immediate. If you press the enter button to access the Main menu directly, the Quick Start may have been disabled by the function POS. 9.9 pag. 52.

Converter Access Code

Access to instrument programming is regulated by six access levels. All functions are assigned to a specific access code and the functions are then grouped according to a logical criterion INSERT FUNCTION.

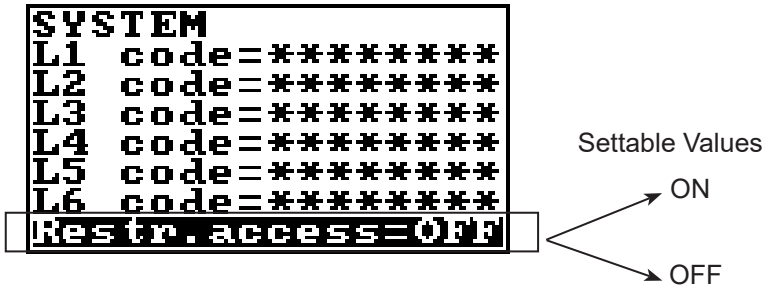
Access Code Set : Menu 13 System

The codes can be set from the instrument keyboard or via the MCP interface. Depending on the access level set, the menu functions will be displayed (see POS. MENU 13 - system pag. 83. These access levels interact with the function POS. 13.10 pag. 53 which enables its use.



Restricted Access Set : Menu 13 System

Restart access = ON: Access allowed only to functions of a specific level (POS. 13.10 pag. 53).



Example: If the operator has an access level code 3, after entering it, it can only modify the functions provided for an access level 3.

Access to restaurants = OFF: After entering the access code of a certain level, it allows you to modify the functions of the selected level and the functions with the lowest access level. Example: If the operator has the level 3 code, after having entered it, he will be able to modify all the functions of level 1,2,3.

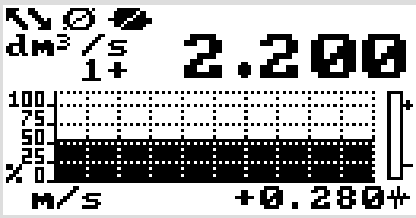
* WARNING: take careful note of the customized code, since there is no way for the user to retrieve or reset it if lost. Factory preset access codes:

- 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.

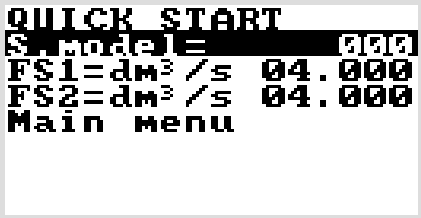
EXAMPLE: Modifying the full scale value from 4dm³/s to 5dm³/s,
from the "Quick start menu"

1



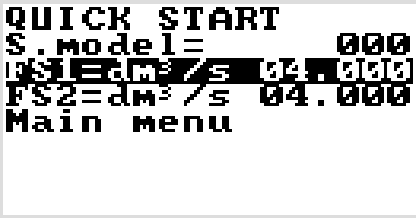
Press the ENTER button to access the Quick Start menu

2



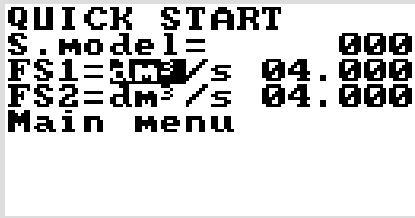
Select this function in the list to be edited

3



Press the ENTER button to select the function.

4



Select the value to be changed

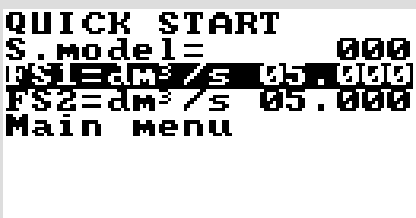
5

Change the value

6

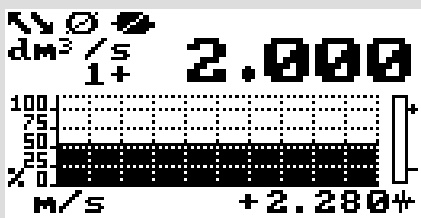
Confirm the new value

7



Long Push

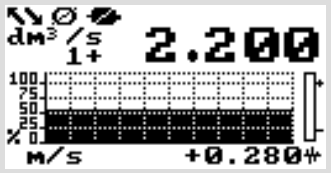
8



Main Page

EXAMPLE: modifying the full scale value from 4dm³/s to 5dm³/s, from the “Main Menu” (quick start menu enabled)

1

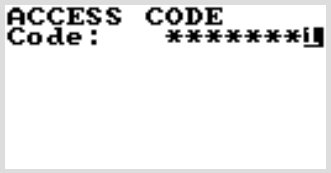


Press the ENTER button to access the Quick Start menu

2

Press arrow keys to select the cell in which to insert the number of the access code.

3



Press ENTER button to confirm value.

4

Select “Main Menu“

5

Press the ENTER button to access the Main Menu

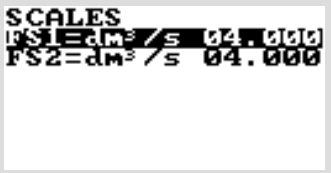
6

Select function

7

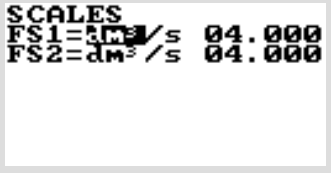
Press the ENTER button to access the“Scale Menu“

8



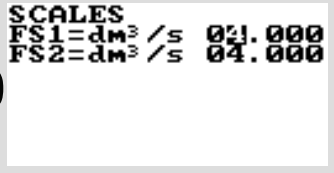
Press the ENTER button to access the “Fs1“

9



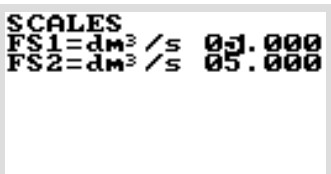
Select the value to be changed

10



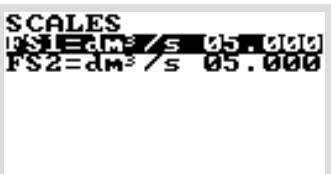
Change the value

11



Press the ENTER button Confirm the new value

12

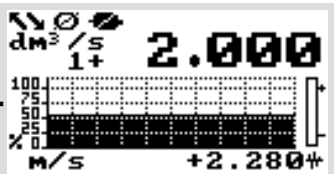


Press Esc

13

Press Esc

14

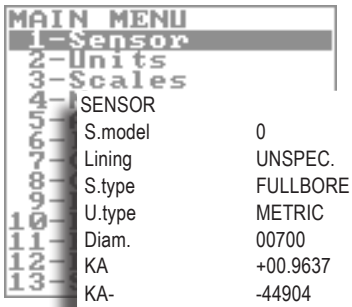


Main page

Functions Menu

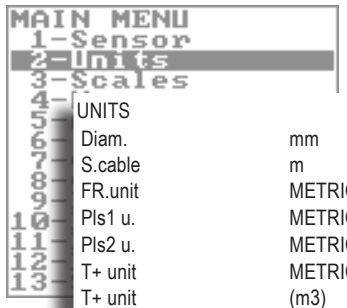
The main menu is selected from the Quick start menu by pressing the ENTER ESC key and entering the access code; enter the access code if required.
Note: Some functions here below are displayed only with other functions active, or with optional modules.

Sensor



SENSOR			
S.model	0	1.1	Sensors model: Enter the first two characters of the serial number of the sensor
Lining	UNSPEC.	1.2	Flow sensor lining material type
S.type	FULLBORE	1.3	Type of sensor: fullbore or insertion
U.type	METRIC	1.4	Type of measure units for sensor parameter: metric or imperial
Diam.	00700	1.5	Sensor's nominal/real diameter DN (0-2500)
KA	+00.9637	1.6	Sensor coefficient KZ (zero point)
KA-	-44904	1.7	Calibration data of sensor for negative flow
KZ	-18852	1.8	Sensor coefficient KZ (zero point)
KD	+00.4014	1.9	Sensor coefficient KD
Ins.position	0	1.10	Insertion position
KP dynamic	OFF	1.11	KP dynamic, coefficient for insertion
Ki	10000	1.12	Sensor coefficient Ki
Kp	10000	1.13	Sensor coefficient Kp
KC	100000	1.14	Sensor coefficient KC
C.Curr.	mA025.0	1.15	Sensor excitation current
C.Reg. PB	ms03	1.16	Current regulator proportional band
C.Reg.DK	stp 005	1.17	Current regulator derivation constant
C.R.time	ms03	1.18	Measure sampling frequency
E.P.Detect	ON	1.19	Enables the empty pipe detection feature
Z max	Kohm 0500	1.20	Empty pipe detection threshold
S.err.delay	10	1.21	Signal error delay (n. sample)
Sens.verify	OFF	1.22	Automatic sensor verify enable
KL	00. +000000	1.23	Linearization coefficient
Zero point cal.		1.24	Pipe hydraulic zero calibration

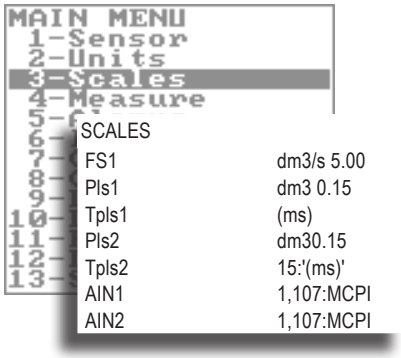
Units



UNITS			
Diam.	mm	2.1	Nominal diameter measure unit
S.cable	m	2.2	Cable length on separate version
FR.unit	METRIC	2.3	Flow rate type measure unit: metric or imperial
Pls1 u.	METRIC	2.4	Pulse 1 type measure unit: metric or not metric
Pls2 u.	METRIC	2.5	Pulse 2 type measure unit: metric or not metric
T+ unit	METRIC	2.6	Total direct totalizer measure unit type: metric or imperial
T+ unit	(m3)	2.7	Total direct totalizer measure unit
T+ D.P.	4	2.8	Total direct totalizer decimal point position
P+ unit	METRIC	2.9	Partial direct totalizer measure unit type: metric or not metric
P+ unit	(m3)	2.10	Partial direct totalizer measure unit
P+ D.P.	4	2.11	Partial direct totalizer decimal point position
T- unit	METRIC	2.12	Total reverse totalizer measure unit type: metric or not metric
T- unit	(m3)	2.13	Total reverse totalizer measure unit
T- D.P.	4	2.14	Total reverse totalizer decimal point position
P- unit	METRIC	2.15	Partial reverse totalizer measure unit type: metric or not metric
P- unit	(m3)	2.16	Partial reverse totalizer measure unit
P- D.P.	4	2.17	Partial reverse totalizer decimal point position
Temp.unit	°C	2.18	Temperature measure
Mass units	ON	2.19	Enable/disable the selection of mass units on full scale set
Sg	(kg/dm3)	2.20	Specific gravity coefficient
AIN1 m.u.	1,107:MCPI	2.21	Unit of measurement for analogue input 1
AIN2 m.u.	1,107:MCPI	2.22	Unit of measurement for analogue input 2

Functions Menu

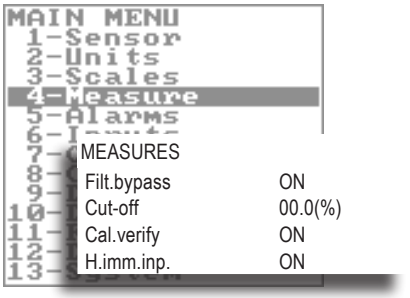
Scales



SCALES

FS1	dm3/s 5.00	3.1	Full scale flow rate 1
Pls1	dm3 0.15	3.2	Full scale flow rate 2
Tpls1	(ms)	3.3	Duration of the pulse generated on channel 1
Pls2	dm30.15	3.4	Pulse value on channel 2
Tpls2	15:'(ms)'	3.5	Duration of the pulse generated on channel 2
AIN1	1,107:MCPI	3.6	Analog input scale 1
AIN2	1,107:MCPI	3.7	Analog input scale 2

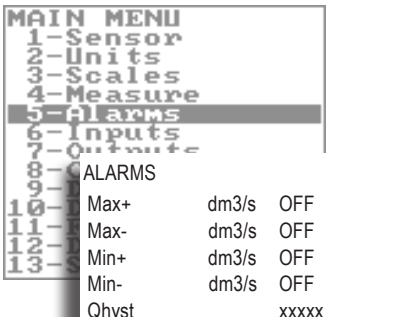
Measure



MEASURES

Filt.bypass	ON	4.1	Measure filter bypass
Cut-off	00.0(%)	4.2	Measure cut-off threshold
Cal.verify	ON	4.3	Automatic calibration verify
H.imm.inp.	ON	4.4	High immunity inputs

Alarms



ALARMS

Max+	dm3/s	OFF	5.1	Max.pos.flow r.alarm threshold MAX+
Max-	dm3/s	OFF	5.2	Max.neg.flow r.alarm threshold MAX-
Min+	dm3/s	OFF	5.3	Min.pos.flow r.alarm threshold MIN+
Min-	dm3/s	OFF	5.4	Min.neg.flow r.alarm threshold MIN-
Qhyst		xxxxx	5.5	Hysterisis on f.rate alarm threshold
A1Mx		()	5.6	MAX alarm threshold for analog input 1
A1Mn		()	5.7	MIN alarm threshold for analog input 1
Ai1H	KPa	0.00	5.8	AIN1 MIN alarm threshold
A2Mx		()	5.9	MAX alarm threshold for analog input 2
A2Mn		()	5.10	MIN alarm threshold for analog input 2
Ai2H	KPa	0.00	5.11	Hysterisis on a. in.2 al. thr

Functions Menu

Inputs

INPUTS			
T+ reset	OFF	6.1	Total direct (positive) flow totalizer reset enable
P+ reset	OFF	6.2	Partial direct (positive) flow totalizer reset enable
T- reset	OFF	6.3	Total reverse (negative) flow totalizer reset enable
P- reset	OFF	6.4	Partial reverse (negative) flow totalizer reset enable
Count lock	OFF	6.5	Totalizer counting lock command
Meas.lock	OFF	6.6	Measure zero lock command
Calibration	OFF	6.7	Calibration external command
Sys.v.detect	ON	6.8	System violation detect
D.In2	SYS.VIOL.	6.9	Digital input 2 function
D.In3	OFF	6.10	Digital input 3 function
D.in p.sup	ON	6.11	Digital auxiliary input power supply.

