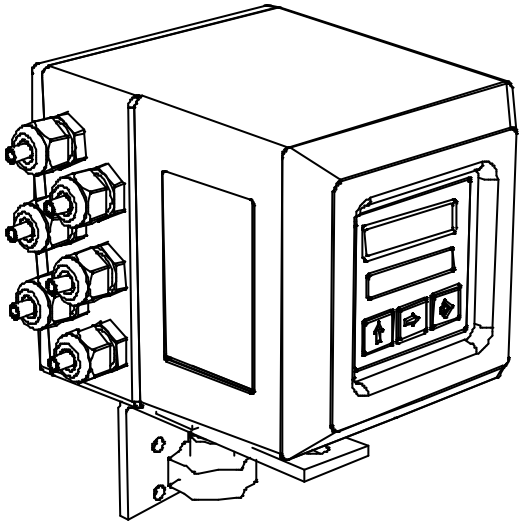
ELECTROMAGNETIC FLOW METER

ISOMAG *Millennium*

OPERATING AND INSTALLATION MANUAL CONVERTER

ML 250



ATTENTION: THE LAST THREE CHARACTER OF FILE NAME, IDENTIFY THE SW VERSION WHICH THE MANUAL IS REFER . THE SW VERSION IS VISUALIZED DURING SWITCH ON OF CONVERTER

CE

ISOIL INDUSTRIA

The solutions that count

FILE NAME : EM250_IS_1_3_1X.doc

INDEX

TECHNICAL CHARACTERISTICS:

ELECTRICAL CONNECTIONS

INPUT/OUTPUT

MODALITY FOR ACCESS TO THE INSTRUMENT FUNCTIONS

PROGRAMMING FUNCTIONS

APPENDIX 1

SAFETY


- Before using the instrument, always make a sure connection to ground

- Verify that the mains voltage is the same written on the tag plate of the converter

- Pay attention not connect the power supply to the outputs or the other terminals of M1/M2

- When the electric connections are completed, close carefully the instruments rear cover

- Avoid to open the instrument's rear cover when the power is on.

- Avoid any attempt to repair the instrument. If the instrument is not functioning properly, please call the nearest assistance service.

START UP AND MAINTENANCE OF THE INSTRUMENTS

BEFORE STARTING UP THE INSTRUMENT PLEASE VERIFY THE FOLLOWING :

- Power supply voltage must correspond to that specified in the name plate
- Electric connections must be done as described at page 8
- Ground connections must be done

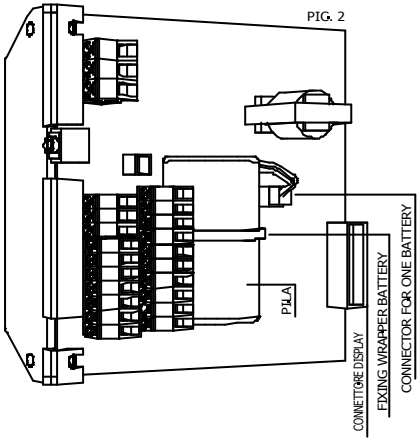
VERIFY PERIODICALLY:

- The integrity of the power supply cables, wiring and other electrical parts connected
- The integrity of the instrument's housing (this must not have bruises or other damages that may compromises the hermetical sealing)
- The tightening of the sealing elements (cable glands, covers, etc.)
- The integrity of the front panel (display and keyboard), damages may compromise the sealing
- The mechanical fixing of the instrument on the pipe or on the wall stand

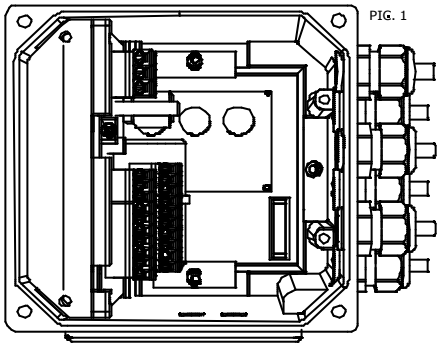
GROUNDING INSTRUCTION

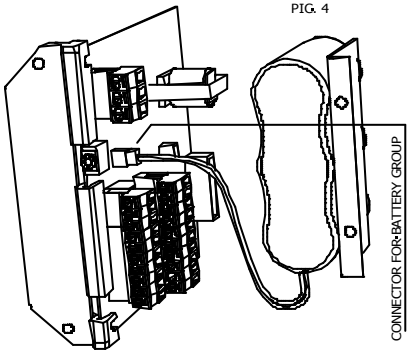

For correct operation of the meter is NECESSARY that the sensor and the liquid are at the same potential, so ALWAY connect the sensor and converter to ground !

Attention: to avoid accidental discharges of the batteries, the instrument is delivered with the batteries disconect, to switch on the instrument is necessary connect the battery cable to the connectors on the board (1 or 2 depends the numbers of batteries installs). Attention : doesn't reverse the polarity.