Outputs

OUTPUTS			
Out1	F.R.SIGN	7.1	Output 1 function selection
Out1 inv.	ON	7.2	Output 1 inverted status
Out1 pls.	ON	7.3	Output 1 pulsed status
Out2	AIN1 MX/MN	7.4	Output 2 function selection
Out2 inv.	ON	7.5	Output 2 inverted status
Out2 pls.	ON	7.6	Output 2 pulsed status
Out3	MAX.AL+	7.7	Output 3 function selection
Out3 inv.	ON	7.8	Output 3 inverted status
Out3 pls.	ON	7.9	Output 3 pulsed status
Out4	MAX.AL+	7.10	Output 4 function selection
Out4 inv.	ON	7.11	Output 4 inverted status
Out4 pls.	ON	7.12	Output 4 pulsed status
Out mA1	4_20 +/-	7.13	Analog current output 1 range
A1S	dm3/s	7.14	Full scale value for analog out1

Communication

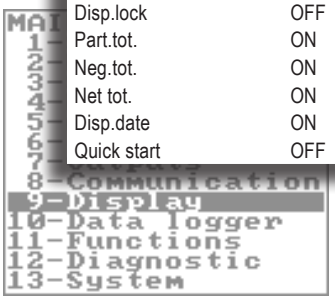
COMMUNICATION			
Dev. Addr.	1	8.1	Device comunication address number
Speed	bps22800	8.2	MODBUS link speed
Parity	NO	8.3	MODBUS link parity
Delay	ms 00	8.4	MODBUS reply delay
C.timeout	2	8.5	Max.delay between chars (frame)

Functions Menu

Display

DISPLAY

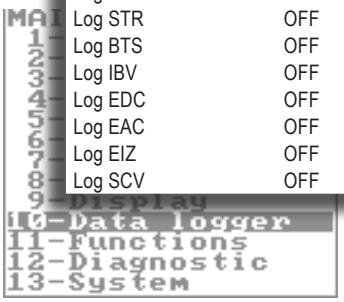
Language	EN	9.1	Language for all messages
Disp.time	s	9.2	Display/keyboard inactivity time
D.rate		9.3	Display refresh rate
Disp.fn.	1	9.4	Display function number
Disp.lock	OFF	9.5	Display function selection lock
Part.tot.	ON	9.6	Partial totalizers enable
Neg.tot.	ON	9.7	Negative totalizers enable
Net tot.	ON	9.8	Net totalizers enable
Disp.date	ON	9.9	Time and date display enable
Quick start	OFF	9.10	Quick start menu enable



Data Logger

DATA LOGGER

D.logger en.	ON	10.1	Data logger enabling
Meas.units	ON	10.2	Measure unit recording enable
Field separ.	;	10.3	Field separator character
Decim.separ.	.	10.4	Decimal separator character
Interv.	0:01:00	10.5	Sampling interval
Log T+	OFF	10.6	Totalizer Total Positive Enable T+
Log P+	OFF	10.7	Totalizer Partial Positive Enable P+
Log T-	OFF	10.8	Totalizer Total Negative Enable T-
Log P-	OFF	10.9	Totalizer Partial Net Enable P-
Log TN	OFF	10.10	Totalizer Total Net Enable
Log PN]	OFF	10.11	Totalizer Partial Net Enable
Log Q(UM)	OFF	10.12	Flow rate in Technical Units Enable
Log Q(%)	OFF	10.13	Flow rate in Percentage Enable
Log AL.EV	OFF	10.14	Alarm Events Enable
Log ADM	OFF	10.15	Additional Measures Enable
Log STR	OFF	10.16	Sensor Test Results Enable
Log BTS	OFF	10.17	Board TemperatureS Enable
Log IBV	OFF	10.18	Internal Board Voltages
Log EDC	OFF	10.19	Electrodes DC Voltages Enable
Log EAC	OFF	10.20	Electrodes AC voltages Enable
Log EIZ	OFF	10.21	Electrodes Source Impedance Enable
Log SCV	OFF	10.22	Sensor Coils Values Enable



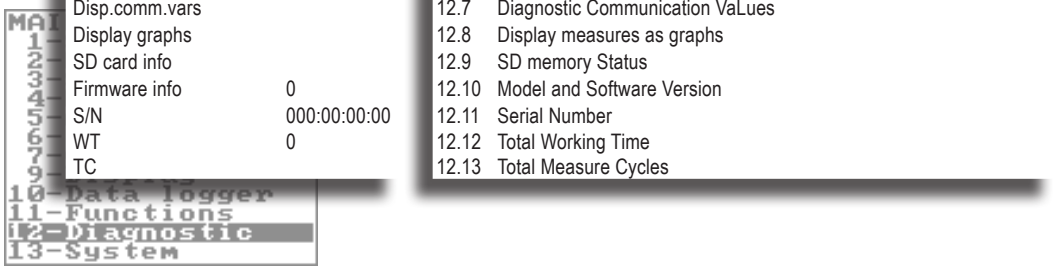
Functions

FUNCTIONS

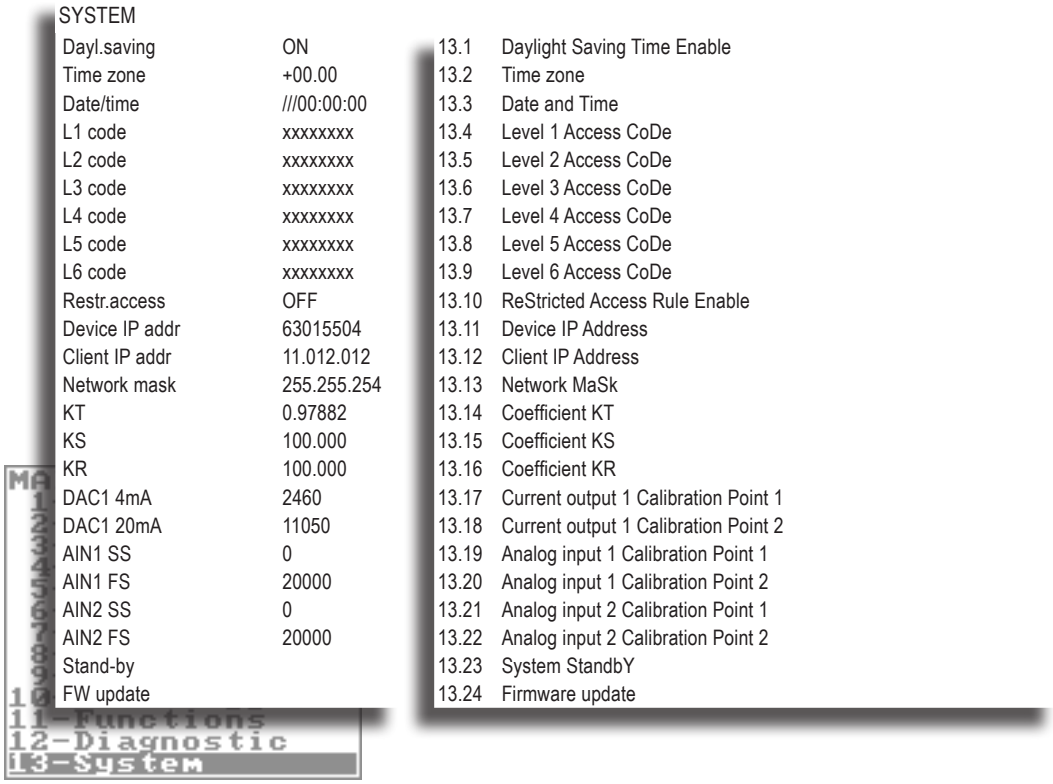
T+ reset	ON	11.1	Vector fluid vol. part. reset function
P+ reset	ON	11.2	Hot water vol. partial reset function
T- reset	;	11.3	Cold water vol. partial reset function
P- reset	.	11.4	Aux input partial reset function
Load Sens.f.def	0:01:00	11.5	Heating energy partial reset function
Load Conv.f.def	OFF	11.6	Cooling energy Partial reset function
Save Sens.f.def	OFF	11.7	Vector fluid vol. total reset function
Save Conv.f.def	OFF	11.8	Hot water vol. total reset function
Calibration	OFF	11.9	Cold water vol. total reset function

Functions Menu

Diagnostic



System



Functions Description

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

Menu visualized on the transmitter (from 1 to 13)

MENU 1 - SENSOR

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

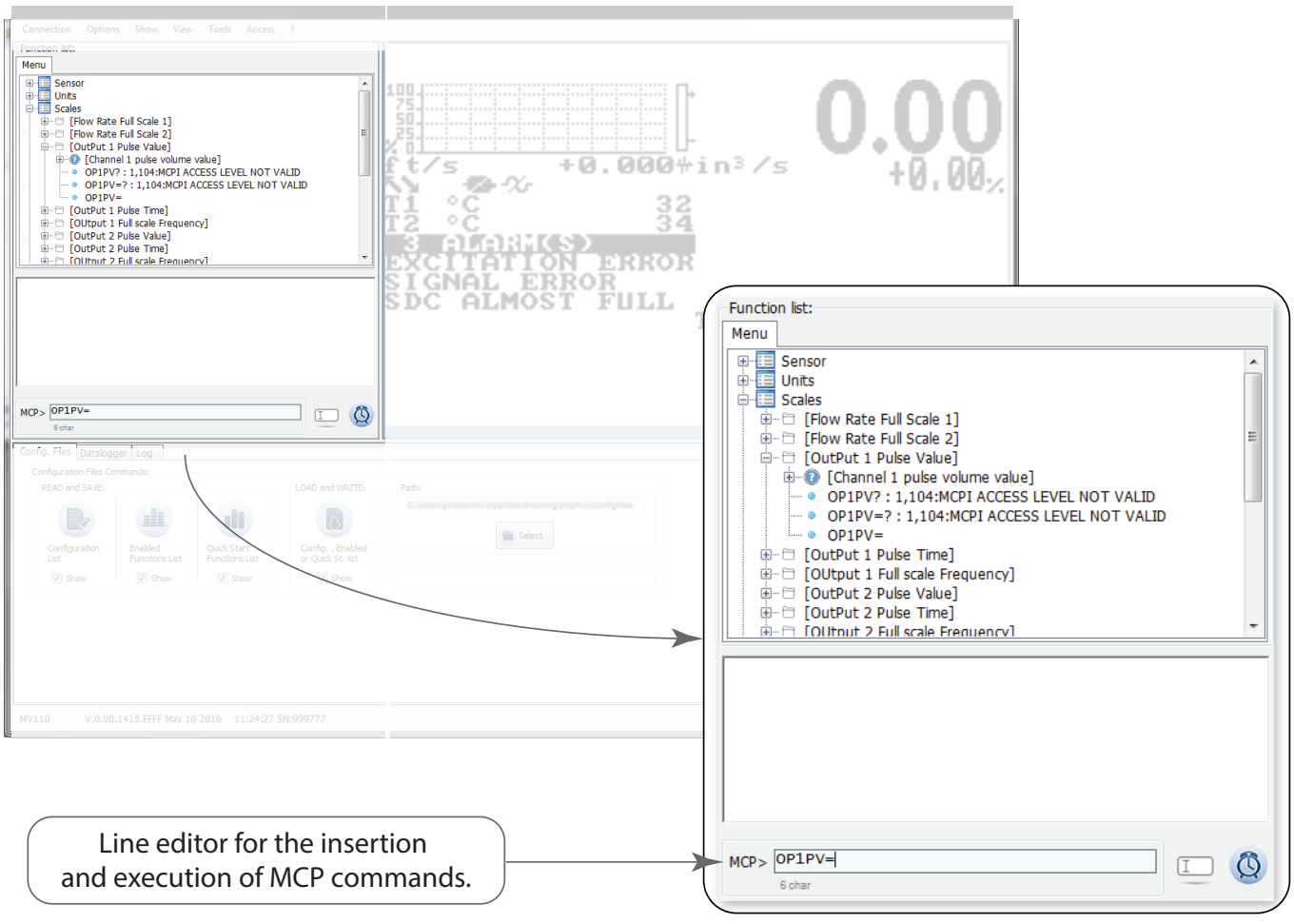
Access level

MCP command

Convert request

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.



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 Material 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) Sensor Type	[S. type = FULL BORE]	*AL4*	[STYPE]

Select the sensor type of full-bore or insertion.

(POS. 1.4) Sensor Units Type	[U.type = METRIC]	*AL2*	[SUTYP]

Select type of unit of measure of sensor's parameter. Values metric or imperial (inch).

(POS. 1.5) Pipe Diameter Value	[Diam. = mm xxx]	*AL4*	[PDIMV]

Select the nominal diameter of the sensor (0-2500). ND is written on the sensor label.

(POS. 1.6) Coefficient KA	[KA = + xx.xxx]	*AL4*	[CFFKA]

KA factor: calibration coefficient

(POS. 1.7) Coefficient KA	[KA = - xx.xxx]	*AL4*	[CFKAN]

KA factor: calibration coefficient for negative flow. This function is showed only if at least 1 negative KL value is set.

(POS. 1.8) Coefficient LK	[KZ = +/- xxxxx]	*AL4*	[CFFKZ]

Calibration Factor. KZ

(POS. 1.9) Coefficient KD	[KD = +/- xxxxx]	*AL4*	[CFFKD]

Calibration Dynamic Factor.

(POS. 1.10) Sensor 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. 1.11) Sensor Insertion Dynamic KP	[KP dynamic = ON/OFF]	*AL4*	[SIPKP]

This function is active with POS.POS. 1.3 see page <HL> set on insertion. See manual of insertion sensor for more details

(POS. 1.12) Coefficient Ki	[Ki = +/- xx.xxx]	*AL4*	[CFFKI]

This function is active with POS. 1.3 see page <HL> set on insertion. See manual of insertion sensor for more details

(POS. 1.13) Coefficient Kp	[Kp dynamic = +/- xxxxx]	*AL4*	[CFFKP]

This function is active with POS. 1.3 see page <HL> set on insertion. See manual of insertion sensor for more details

Menu 1 - Sensor

(POS. 1.14) Coefficient 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. 1.15) Coils Excitation 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. 1.16) Coils Regulator Proportional Band	[C.Reg.PB = xxx]	AL4	[CRPRB]

Proportional band of coils current regulator.This function is activated if the sensor model is NOT present on the sensors table standard parameters.

(POS. 1.17) Coils Regulator Derivative Constant	[C.Reg. DK = xxx]	AL4	[CRDER]

This function enable/disable the presence of the preamplifier. The use of the preamplifier inhibit the possibility to use BIV and Empty Pipe Detection.

(POS. 1.18) Coils Current Rse Time	[C.R.time]	AL4	[CCRTM]

Coils current rise time

(POS. 1.19) Empty Pipe Detection Enable	[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. 1.20) Empty Pipe Detection Threshold	[Z max = Kohm xxxx]	AL4	[EPDTH]

Empty tube detection threshold value. This function is activated if the function is enabled POS. 1.19 pag. 49

(POS. 1.21) Signal Error Alarm Time	[S.err.delay = mxxx]	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. 1.22) Electrodes Cleaning	[El.cleaning = OFF]	AL3	[ELCLN]

Enable the Automatic sensor verification (see BIV optional function)

(POS. 1.23) SET KL Values	[KL = XX + / - XXXXXXXXX]	AL4	[SETKL]

Flow linearization coefficient, reserved to the service. This command is only showed if SMODL = 000.

(POS. 1.24) SET KJ value	[Zero point cal]	AL4	[SETKJ]

This feature appears only when are met the conditions established by the values assigned to functions DYNRT and DYNST, in detail:

- The flowrate is stable lower the value assigned to the function DYNRT.
- It must have elapsed at least the value assigned to the function DYNST after the last significant change of flow rate above the DYNRT value.

When the above conditions are met, the zero-point calibration function will appear on the display.
ALL THIS FUNCTIONS ARE RESERVED TO THE SERVICE, so the values assigned to these functions are not settable.

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

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

Resistance value of E1 electrodes

Sensor E2 Reference Resistance	[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.

(POS. 1.26) SET TK values	[MCP ONLY]	*AL4*	[SETTK]

Temperature coefficients

(POS. 1.26) SET KJ values	[MCP ONLY]	*AL4*	[CFFKJ]

Value of manual zeroing

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) Sensor Diameter Unit of Measure **[Diam.= mm]** ***AL2*** **[SDIUM]**

Sensor diameter unit of measure (mm or inch)

(POS. 2.2) Sensor Cable Length **[S.cable= m]** ***AL2*** **[SCAUM]**

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

(POS. 2.3) Flow Rate Unit of Measure Type **[FR unit= METRIC]** ***AL2*** **[FRMUT]**

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

(POS. 2.4) Pulse 1 Unit of measure Type **[PL1 unit= METRIC]** ***AL2*** **[PL1UT]**

Impulse unit of measure 1: metric or non-metric (English and American units). This works if you function POS. 7.3 pag. 51 is set to the pulse value.
Furthermore the value of this function manages the full scale values of the function POS. 3.2 pag. 50

(POS. 2.5) Pulse 2 Unit of Measure Type **[PL2 unit= METRIC]** ***AL2*** **[PL2UT]**

Pulse unit of measure 2: metric or non-metric (English and American units). This works if you function POS. 7.6 pag. <?> is set to the pulse value.
Furthermore the value of this function manages the full scale values of the function POS. 3.4 pag. <?>.

(POS. 2.6) Totalizer Total Positive Unit of Measure Type **[U.m. T+ = METRIC]** ***AL2*** **[TTPUT]**

This function sets the type of unit of measurement of the totalizer: metric or non-metric (English and American units).

(POS. 2.7) Totalizer Total Positive Unit of Measure **[U.m. T+= m³]** ***AL2*** **[TTPUM]**

This function sets the unit of measurement for the total direct totalizer. The choice of its values depends on the choice of the unit of measurement of the function POS. 2.6 pag. <?>.

(POS. 2.8) Totalizer Total Positive Decimal Point Position **[N.d.T+= METRIC]** ***AL2*** **[TTPDP]**

Setting total 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. 2.9) Totalizer Partial Positive Unit of measure Type **[U.m. P+= METRIC]** ***AL2*** **[TPPUT]**

This function sets the type of unit of measurement of the partial totalizer: metric or non-metric (English and American units).

(POS. 2.10) **[U.m. P+= m³]** ***AL2*** **[TPPUM]**

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

Menu 2 - Units

(POS. 2.11) Totalizer Partial Positive Decimal Point Position **[N.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) Totalizer Total Negative Unit of measure Type **[U.m T-= METRIC]** ***AL2*** **[TTNUT]**

This function sets the type of unit of measurement of the total inverse totalizer: metric or non-metric (English and American units).

(POS. 2.13) Totalizer Total Negative Unit of Measure **[U.m T-= dm³]** ***AL2*** **[TTNUM]**

This function sets the unit of measurement for the total inverse totalizer. The choice of its values depends on the choice of the unit of measurement of the function POS. 2.12 pag. 49.

(POS. 2.14) Totalizer Total Negative Decimal Point Position **[N.d. T-= 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) Totalizer Partial Negative Unit of measure Type **[U.m P-= METRIC]** ***AL2*** **[TPNUT]**

This function sets the type of unit of measurement of the inverse partial totalizer: metric or non-metric (English and American units).

(POS. 2.16) Totalizer Partial Negative Unit of Measure **[U.m P- = dm³]** ***AL2*** **[TPNUM]**

This function sets the unit of measurement for the inverse partial totalizer. The choice of its values depends on the choice of the unit of measurement of the function POS. 2.15 pag. 50

(POS. 2.17) Totalizer Partial Negative Decimal Point Position **[N.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 unit of measure.

(POS. 2.19) Mass Units Enable **[Mass units= ON/OFF]** ***AL2*** **[MSSUE]**

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

(POS. 2.20) Volume to Mass Specific Gravity Coefficient **[Sg= Kg/dm³ x.xxxx]** ***AL2*** **[VMSGC]**

Specific weight setting. This function is activated when the function is enabled POS. 2.19 pag. 16.

(POS. 2.21) Analog Input 1 measure Unit **[AIN1 m.u.]** ***AL2*** **[AIN1U]**

Analog Input 1 measure Unit

(POS. 2.22) Analog Input 2 measure Unit **[AIN2 m.u.]** ***AL2*** **[AIN2U]**

Analog Input 2 measure Unit

Menu 3 - Scale

(POS. 3.1) Flow Rate Full Scale 1	[FS1= l/s xxxx.x]	*AL4*	[FRFS1]

The full scale is used to indicate the maximum flow rate of the meter. The scale must be chosen carefully, since its value is used for many other parameters. There are three input fields for this parameter, from left to right:

1) unit of measure 2) unit of time 3) numerical value

The selection is done by positioning the cursor over the field to be modified. To change the type of measurement (metric, British or American, mass or volume) see functions POS. 2.3 pag. 49, POS. 2.20 pag. 49.
The value of Fs1-2 also depends on the value of the nominal diameter set by the function POS. 2.10 pag. 49 .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 unit of measures are shown as appear on the display. The Imperial units units are diversified by using capital and small characters.

Metric	
cm³	Cubic centimeter
ml	Milliliter
l	Liter
dm³	Cubic decimeter
dal	Decaliter
hl	Hectoliter
m³	Cubic meter
mL	Megaliter

Not Metric	
in³	Cubic inch
Gal	American gallon
GAL	Imperial gallon
ft³	Cubic foot
bbl	Standard barrel
BBL	Oil barrel
yd³	Cubic yard
kgl	KAmerican Gallon
KGL	K British Gallon
IGL	Imperial Gallon
IKG	Imperial K Gallon
IGL	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.

Menu 3 - Scale

(POS. 3.2-3.4) OutPut 1-2 Pulse Value	[Pls1-2 = dm³ x.xxxxx]	*AL2*	[OP1PV-OP2PV]

Vps1 and Vps2 is activated when the pulse values on channel 1 and 2 are set by the following functions POS. 7.1 pag. <AE>; POS. 7.4 pag. 51 This function allows the user to reset the generation of a pulse when a defined amount of liquid has passed through the sensor.

To set the parameter, complete the 2 fields, from left to right: 1) unit of measurement 2) numerical value and the selection is made by positioning the cursor in the field to be modified. To change the type of unit (metric, British or American, mass or volume) see the function POS. 2.4 pag. 49; POS. 2.5 pag. 49. The value Vps1 and Vps2 depends on the nominal diameter that can be set by the function POS. 1.5 pag. 49 and the available units of measurement are those that can be set and described in the function POS. 3.1 pag. 50.

(POS. 3.3-3.5) OutPut1-2 Pulse Time	[Tpls1-2 = ms x.xxxxx]	*AL2*	[OP1PT-OP2PT]

Output 1 and output 2 pulse duration. Tmps1 and Tmps2 is activated when the pulse values on channel 1 and 2 are set by the following functions POS. 7.1 pag. <AE> and POS. 7.4 pag. 51. The user must set the corresponding duration of the pulse to be outputed. This value is expressed in milliseconds and has to be between 5 and 200 ms. 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, and electromechanical pulse counter is connected, a minimum pulse time of 5 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. 3.3) Analog Input 1 Scale	[AIN1]	*AL6*	[AIN1S]

Analog Input 1 Sensor's Scale

(POS. 3.3) Analog Input 2 Scale	[AIN2]	*AL6*	[AIN2S]

Analog Input 2 Sensor's Scale

Menu 4 - Measure

(POS. 4.1) Measure Filter Bypass	[Filt.bypass = ON/OFF]	*AL3*	[MFBYP]

This function modifies the standard behaviour of the filtering system. It can take the following values:

- **"OFF":** SMART adaptive filtering mode, with continuous measure evaluation analysis (default mode, standard use)
- **"1":** When the absolute value of the flow rate is greater than a minimum threshold (0.1 - 0.25% of 10 m/s f.s) the measure value is given without any filtering action. It permits to have the fastest possible response from the meter. Bypassing the filter implies that the obtained measure is more noisy than usual. This function may be useful for systems that needs to react to flow rate changes with the maximum speed and they don't care about unstable flow rate readings. Selecting an appropriate volume unit for pulses and totalizers (as big as possible) can minimize or even null the noise in long term evaluation.
- **"2":** The measure value is always filtered with the longest delay and strongest filtering action. It can be used when the level of native noise or instability on the measure is really high, preventing any smart filtering action. In this case the system will be really slow to react to flow step changes, but still capable of accurate readings.

Menu 4 - Measure

(POS. 4.2) Measure Filter 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) Auto Calibration Verify Enable	[Cal.verify = ON/OFF]	AL3	[ACAVE]

This function enables an automatic verification of board's coefficients. As the transmitter 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) High Immunity Inputs	[H.imm. inp.]	AL4	[HIINP]

The HIINP function (INPut High Immunity filter) introduces a hardware filter to be used ONLY IN CASE OF ABSOLUTE NECESSITY, when the measure is absolutely unstable or it is NOT possible to make the measure, and every possible attempt to reduce or eliminate the noise do not give a positive result, with particular attention of instrument ground connection. When this function is activated (HIINP = ON) the measure will be influenced by an unavoidable error estimated around 1%.

Menu 4 - Measure: Only MCP Functions

Low Power Cycle Simulation	[MCP ONLY]	AL6	[LPSIM]

"Low power cycle simulation" can be used to make the flow meter measuring in the same way it does when it is going on battery even when it is powered by USB or power supply.

Measure Filter Cut-off Threshold 2	[MCP ONLY]	AL6	[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.

Pressure Cut-off Threshold	[MCP ONLY]	AL3	[PRCUT]

Pressure cut-off threshold

Dynamic Sample Analysis	[MCP ONLY]	AL6	[DYNSA]

Reserved to the service

Dynamic Sample Time	[MCP ONLY]	AL6	[DYNST]

Reserved to the service

Dynamic Range Threshold	[MCP ONLY]	AL6	[DYNRT]

Reserved to the service

Measure Sampling Time	[MCP ONLY]	AL4	[MSTME]

This function allows to program the sampling interval within these values:
0:'01(s)'|1:'02(s)'|2:'03(s)'|3:'04(s)'|4:'05(s)'|5:'06(s)'|6:'10(s)'|7:'12(s)'|8:'15(s)'
default value=8:'15(s)'

Menu 5 - Alarms

(POS. 5.1) Flow Rate Alarm Max Positive	[Max+ = XXXXX]	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 in technical units and can be set from 0 to frmax, with resolution 1/250 of frmax.Setting this parameter to OFF disables the alarm start.

(POS. 5.2) Flow Rate Alarm Max Negative	[Max- = XXXXX]	*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 in technical units and can be set from 0 to frmax, with resolution 1/250 of frmax.Setting this parameter to OFF disables the alarm start.

(POS. 5.3) Flow Rate Alarm Min Positive	[Min+ = XXXXX]	*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 in technical units and can be set from 0 to frmax, with resolution 1/250 of frmax.Setting this parameter to OFF disables the alarm start.

(POS. 5.4) Flow Rate Alarm Min Negative	[Min- = XXXXX]	*AL3*	[FRANN]

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 in technical units and can be set from 0 to frmax, with resolution 1/250 of frmax.Setting this parameter to OFF disables the alarm start.

(POS. 5.5) Alarm Thresholds Hysteresis	[Hysteresis = XXXXX]	AL3	[ATHYS]

Hysteresis threshold set for the minimum and maximum flow rate alarms. The value of this parameter is expressed in technical units and can be set from 0 to 1/250 of the fsmax at 10 m / s.

GENERAL NOTE FOR ALARM THRESHOLDS (POS 5.5-5.6-5.7-5.8-5.9)

To set the alarm threshold the system calculates a technical units value using the data entered as an alarm value and as reference the full scale of the corresponding analog channel. If the calculated technical units value is close to zero, the function changes to the “OFF” value.

% Value set internally = (100 x value set on the display) / full scale value

Therefore make sure that the value entered is sufficient not to fall back into the condition for which the function switches to the “OFF” value.

(POS 5.6) Analog Input 1 Alarm Max	[A1Mx = XXXXXX]	*AL3*	[AI1MX]

MAX analog input 1 alarm threshold. Set this parameter to zero to disable the alarm start.

(POS. 5.7) Analog Input 1 Alarm Min	[A1Mn = XXXXXX]	AL3	[AI1MN]

Alarm threshold MIN analog input 1. Set this parameter to zero to disable the start of the alarm.

(POS 5.8) Analog Input 2 Hysterisis	[Ai1H = xxx]	*AL3*	[AI1HY]

Hysterisis value on analog input 1

(POS. 5.9) Analog Input 2 Alarm Max	[A2Mx = XXXXXX]	AL3	[AI2MX]

MAX alarm input analogue threshold 2. Set this parameter to zero to disable the start of the alarm.

(POS 5.10) Analog Input 2 Alarm Min	[A2Mn = XXXXXX]	*AL3*	[AI2MN]

Alarm threshold MIN analogue input 2. Set this parameter to zero to disable the start of the alarm.

(POS. 5.11) Analog Input 2 Hysterisis	[Ai2H = xxx]	AL3	[AI2HY]

Hysterisis value on analog input 2

Menu 6 - Inputs

(POS. 6.1-2) Volume Totalizer Total /Partial Positive Reset 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) Volume Totalizer Total /Partial Negative Reset 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 Count Lock Input Enable [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 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 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) System Violation Detect [sys.v.detect = ON/OFF] *AL3* [SYSVD]

Enable alarm related to system violation.

(POS. 6.9) Digital Input 2 Function [D.In2 = All./Vi.sist/OFF] *AL3* [DIN2F]

Input 2 function selection. The values that can be set are: system violation, flooding and OFF.

(POS. 6.10) Digital Input 3 Function [D.In3 = All./Vi.sist/OFF] *AL3* [DIN3F]

Input 3 function selection. The values that can be set are: system violation, flooding and OFF

(POS. 6.11) Digital Inputs Power Supply [D.in p.sup = ON/OFF] *AL3* [DINPS]

Digital auxiliary input power supply.

Menu 7 - Outputs

The values to be associated with outputs 1/2/3/4 relating to functions 7.1 / 7.4 / 7.7 / 7.10 are listed below:

- **OFF:** DISABLE
- **MAX AL. +:** MAX DIRECT FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- **MIN AL. +:** MIN DIRECT FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- **MAX/MIN+:** MAX/MIN DIRECT FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- **MAX AL.-:** MAX INVERSE FLOW RATE OUTPUT (ENERGIZED = AL. OFF)
- **MIN AL.-:** MAX 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)
- **HARDW AL.SYSTEM ALARM:** IT IS ACTIVATED WHEN ONE OR MORE OF THE FOLLOWING CONDITIONS OCCUR: coil excitation error, flow measurement acquisition error (critical signal or acquisition conditions), auxiliary measurement acquisition error. if they are installed (temperature, pressure, etc.)
- **OVERFLOW:** OUT OF RANGE ALARM OUTPUT (ENERGIZED = FLOWRATE OK)
- **ALL ALARMS:** SUM OF ALL ALARMS POSSIBLE
- **EXT. COMM:** THE OUTPUT CAN ASSUME A STATUS DEPENDENT ON AN EXTERNAL COMMAND (via MCP, MODBUS, etc.)
- **BATT. LOW:** REPORT WHEN THE BATTERIES ARE ALMOST EMPTY
- **FLOW RATE SIGN.:** FLOW DIRECTION (ENERGIZED WHEN FLOW IS NEGATIVE)
- **IAN1 MAX:** MAXIMUM VALUE OF ANALOGUE INPUT 1 (function linked to the values set in the function POS. 3.6 pag. 50)
- **IAN1 MIN:** MINIMUM VALUE OF ANALOGUE INPUT 1 (function linked to the values set in the function POS. 3.6 pag. 50)
- **IAN1 MX / MN:** MAXIMUM AND MINIMUM VALUE OF ANALOGUE INPUT 1 (function linked to the values set in the function POS. 3.6 pag. 50)
- **AIN2 MAX:** MAXIMUM VALUE OF ANALOGUE INPUT 2 (function linked to the values set in the function POS. 3.7 pag. 50)
- **AIN2 MIN:** MINIMUM VALUE OF ANALOGUE INPUT 2 (function linked to the values set in the function POS. 3.7 pag. 50)
- **AIN2 MX / MN:** MAXIMUM AND MINIMUM VALUE OF ANALOGUE INPUT 2 (function linked to the values set in the function POS. 3.7 pag. 50)
- **PULSES.+:** PULSE POSITIVE FLOW RATE
- **PULSES.-:** PULSE NEGATIVE FLOW RATE
- **PULSES+/-:** PULSE NEGATIVE/POSITIVE FLOW RATE

(POS. 7.1) Output 1 Function	[Out1 = XXXXX]	*AL3*	[OUT1F]

Assigned function output 1. The values that can be set are described in the introduction to the MENU 7 OUTPUTS description.

(POS. 7.2) Output 1 Inverted Status	[Out1 inv. = OFF/ON]	*AL3*	[O1INV]

Output 1 Inverted status

(POS. 7.3) Output 1 Pulsed Status	[Out1 inv. = OFF/ON]	*AL3*	[O1PLS]

Output 1 PuLsed Status

Menu 7 - Outputs

(POS. 7.4) Output 2 Function **[Out2 = XXXXXX]** ***AL3*** **[OUT2F]**

Assigned function output 2. The values that can be set are described in the introduction to the MENU 7 OUTPUTS description.

(POS. 7.5) Output 2 Inverted Status **[Out2 inv. = OFF/ON]** ***AL3*** **[O2INV]**

OUtput 2 INVerted status.

(POS. 7.6) Output 2 Pulsed Status **[Out2 pls.= OFF/ON]** ***AL3*** **[O2PLS]**

Output 2 impulsive operation

(POS. 7.7) Output 3 Function **[Out3 = XXXXXX]** ***AL3*** **[OUT3F]**

Assigned function output 3. The values that can be set are described in the introduction to the MENU 7 OUTPUTS description.

(POS. 7.8) Output 3 Inverted Status **[Out3 inv. = OFF/ON]** ***AL3*** **[O3INV]**

OUtput 3 INVerted status.

(POS. 7.9) Output 3 Pulsed Status **[Out3 pls. = OFF/ON]** ***AL3*** **[O3PLS]**

Output 3 impulsive operation

(POS. 7.10) Output 4 Function **[Out4=XXXXXX]** ***AL3*** **[OUT4F]**

Assigned function output 4. The values that can be set are described in the introduction to the MENU 7 OUTPUTS description.

(POS. 7.11) Output 4 Inverted Status **[Out4 inv. = OFF/ON]** ***AL3*** **[O4INV]**

OUtput 4 Inverted status.

(POS. 7.12) Output 4 Pulsed Status **[Out4 pls. = OFF/ON]** ***AL3*** **[O4PLS]**

Output 4 impulsive operation

(POS. 7.13) Analog Output 1 Configuration **[Out mA1 = XXXXX]** ***AL3*** **[AO1CF]**

Choice of the measuring range to be associated with the current output 1. There are three modification fields:

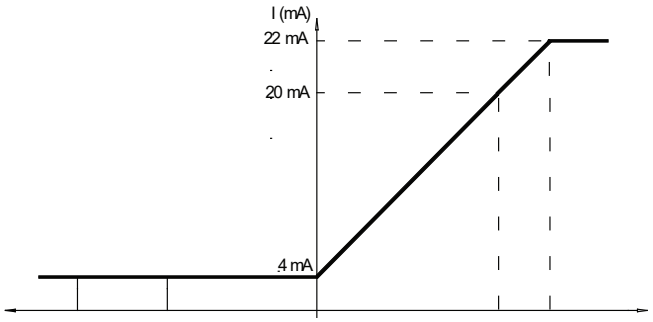
- Scale zero: 4 or 0mA
- Full scale: 20 or 22mA
- Field: + = positive, - = negative, blank = both, -0+ = central zero scale

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

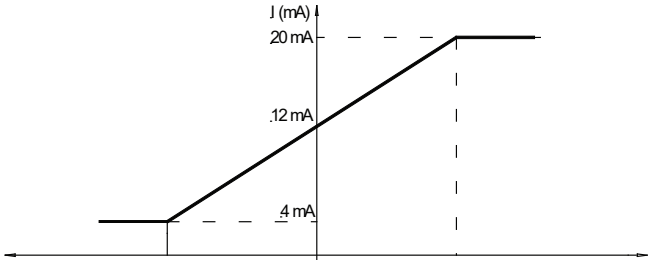
Current Values in mA Associate to the % Full Scale Value					
Possible Field	**Reverse Flow Value**		**Zero**	**Direct Flow Value**	
	≤-110%	-100%	0%	+100%	≥+110%
*Out.mA = 4 ÷ 20 +	4	4	4	20	20
Out.mA = 4 ÷ 20 -	20	20	4	4	4
Out.mA = 4 ÷ 20 +/-	20	20	4	20	20
**Out.mA = 4 ÷ 20 –0+	4	4	12	20	20

Menu 7 - Outputs

* Example 1: out 4-20 +



** Example 2: out 4-20 –0+



(POS. 7.14) Analog Output 1 Full Scale	[A1S = xx/x x.xxxx]	AL3	[AO1FS]

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

Menu 8 - Comunications

(POS. 8.1) Device Address	[Dev. Addr.]	AL3	[DVADD]

Device Address.

(POS. 8.2) Modbus Speed	[Speed]	AL3	[MDBSP]

Modbus Speed. Speed range setting: 4800(bps) / 9600(bps) / 19200(bps) / 22800(bps) / 38400(bps)/ 57600(bps).

(POS. 8.3) Modbus Parity	[Parity]	AL3	[MDBPA]

Modbus Parity.

(POS. 8.4) Modbus Delay	[Delay]	AL3	[MDBDL]

Modbus delay.

(POS. 8.5) Modbus Chars Timeout	[C.timeout]	AL3	[MDBCT]

MODBUS Chars Timeout

For ModBus functions see the dedicated manual

Menu 9 - Display

(POS. 9.1) Layout Language	[Language]	*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) Keyboard Timeout Time	[Disp. time]	*AL1*	[KBTMT]

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

(POS. 9.3) Display Function Number	[Disp.fn]	*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.

(POS. 9.4) Display Function Lock Enable	[Disp.lock = x]	*AL2*	[DLOKE]

This function locks the scrolling of the display pages selected by the setting. POS. 9.5 see page 36 function.

(POS. 9.5) Partial Totalizers Enable	[Part. tot = ON]	*AL2*	[PTOTE]

This function enables the display of partial totalizer in visualization pages

(POS. 9.6) Negative Value Totalizers Enable	[Neg. tot = ON]	*AL2*	[NEGTE]

This function enables the display of negative totalizer in visualization pages

(POS. 9.7) Net Value Totalizers Enable	[Net. tot = ON]	*AL2*	[NVTTE]

This function enables the display of net totalizer in visualization pages

(POS. 9.8) Date and Time Display Enable	[Disp.Date = ON]	*AL2*	[DATDE]

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

(POS. 9.9) Quick Start Menu Enable	[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 logger.

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

(POS. 10.2) Data Logger Units of Measure Enable	[Meas. units = ON]	*AL3*	[DLUME]

Enables the registration of the units of measurement set in the device.

(POS. 10.3) Data Logger Field Separator Character	[Field separ. = ;]	*AL3*	[DLFSC]

This function will set the separator character between data logger data.

(POS. 10.4) Data Logger Decimal Separator Character	[Decim.separ. = .]	*AL3*	[DLDSC]

This function sets the separator character between the value of the num. value of the recorded data.

(POS. 10.5) Data Logger Sample Interval	[Interv. = xx:xx:xx]	*AL3*	[DLGSI]

Sampling interval. This function set the log frequency. [Interv.= Hours : Minutes: Seconds]

(POS. 10.6) Data Logger Totalizer Total Positive Enable	[Log T+ = ON]	*AL3*	[DTTPE]

Enables recording of total positive totalizer values.

(POS. 10.7) Data Logger Totalizer Partial Positive Enable	[Log P+ = ON]	*AL3*	[DTPPE]

Enables recording of positive partial totalizer values.

(POS. 10.8) Data Logger Totalizer Total Negative Enable	[Log T- = ON]	*AL3*	[DTTNE]

Enables recording of total negative totalizer values.

(POS. 10.9) Data Logger Totalizer Partial Negative Enable	[Log P- = ON]	*AL3*	[DTPNE]

Enables recording of negative partial totalizer values.

(POS. 10.10) Data Logger Totalizer Total Net Enable	[Log TN = ON]	*AL3*	[DLTNE]

Enables recording of total totalizer net values.

(POS. 10.11) Data Logger Totalizer Partial Net Enable	[Log PN = ON]	*AL3*	[DLPNE]

Enables the recording of the net partial totalizer values.

(POS. 10.12) Data logger Flow Rate in Technical Units Enable	[Log Q(UM) = ON]	*AL3*	[DFTUE]

Ability to record the flow rate in a set unit of measurement.

(POS. 10.13) Data logger Flow rate in Percentage Enable	[Log Q(%) = ON]	*AL3*	[DFPCE]

Ability to record the flow rate as a percentage of the set full scale value

(POS. 10.14) Data Logger Alarm Events Enable	[Log AL.EV = ON]	*AL3*	[DALEE]

Enables recording of events and alarms.

Menu 10 - Data Logger

(POS. 10.15) Data logger Additional Measure Enable	[Log ADM = ON]	*AL6*	[DADME]

It allows to log the additional analog measurements, as for example pressure and temperature.
This option is valid only with analog inputs enabled and the module installed.

(POS. 10.16) Data logger Sensor Test Results Enable	[Log STR = ON]	*AL6*	[DSTRE]

Enable logging of sensor test results

(POS. 10.17) Data logger Board Temperatures Enable	[Log BTS = ON]	*AL6*	[DBTSE]

Enable logging of board temperature

(POS. 10.18) Data logger Internal Board Voltages	[Log IBV = ON]	*AL6*	[DIBVE]

Enable logging of internal board voltage

(POS. 10.19) Data logger Electrodes DC Voltages Enable	[Log EDC= ON]	*AL6*	[DEDVE]

Enable logging of electrodes DC voltage

(POS. 10.20) Data logger Electrodes AC voltages Enable	[Log AEC= ON]	*AL6*	[DEAVE]

Enable logging of electrodes AC voltage

(POS. 10.21) Data logger Electrodes Source Impedance Enable	[Log EIZ= ON]	*AL6*	[DESIE]

Enable logging of electrodes impedance

(POS. 10.22) Data logger Sensor Coils Values Enable	[Log SCV= ON]	*AL6*	[DSCVE]

Enable logging of sensor coils value

Menu 10 - Data Logger: Only MCP Functions

Log All Information Enable	[MCP ONLY]	*AL0*	[LGAIE]

Enable logging of all instrument events. This function enables the recording of all data for which registration is required. Activating this function, the system records in detail each operation with the consequence that the file produced by the logger will be large and will incisively reduce the space in the SD memory. It is advisable to activate this function only if necessary (for example to identify communication problems with SMTP or FTP servers).

Sensor Test Data Fields Format	[MCP ONLY]	*AL0*	[DLFLF]

Data logger fields format

Sensor Test Data Fields Format	[MCP ONLY]	*AL0*	[STFLF]

Format sensor test data fields

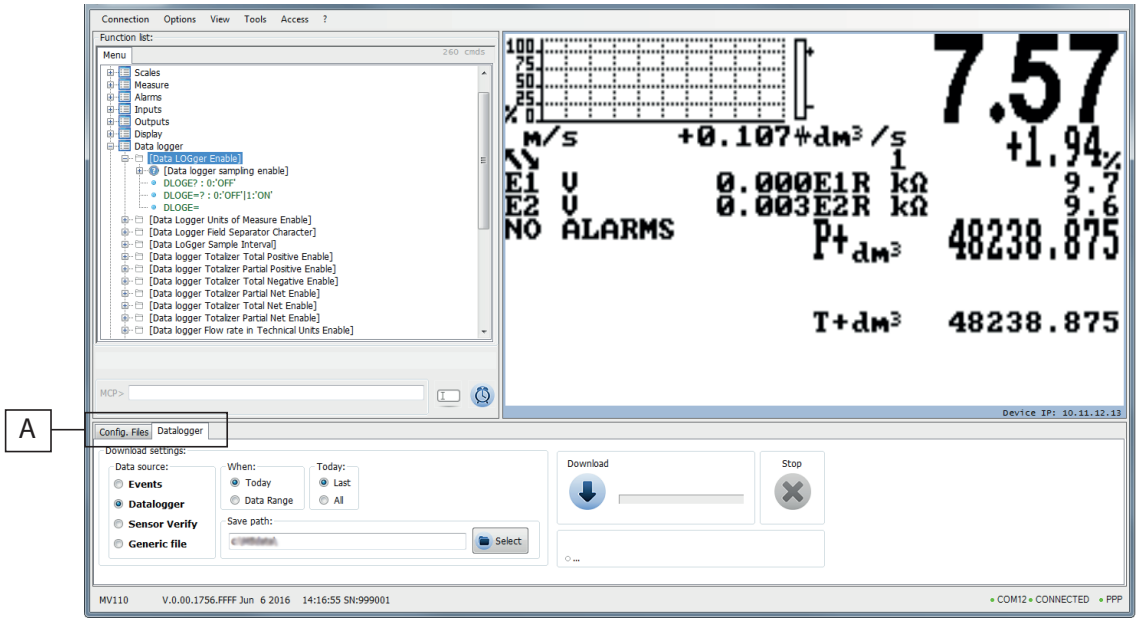
Data Logger Instantaneous Process Data	[MCP ONLY]	*AL0*	[DLIPD]

Read instantaneous values of process data.

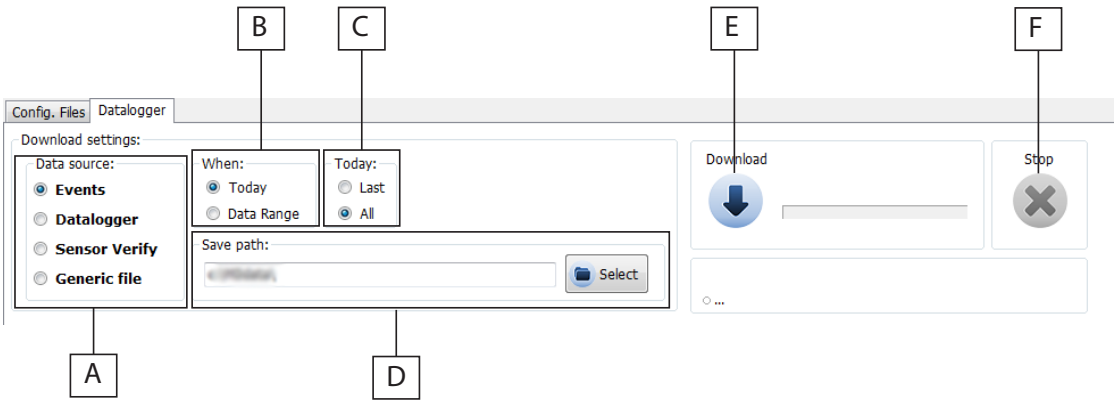
Using Data Logger by MCP Interface

The data collected by the data logger are stored on a micro SD card. Their organization is based on a tree structure and the system saves day by day, in two separate files, events and data loggers. Data can be downloaded via the MCP interface, as shown in the following examples. **Note:** The number of processed data depends on the sampling interval set and the number of variables enabled for registration.

MCP Interface



Select the “data logger” tab as shown below to access the file download interface.



A=Data source
Events: Download system events (Sample Line 2016/09 / 14-01: 00: 00.000 -W0216- [1] ALARMS still active)
Data logger: Download and save the recorded data through the data logger function.
Sensor Verify: Download sensor verification data (if BIV is active).
Generic file: Download a specific file contained in the SD card.

B=When
Indicates the reference period to download the data.
Today: current day file download
Data range: selection of the download period.

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

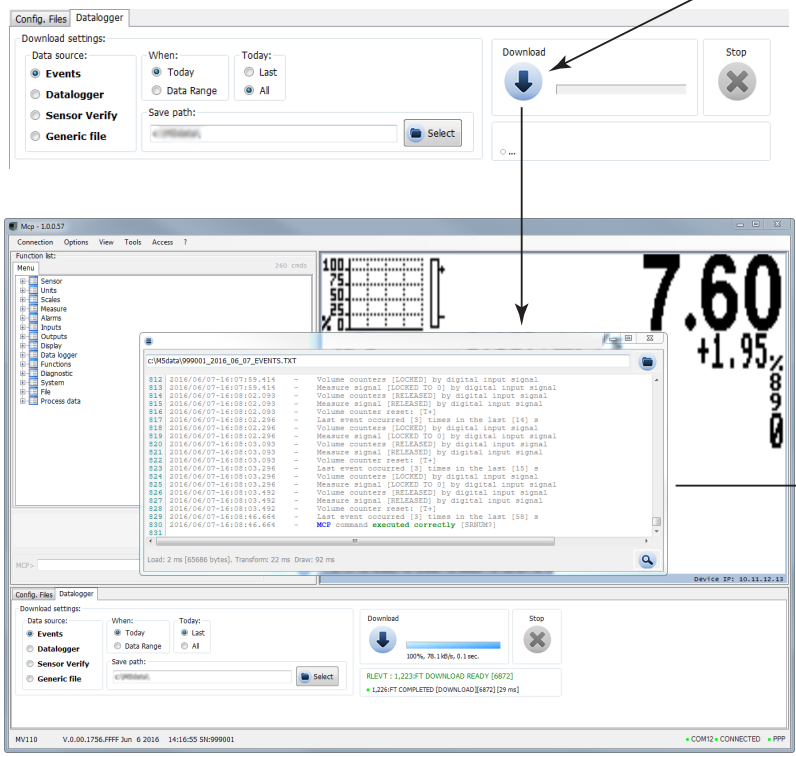
E=Download:

Button to start the download process

F=Stop:

Button to stop the download process

Example: Download Events

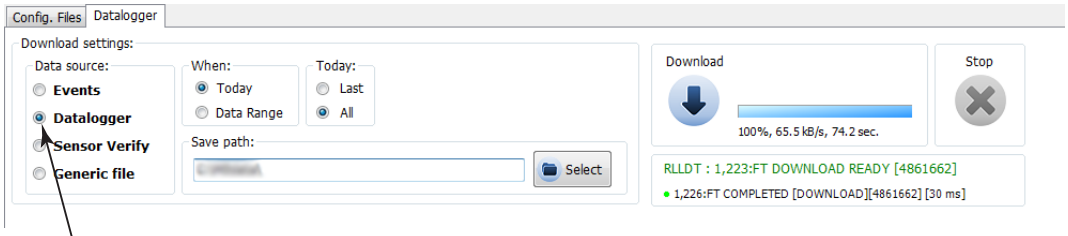


To download all the events of the current day in a specific folder, set the below parameters as follows:
Data source: Events
When: Today
Today: All
Save path: C: / .....
The parameters are set then click the Download button.

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 transmitter 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.

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).

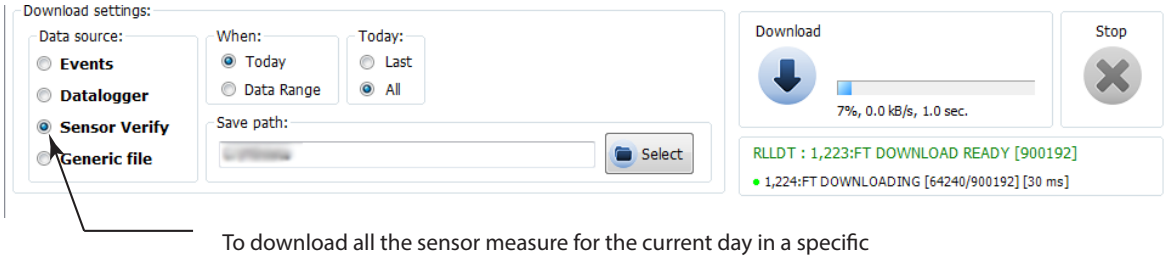
Visualization of downloaded file. Access Level 2 (diagnostic level) is required in order to download this type of file.

A	N.RECORD n° n° n°	**N°Record:** View progressively the number of registered records.
B	DATE dd/mm/yy dd/mm/yy dd/mm/yy	**Date:** The recording date viewing for each record.
C	HOURS 00:00:00 00:00:00 00:00:00	**Hours:** Time recording viewing for each record.
D	U.M dm3 dm3 dm3	**Total positive totalizer value:** Form Fields when the send flag is active on the totalizer T+.
E	T+ 0 0 0	
F	U.M dm3 dm3 dm3	**Partial positive totalizer value:** Form Fields when the send flag is active on the totalizer P+.
G	P+ 0 0 0	
H	U.M dm3 dm3 dm3	**Total negative totalizer value:** Form Fields when the send flag is active on the totalizer T-.
I	T- 0 0 0	
J	U.M dm3 dm3 dm3	**Partial negative totalizer value:** Form Fields when the send flag is active on the totalizer P-.
K	P- 0 0 0	
L	U.M dm3 dm3 dm3	**Total net totalizer value:** Form Fields when the send flag is active on the totalizer TN.
M	TN 0 0 0	
N	U.M dm3 dm3 dm3	**Partial net totalizer value:** Form Fields when the send flag is active on the totalizer PN
O	PN 0 0 0	
P	U.M dm3/s dm3/s dm3/s	**Flow rate:** Form Fields present when the send flag is on the flow in units of measurement.
Q	F. RATE 0 0 0	
R	Value % % %	**Flow rate %:** value of the flow expressed in percent of the full scale. Fields present when the percentage flow send flag is active.
S	F.RATE % 0 0 0	
T	ALARMS AL AL AL	**N° active alarms**: form fields present when the flag of alarm recording is active (only n° of present total alarms)
U	N° 0 0 0	
V	U.M mA mA mA	**Loss of current measured during insulation test:** available value when recording the sensor test data is active.
W	CPTI 0 0 0	
X	U.M ms ms ms	**Time rise A:** Available value when recording the sensor test data is active.
Y	T.RISE A 0 0 0	
Z	U.M ms ms ms	**Time rise B:** Available value when recording the sensor test data is active.
AA	T.RISE B 0 0 0	
AB	ERROR ERR ERR ERR	**Sensor test error code:** Available value when recording the sensor test data is active.
AC	N° 0 0 0	
AD	U.M V V V	**Voltage measured on electrode E1:** Form fields when is active the recording of data on the input voltage (diagnostic value).
AE	E1V 0 0 0	
AF	U.M V V V	**Voltage measured on electrode E2:** Form fields when is active the recording of data on the input voltage (diagnostic value).
AG	E2V 0.023 0.023 0.023	

AH	U.M V V V	**Differential voltage between the two electrodes VD=E1-E2:** Form fields when is active the recording of data on the input voltage (diagnostic value)
AI	Value 0 0 0	
AJ	U.M V V V	**Common mode voltage in the electrodes VC=E1+E2/2:** Form fields when is active the recording of data on the input voltage (diagnostic value).
AK	Value 0 0 0	
AL	U.M V V V	**Noise at low frequency measured on the electrodes**: Form fields when is active the recording of data on the input signal noise levels (diagnostic value).
AM	Value 0 0 0	
AN	U.M V V V	**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).
AO	Value 0 0 0	
AP	U.M mV mV mV	**Low-frequency noise measured input ADC:** Form fields when is active the recording of data on the input signal noise levels (diagnostic values).
AQ	Value 0 0 0	
AR	U.M mV mV mV	**High frequency noise measured input ADC**: Form fields when is active the recording of data on the input signal noise levels (diagnostic values).
AS	Value 0 0 0	
AT	U.M kohm kohm kohm	**Measured equivalent resistance on the electrode 1:** Form fields when is active the recording of data on the electrode resistance measurements (diagnostic values).
AU	E1R 0 0 0	
AV	U.M kohm kohm kohm	**Measured equivalent resistance on the electrode 2:** Form fields when is active the recording of data on the electrode resistance measurements (diagnostic values).
AW	E2R 0 0 0	
AX	U.M mA mA mA	**Coils excitation current:** Form fields when is active the recording of data related to the sensor excitation circuit measures (diagnostic value)
AY	EXC.CURR. 0 0 0	
AZ	U.M ohm ohm ohm	**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).
BA	R.COILS 0 0 0	
BB	U.M C° C° C°	**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).
BC	TCOILS 0 0 0	
BD	U.M C° C° C°	**Temperature T1 (sheet sensor 1):** Form fields when the data transmission flag on board the internal temperature measurement is active (diagnostic values).
BE	T1 0 0 0	
BF	U.M C° C° C°	**Temperature T2 (sheet sensor 2):** Form fields when the data transmission flag on board the internal temperature measurement is active (diagnostic values).
BG	T2 0 0 0	
BH	U.M C° C° C°	**CPU temperature:** Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic value).
BI	TCPU 0 0 0	
BJ	U.M V V V	**Primary power supply of CPU:** Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic value).
BK	VCPU 0 0 0	
BL	U.M V V V	**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).
BM	Value 0 0 0	
BN	U.M V V V	**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).
BO	Value 0 0 0	
BP	/	Not available value
BQ	/	
BR	U.M V V V	**Unit of measure and Voltage value of rechargeable battery.** Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic values).
BS	BATT 0 0 0	
BT	Value % % %	**% Battery charge:** Form fields when the data on the card's internal power supply voltage measurements flag is ON (diagnostic values).
BU	BATT % 0 0 0	
BV	HEX 0x8A97 0xD1D8 0x3754	Checksum

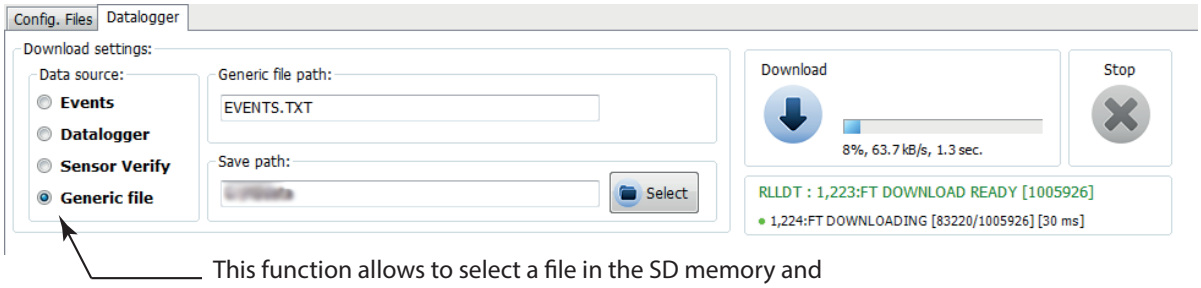
Example: Sensor Verify

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 transmitter 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) Volume Totalizer Total Positive Reset	[T+ RESET = ON]	*AL3*	[VTTPR]

Reset total direct totalizer for direct flow rate (+)

(POS. 11.2) Volume Totalizer Partial Positive Reset	[P+ RESET = ON]	*AL3*	[VTPPR]

Reset total partial totalizer for direct flow rate (+)

(POS. 11.3) Volume Totalizer Total Negative Reset	[T- RESET = ON]	*AL3*	[VTTNR]

Reset total reverse totalizer for direct flow rate (-)

(POS. 11.4) Volume Totalizer Partial Negative Reset	[P- RESET = ON]	*AL3*	[VTPNR]

Reset partial reverse totalizer for direct flow rate (-)

(POS. 11.5) Load Factory Default Sensor Data	[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 Transmitter Data	[Load conv.f.def = ON]	*AL3*	[LFDCD]

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

(POS. 11.7) Save Factory Default Sensor Data	[Save sens.f.def = ON]	*AL6*	[SFDSD]

This function save the parameters of the sensor factory default.

(POS. 11.8) Save Factory Default Transmitter Data	[Save conv.f.def = ON]	*AL6*	[SFDCD]

This function loads the data from a transmitter to another.

(POS. 11.9) CALibration Immediate Command	[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:

- SENSOR DIAMETER -> Menu Sensor1
- SENSOR MODEL -> Menu Sensor1
- Exc. CURRENT -> Menu Sensor1
- 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

Sensor Reference Data Save	[MCP ONLY]	AL4	[SRFDS]

Save conv.f.def= ON, saving sensor reference 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.

Input Reference Data Save	[MCP ONLY]	AL4	[IRFDS]

Save electrodes reference data.

Menu 12 - Diagnostic

(POS. 12.1) Autotest Immediate Command	[Self Test]	*AL3*	[ATSIC]

If-test function. This function stops the normal functions of the counter and performs a complete test cycle on the input, measurement and excitation circuits. To Activate this function, after having selected it, press the “enter” button and the question “Confirm?“ Press “ESC“ to automatically start the test or any other button to cancel the operation. At the end of the operation the converter restarts and restores the screen to the initial display page. This function is performed automatically when the device is turned on.

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

This function allows you to test the graphic display of the converter. During the execution of this function, 4 screens are displayed in sequence to test the correct operation of the device.

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

Diagnostic function and sensor verification, allows to do a sensor test (if BIV enabled).

(POS. 12.4) Measure Simulation Enable	[Flow sim = ON]	*AL3*	[MSIEN]

Enabling the flow simulation function. By activating this function it is possible to simulate a flow. With this system it is possible to test the outputs of the meter and the instruments connected to it. After enabling the flow rate, this symbol appears on the display‘▲▼’ and the simulation can be:

- Set: pressing the “Enter” key from one of the display pages, to set the% flow rate value, and pressing “Enter” again to confirm the value.
- Ended: by pressing the “Esc” key on the page where the simulated value is set.

(POS. 12.5) Diagnostic System Values	[Disp. sys. val.]	*ALL*	[DSVLS]

This function shows the values of CPU temperatures and total measure cycle

(POS. 12.6) Diagnostic Measure Values	[Display measures]	*AL5*	[DMVLS]

This function shows the values of various internal parameters (diagnostic purpose reserved for the service).

Menu 12 - Diagnostic

(POS. 12.7) Diagnostic Communication 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
MCPI_S: ESTABLISH
RxCNT:      1477149
TxCNT:      6515456
E_SR_LINK:        0
E_PAKTLEN:        0
E_NETLAYR:        0
E_TSPLAYR:        0
E_ARPHDR1:        0
E_ARPHDR2:        0
E_IP_HDR1:        0
E_IP_HDR2:        0
E_IP_HDR3:        0
E_IP_HDR4:        0
E_IP_HDR5:        3
E_IP_HDR6:        0
E_IP_HDR7:        0
E_IP_HDR8:        0
E_IP_HDR9:        0
E_TCPHDR1:        0
E_TCPHDR2:        0
E_UDPHDR1:        0
E_UDPHDR2:        0
E_UDPHDR3:       92
E_ICMPHDR:        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:

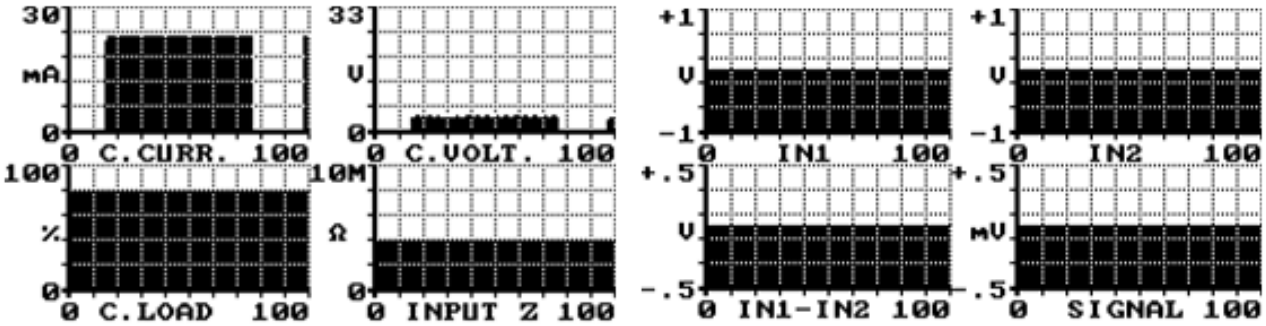
"CLOSED" = socket closed
"ACCEPT" = socket awaiting for new connection
"ESTABLISH" = link established
"CLS_WAIT" = waiting for closure
"LAST_ACK" = lask ACK sent
"FIN_WAIT" = (see TCP/IP RFC documentation)
"TIME_WAIT" = (see TCP/IP RFC documentation)

(POS. 12.8) Oscilloscope Function [Display graphs] *AL5* [OSCOP]

This function displays the input graphs. The MCP command allows you to see the data on the graph in numeric format, as a list of values. Typing OSCOP = 1 allows you to view the numeric values of the graph in position 1. The measurement charts provided are 8.

Z = impedance
C. current = Coils current
C. volt = Coils voltage
C.load: Coils load

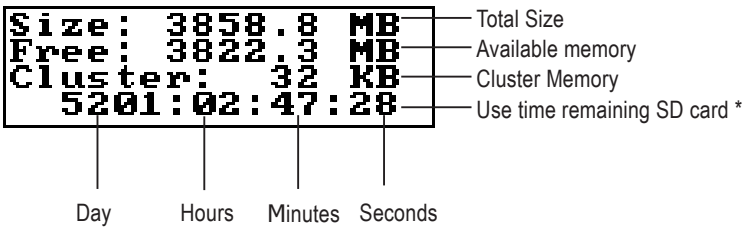
Input 1 = E1
Input 2 = E2
SIGNAL = analog to digital converter.
Input 1-Input 2



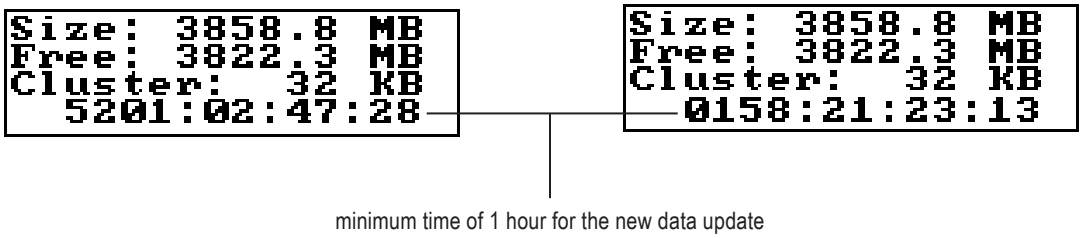
Menu 12 - Diagnostic

(POS. 12.9) SD memory Status	[SD card info]	*AL0*	[SDSTA]

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



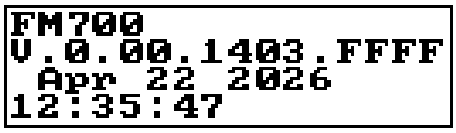
The statistical calculation is performed every time the command SDSTA is invoked. The statistical data are updated AUTOMATICALLY every day (24 hours) or manually each time the function is called to display or send the SDSTA command. However, given that for the detection is necessary a minimum of one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



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) Model and Software Version	[Firmware info]	*AL0*	[MODSV]

Firmware info version/revision



(POS. 12.11) Serial Number	[S/N= xxxxxx]	*AL0*	[SRNUM]

View Board serial number. (read only)

(POS. 12.12) Total Working Time	[WT = xxxx: xx: xx: xx]	*AL0*	[TWKTM]

View Total working time instrument. (read only)

(POS. 12.13) Total Measure Cycles	[TC = xxxxxxxxxx]	*AL0*	[TMCYC]

View Total number of cycles measured on battery (read only)

Menu 12 - Diagnostic: Only MCP Functions

Diagnostic Function	[MCP Only]	*AL3*	[DIAGF]

Diagnostic functions code.

Coil Current Mean Real Value	[MCP Only]	*AL3*	[CCMRV]

Real average excitation current value.

Analog Input 1 Start Scale Cal.	[MCP Only]	*AL3*	[A1SSC]

End of scale analogue input calibration 1.

Analog Input 1 Full Scale Cal.	[MCP Only]	*AL3*	[A1FSC]

End of scale analogue input calibration 1.

Analog Input 2 Start Scale Cal.	[MCP Only]	*AL3*	[A2SSC]

Calibration of the analog input 2 start scale.

Analog Input 2 Full Scale Cal.	[MCP Only]	*AL3*	[A2FSC]

End of scale analogue input calibration 2.

Menu 13 - System

(POS. 13.1) Daylight Saving Time Enable	[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) Level n° Access Code	[Ln xxxxxxxx]	---	[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 1.19 see page <HL>)
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 Rule Enable	[Restr. access= ON/OFF]	*AL2*	[RSARE]

If Active this command allows you to view only the functions of the access level entered.
Example: RSARE = ON; Known access level L3; only the functions that operate with access level 3 will be displayed and the other functions will not be displayed.
If this command is set to OFF, the functions with the entered access code and the functions with the access code lower than the one just entered will be displayed.

IP Address Setting (13.11-12-13)

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

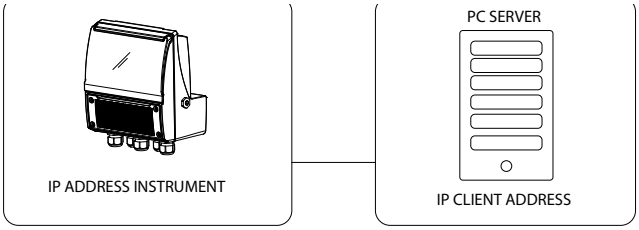
Device IP network adress

(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 transmitter).



(POS. 13.14) Coefficient KT	[KF=X.XXXXX]	*AL6*	[CFFKT]

Gain correction coefficient (calculated automatically)

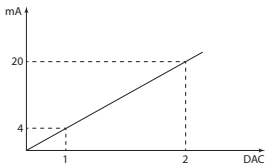
(POS. 13.15) Coefficient KS	[KF=X.XXXXX]	*AL5*	[CFFKS]

Correction coefficient constant instrumental

(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) Current Output 1 Calibration Point 1	[DAC1 4mA=XXXXX]	*AL5*	[C1CP1]

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

(POS. 13.18) Current Output 1 Calibration Point 2	[DAC1 20mA=XXXXX]	*AL5*	[C1CP2]

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

(POS. 13.19) Analog Input 1 Calibration Point 1	[AIN1 SS = ± xxxxx]	*AL5*	[A1CP1]

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

IP Address Setting (13.11-12-13)

(POS. 13.20) Analog Input 1 Calibration Point 2	[AIN1 FS = ± xxxxx]	*AL5*	[A1CP2]

DAC2 out 20mA calibration point (current output2 calibration point 2)

(POS. 13.21) Analog Input 2 Calibration Point 1	[AIN2 SS = ± xxxxx]	*AL5*	[A2CP1]

DAC2 out 20mA calibration point (current output2 calibration point 2)

(POS. 13.22) Analog Input 2 Calibration Point 2	[AIN2 FS = ± xxxxx]	*AL3*	[A2CP2]

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

(POS. 13.23) Standby	[STAND-BY]	*AL3*	[SSTBY]

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

(POS. 13.24) 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

Firmware CRC-32 Values	[MCP ONLY]	*AL6*	[FWCRC]

Firmware CRC

Calibration Execution Status Memory	[MCP ONLY]	*AL6*	[CALXM]

Calibration Execution status Memory. This function checks the instrument's internal calibration status.
CALXM=1 instrument calibrated correctly
CALXM=0 Invalid calibration / Calibration not completed (invalid calibration (if the function is zero, start the calibration function, MCP CALIC command).

RTC Adjustment Coefficient	[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 

Menu 13 - System: Only MCP Functions

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 transmitter for quick start menu.

Quick Start Function Status List	[MCP ONLY]	*AL6*	[QSLST]

List quick start group functions

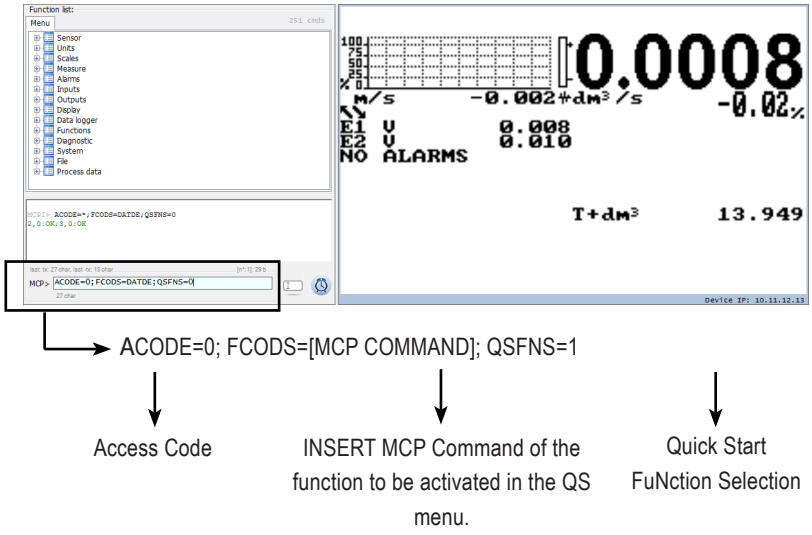
Function Enable Status List	[MCP ONLY]	*AL6*	[FSLST]

List enable status of functions

Access Code	[MCP ONLY]	*AL0*	[ACODE]

Input the right access code

Example set quick start menù function for mcp.



ACODE=0; FCODS=[MCP COMMAND]; QSFNS=1

Access Code

INSERT MCP Command of the function to be activated in the QS menu.

Quick Start FuNction Selection

Menu 13 - System: Only MCP Functions

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 transmitter functions.

Functions List Compact	[MCP ONLY]	*AL0*	[FLISC]

View compact list of all available transmitter 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 transmitter parameter.

Hidden Functions List	[MCP ONLY]	*AL4*	[HFLST]

Totalizer T+ value set

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

Totalizer T+ value set

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

Totalizer P+ value set

Volume Totalizer Total Negative Set	[MCP ONLY]	*AL4*	[VTTNS]

Totalizer T- value set

Volume Totalizer Partial Negative Set	[MCP ONLY]	*AL4*	[VTPNS]

Totalizer P- value set

Volume Total Positive Overflow Set	[MCP ONLY]	*AL4*	[VTPOS]

Totalizer T+ overflow value set

Volume Partial Positive Overflow Set	[MCP ONLY]	*AL4*	[VPPOS]

Totalizer P+ overflow value set

Volume Total Negative Overflow Set	[MCP ONLY]	*AL4*	[VTNOS]

Totalizer T- overflow value set

Menu 13 - System: Only MCP Functions

Volume Partial Negative Overflow Set	[MCP ONLY]	*AL4*	[VPNOS]

Totalizer 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

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 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*	[RALDT]

Read all current logged data

Read Last Sensor Verify Data	[MCP ONLY]	*AL2*	[RLSVD]

Read the latest sensor ver. data

Menu 14 - File (only MCP)

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

Menu 14 - File (only MCP)

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

Menu 15 - Process Data (Only MCP)

(POS. 15.1) Output 1 Set	[MCP ONLY]	*AL0*	[OUT1S]

Set value for digital output 1

(POS. 15.2) Output 2 Set	[MCP ONLY]	*AL0*	[OUT2S]

Set value for digital output 2

Menu 15 - Process Data (Only MCP)

(POS. 15.3) Output 3 Set	[MCP ONLY]	*AL0*	[OUT3S]

Set value for digital output 3

(POS. 15.4) Output 4 Set	[MCP ONLY]	*AL0*	[OUT4S]

Set value for digital output 4

(POS. 15.5) Digital Input 1 Status	[MCP ONLY]	*AL0*	[DIN1S]

Digital input 1 status read

(POS. 15.6) Digital Input 2 Status	[MCP ONLY]	*AL0*	[DIN2S]

Digital input 2 status read

(POS. 15.7) Digital Input 3 Status	[MCP ONLY]	*AL0*	[DIN3S]

Digital input 3 status read

(POS. 15.8) Flow Rate Full Scale in Chosen Units	[MCP ONLY]	*AL0*	[FRFSU]

Flow rate full scale in chosen units

(POS. 15.9) Flow Rate Value Percentage	[MCP ONLY]	*AL0*	[FRVPC]

Flow rate value in percentage

(POS. 15.10) KL Test	[MCP ONLY]	*AL0*	[KLTST]

KL Test

(POS. 15.11) Flow Rate Value Percentage Without Cut-off	[MCP ONLY]	*AL0*	[FRVPX]

Flow rate in percentage without cut-off

(POS. 15.12) Flow Rate Value Binary Without cut-off	[MCP ONLY]	*AL0*	[FRVBX]

Flow rate in binary without cut-off

(POS. 15.13) Flow Rate Value Technical Unit	[MCP ONLY]	*AL0*	[FRVTU]

Flow rate value in unit of measure

(POS. 15.14) Volume Totalizer Total Positive Value	[MCP ONLY]	*AL0*	[VTTPV]

Totalizer T+ read value

(POS. 15.15) Volume Totalizer Partial Positive Value	[MCP ONLY]	*AL0*	[VTPPV]

Totalizer P+ read value

(POS. 15.16) Volume Totalizer Total Negative Value	[MCP ONLY]	*AL0*	[VTTNV]

Totalizer T- read value

Menu 15 - Process Data (Only MCP)

(POS. 15.17) Volume Totalizer Partial Negative Value	[MCP ONLY]	*AL0*	[VTPNV]

Totalizer P- read value

(POS. 15.18) Volume Totalizer Total Positive Overflow	[MCP ONLY]	*AL0*	[VTTPO]

Totalizer T+ number of overflows

(POS. 15.19) Volume Totalizer Partial Positive Overflow	[MCP ONLY]	*AL0*	[VTPPO]

Totalizer P+ number of overflows

(POS. 15.20) Volume Totalizer Total Negative Overflow	[MCP ONLY]	*AL0*	[VTTNO]

Totalizer T- number of overflows

(POS. 15.21) Volume Totalizer Partial Negative Overflow	[MCP ONLY]	*AL0*	[VTPNO]

Totalizer P- number of overflows

(POS. 15.22) Volume Totalizers All	[MCP ONLY]	*AL0*	[VTALL]

Board temperatures

(POS. 15.23) Board Temperatures	[MCP ONLY]	*AL0*	[BTMPS]

Board temperatures

(POS. 15.24) CPU Temperature	[MCP ONLY]	*AL0*	[CPUTP]

CPU temperature

(POS. 15.25) Sensor Coils Temperature	[MCP ONLY]	*AL0*	[SCLTP]

Sensor’s coils temperature

(POS. 15.26) Liquid Velocity	[MCP ONLY]	*AL0*	[LQVEL]

Liquid velocity

(POS. 15.27) Average Process Data Samples Number	[MCP ONLY]	*AL0*	[AVGSN]

Number of samples for averaged values

(POS. 15.28) Alarm Status	[MCP ONLY]	*AL0*	[ALARM]

Active alarm(s) status

(POS. 15.29) Sensor Test Result Code	[MCP ONLY]	*AL0*	[STSRC]

Sensor test result code

(POS. 15.30) Main Power Status	[MCP ONLY]	*AL0*	[MPWRS]

Status of main power supply

Menu 15 - Process Data (Only MCP)

(POS. 15.31) Input Resistance	[MCP ONLY]	*AL0*	[INRES]

Equivalent Input resistance

(POS. 15.32) Input Voltages	[MCP ONLY]	*AL0*	[INVLS]

Electrodes input voltages

(POS. 15.33) Sensor Table Version	[MCP ONLY]	AL0	[STBLV]

Sensor's table version

(POS. 15.34) Sequence Number	[MCP ONLY]	*AL0*	[SEQNB]

Sequence number. The SEQNB command allows you to specify a sequence number to be used when querying the meter (additional verification procedure). The same number that is set with SEQNB = number is retransmitted as a response by the converter. This function, together with the process commands used to read the variables (capacity, volumes, etc.) allows to keep synchronized the received values with the requests made. In this way it is possible to verify the temporal sequence with which the messages are received by the meter.

Example:

Request: SEQNB=1;FRVPC?

Request: 1;%,12.345678

Request: SEQNB=2;FRVPC?

Request: 2;%,11.456778

Request: SEQNB=3;FRVPC?

Request: 3;%,10.983228

Request: SEQNB=4;FRVPC?

..

.. <= Sequence 4 is missing, error

..

Request: SEQNB=5;FRVPC?

Return: 5;%,10.992783

The example shows how SEQNB can help identify exactly what message was lost. In this case the requests are all the same (apart from the SEQNB number), but with different requests, SEQNB can be a verification tool.

(POS. 15.35) Analog Input 1 Value Technical Unit	[MCP ONLY]	*AL0*	[A1VTU]

Analog input 1 Value Technical Unit

(POS. 15.36) Analog Input 2 Value Technical Unit	[MCP ONLY]	*AL0*	[A2VTU]

Analog input 2 Value Technical Unit

(POS. 15.37) System Battery Voltage 1	[MCP ONLY]	*AL0*	[SBVL1]

System Battery Voltage 1

(POS. 15.38) System Battery Voltage 2	[MCP ONLY]	AL0	[SBVL2]

System Battery Voltage 2

(POS. 15.39) System Battery Charge Status	[MCP ONLY]	*AL0*	[SBCHS]

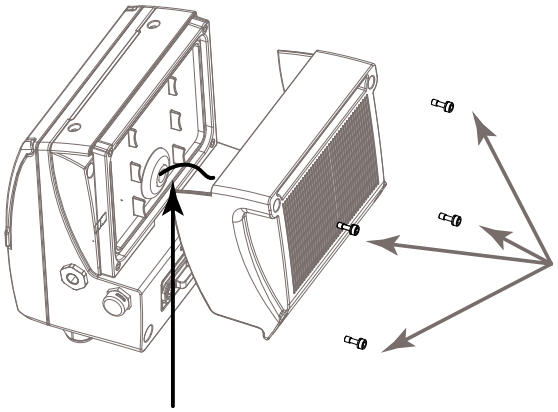
System Battery Charge Status

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.

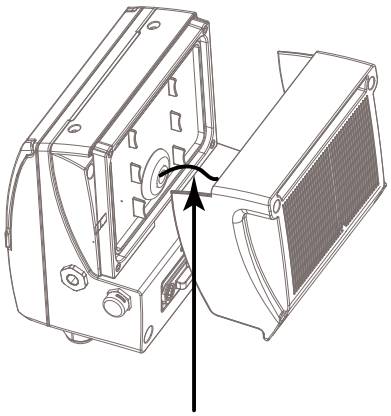
Operating Procedure To Change The Converter Board

Remove the 4 screws (see POS. converter power supply pag. 20) to be able to remove the battery case. Attention to the internal wiring of the instrument.



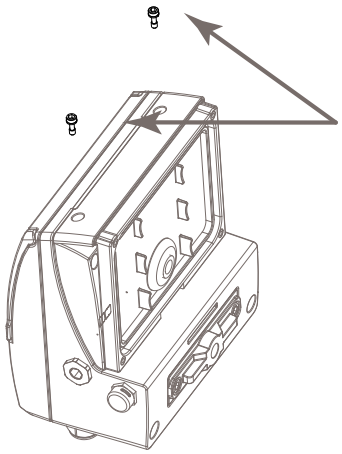
REMOVE THE 4 SCREWS
OF FIXING OF
HOUSING COVER
BATTERY HOLDER

**WARNING !
OPEN THE BATTERY PACK
DELICATELY NOT FOR
DAMAGE THE SHOCK
ELECTRICAL BATTERIES**

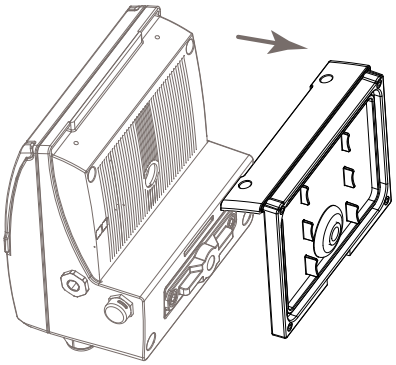


GENTLY DISCONNECT
THE CABLES OF THE BATTERY PACK

Remove the 2 screws to be able to remove the battery case cover. Attention to the internal wiring of the instrument



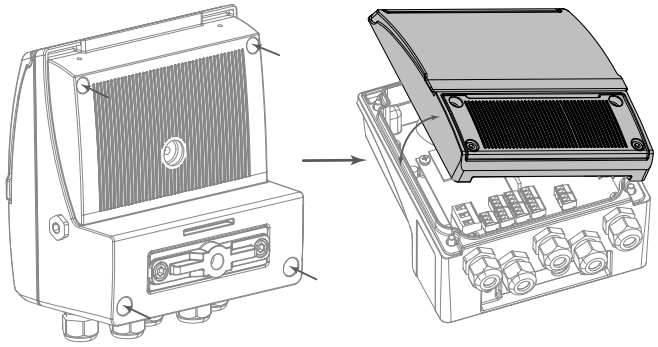
REMOVE THE 2 SCREWS
OF FIXING OF
HOUSING COVER
BATTERY HOLDER



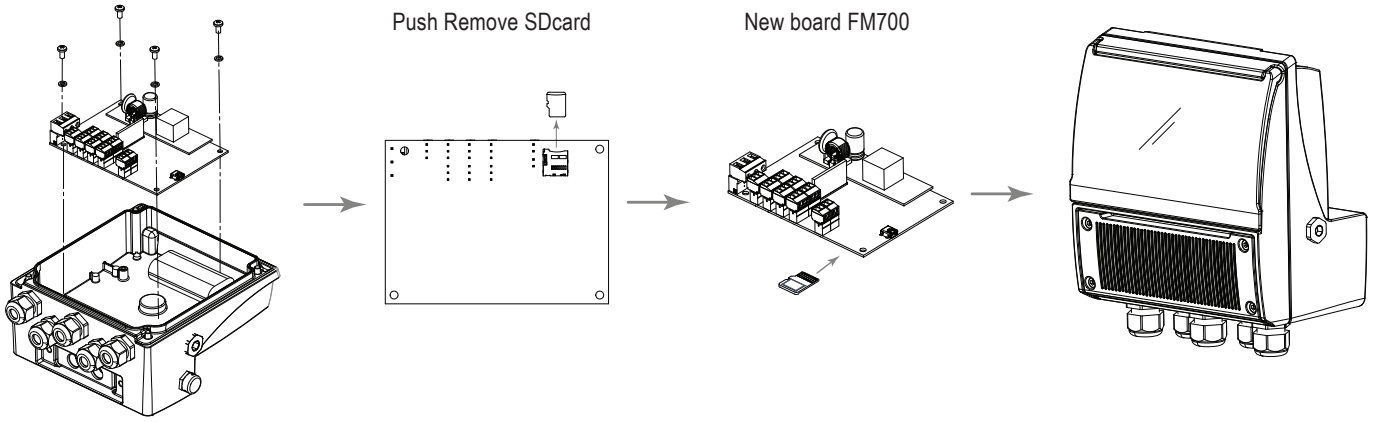
Meter Data

Operating procedure to change the transmitter board

Remove the 4 screws (see "FM700 construction (ALUMINIUM AND PA6 VERSIONS)" page14) to remove the main housing. Attention of any electrical cables.



Remove the 4 screws(see "FM700 construction (ALUMINIUM AND PA6 VERSIONS)" to remove the FM700 board. Attention of any electrical cables. Remove the SD card and insert the new FM700 board.



Once the card is assembled to the converter, perform the following procedures:

- Connect the internal wiring to the board without directly connecting the batteries (see diagrams POS. converter power supply pag. 20).
- Assemble the MV housing cover
- Assemble the battery case cover
- Connect the batteries of the housing to the cable / wiring to the board.
- Assemble the battery case with the 4 screws removed
- Correctly assembled the converter start the function (POS. 11.8 pag. 52) to restore data.

B.I.V. (Built-in Verificator)

BIV, abbreviation for Built In Verificator, is available as option for FM700 transmitters 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 transmitter.

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 transmitter 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 transmitter 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.

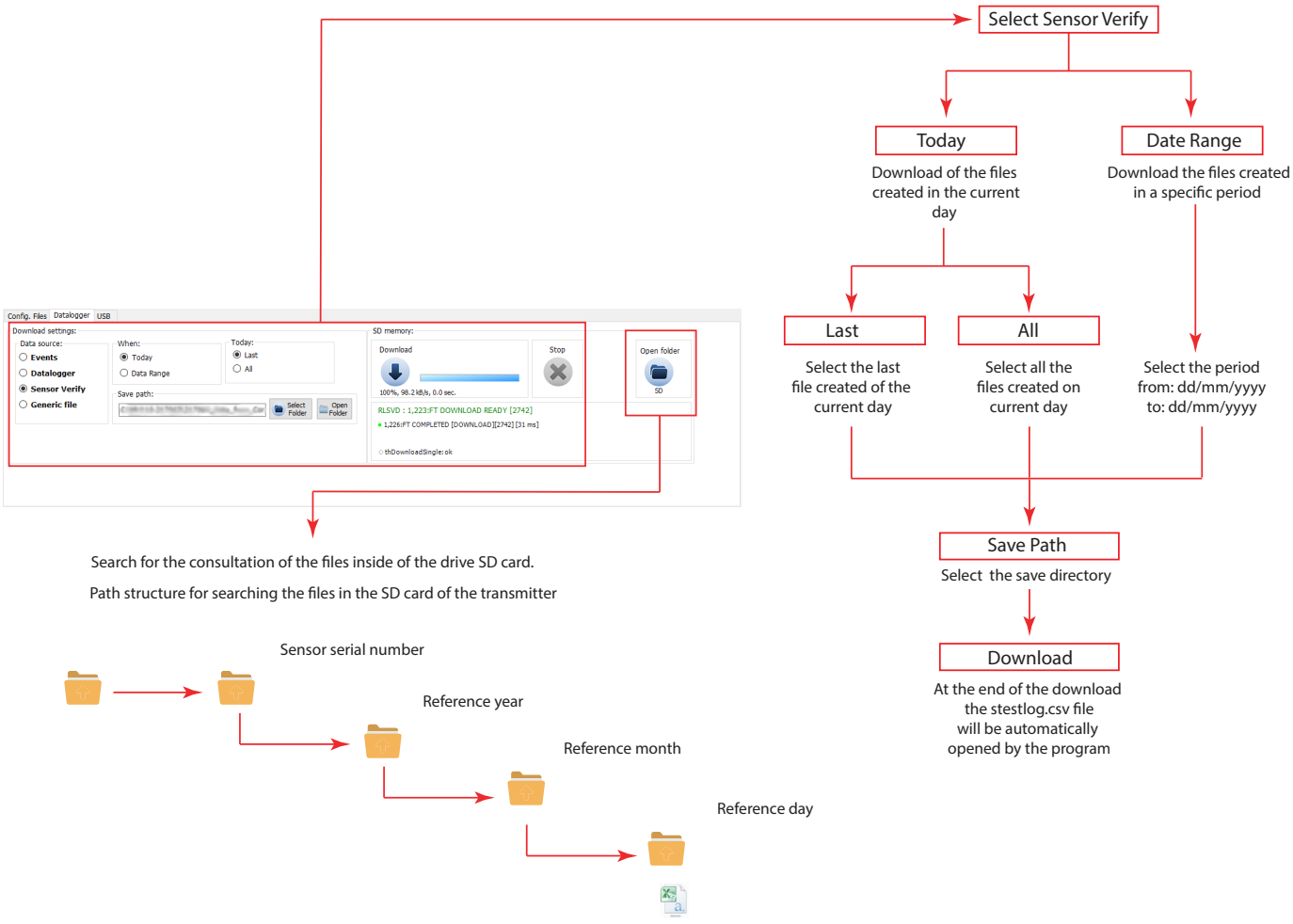
Practically, in the absence of the necessary hardware permissions, this function is useful to test the insulation of the coils.

B.I.V. (Built-in Verificator)

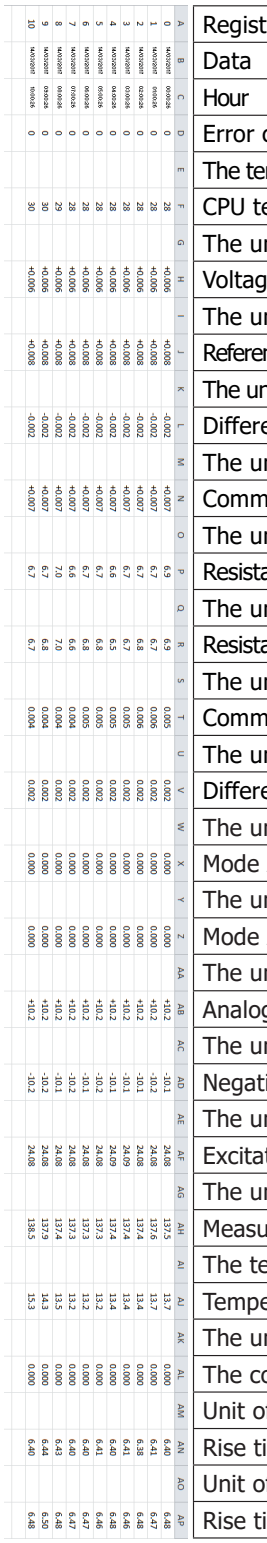
Opening and reading manually the files STESTLOG.CSV

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

- Start the MPC program  for opening the converter menu interface.
- Follow these steps:



- Reading and meaning of the STESTLOG.CSV file



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 of measurement are recorded only if the specific 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 configuration of the converter.

B.I.V. (Built-in Verificator)

Standard and internal check to the instrument limits

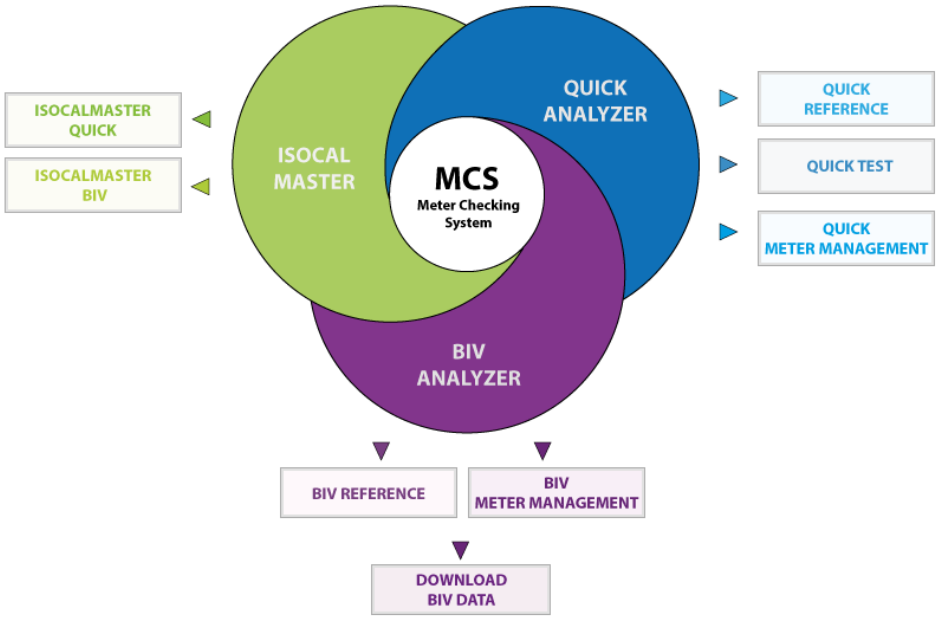
The measured data are compared with the reference values previously stored. The variation of different variable measured,shall be within the following range:

- 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).

MCS Software

Meter Checking System (MCS) Is a modular system that provides diagnostic activities. The system is made up of multiple components: the enabled functions depend on the connected instrument.



MCS for FM700

When a FM700 is connected to MCS is possible to use all the system MCS sections.
For the section BIV analyzer (purple section) It's necessary to have selected the BIV option in order phase.
For the section IsocalMaster (green section) It's necessary to connect an IsocalMaster device.
See the MCS software manual for more information

Alarm Messages (Causes and actions to be taken)

Alarm coding table with added bit-code values that appear on the data logger. The codes can be added when there are several alarms simultaneously. The codes are in HEX format, so for calculations on sums (which are arithmetic ORs) you need to use HEX mathematics and not decimal.a. Example 1: 10H (16 decimal) + 20H (32 decimal) = 30H (48 decimal).

b. Example 2: 10H (16 decimal) + 4H (4 decimal) = 14H (20 decimal)

Code	Bitcode Data Logger (Hexadecimal)	Alarm Description	Cause/Solutions
00	0000000000000001	PCB is not inizialized	Contact the service
01	0000000000000002	F-RAM error	Try to restart. If the error persists, please contact the service
02	0000000000000004	SD-card error	Try to restart. f the error persists, contact the service
03	0000000000000008	The SD-card isalmost full	Plan to replace the SD-card as soon as possible
04	0000000000000010	The SD-card is full	Replace the SD-card
05	0000000000000020	Power Primary absent	This alarm condition can be configured by the user. Evaluate whether this condition is normal or unexpected
06	0000000000000040	Communication error between CPUs.	Try to restart. If the error persists Contact the service
07	0000000000000080	Low baterries level	Replace the batteries
08	0000000000000100	ISOCALMASTER connected	ISOCALMASTER module inserted and correctly recognized
16	0000000000010000	System restarted	Evaluate whether the reboot was expected. If not, consult the event logger to determine the causes.
17	0000000000020000	Date/hour not valid	Set date and hour
18	0000000000040000	CPU frequency error	Contact the service
19	0000000000080000	Internal voltage error	Contact the service
22	0000000000400000	Excitation error	Sensor not connected correctly, broken or incorrect wiring, faulty connections or incorrect sensor piloting parameters.
23	0000000000800000	Signal error	Critical measurement conditions, lack of valid earth connection, presence of persistent electrical disturbances or incorrect or interrupted wiring / connections with the sensor.
24	0000000001000000	Empty tube	The sensor is empty. Check the presence of liquid in the connected piping, check the correct setting of the maximum allowable resistance on the electrodes.
25	0000000002000000	Max flow alarm +	Check the process conditions and the MAX + alarm threshold set
26	0000000004000000	Max flow alarm -	Check the process conditions and the MAX - alarm threshold set
27	0000000008000000	Min flow alarm +	Check the process conditions and the set MIN + alarm threshold
28	0000000010000000	Min flow alarm -	Check the process conditions and the set MIN - alarm threshold
29	0000000020000000	Flow rate > F.sclae +	Check the process conditions and the full scale value set
30	0000000040000000	Flow rate < F.sclae +	Check the process conditions and the full scale value set

Alarm Messages (Causes and actions to be taken)

Code	Bitcode Data Logger (Hexadecimal)	Alarm Description	Cause/Solutions
31	0000000080000000	Pulse output 1 out of range	Check process conditions and set values for pulse unit 1 and pulse duration 1
32	0000000100000000	Pulse output 2 out of range	Check process conditions and set values for pulse unit 2 and pulse duration 2
33	0000000200000000	Calibration error	Make sure that the sensor is connected correctly and that the sensor type matches the one set. If the error persists, contact the service
34	0000000400000000	Sensor error	The sensor test has failed. Examine the code reported in the event logger or diagnostic values page to determine possible causes. ATTENTION: the error condition persists until the next test is performed or until the instrument is restarted.
35	0000000800000000	Configuration login failed	An attempt was made to access the configuration parameters with an incorrect password. This alarm condition can be configured by the user.
36	0000001000000000	Configuration access detected	Access to configuration parameters was detected. This could be a legitimate or unexpected operation. The alarm condition can be configured by the user.
37	0000002000000000	System violation	A system integrity violation was detected. This alarm is detected by means of a switch connected to a digital input of the instrument specifically configured for this use
38	0000004000000000	Flooding	A system flood condition has been detected. This alarm is detected by a switch connected to a digital input of the instrument specially configured for this use
39	0000008000000000	Analog input 1 error	The signal or sensor connected to the optional analog input 1 are incorrect or not configured correctly. Check the relative wiring and that the sensor type is correct / functioning.
40	0000010000000000	Analog input 1 out of range	The signal deriving from the sensor connected to the optional analogue input 1 is too large for the configured measurement scale. Review the configuration parameters and check that the sensor is connected correctly.
41	0000020000000000	Analogue input 1 measurement greater than threshold	Check the process conditions and the threshold set as the maximum signal alarm for the optional analog input 1
42	0000040000000000	Analogue input 1 measurement below threshold	Check the process conditions and the threshold set as a minimum signal alarm for the optional analog input 1
43	0000080000000000	Analog input 2 error	The signal or sensor connected to the optional analogue input 2 is incorrect or not configured correctly. Check the relative wiring and that the sensor type is correct / functioning.
44	0000100000000000	Analog input 2 out of range	The signal deriving from the sensor connected to the optional analogue input 2 is too large for the configured measurement scale. Review the configuration parameters and check that the sensor is connected correctly.
45	0000200000000000	Analogue input 2 measurement greater than threshold	Check the process conditions and the threshold set as the maximum signal alarm for the optional analog input 2
46	0000400000000000	Analogue input 2 measurement below threshold	Check the process conditions and the threshold set as a minimum signal alarm for the optional analog input 2
47	0000800000000000	System protection error	The system has detected a protection error related to the MID parameters.Contact the service

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.	To verify: - wiring between converter sensor, - 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	
10000	Excitation error during the test	The sensor test failed because an excitation error was present. Check the sensor wiring and the parameters set, in particular check that the type of sensor is set correctly.
20000	Invalid reference values	The reference values used to check the measurements detected on the sensor are not valid. Perform the procedure for storing reference values correctly.
40000	Empty tube	The tube is empty and therefore it is not possible to check the values measured on the electrodes. Check the installation conditions and the parameters related to the recognition of the empty pipe condition (maximum resistance threshold on the electrodes).

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.

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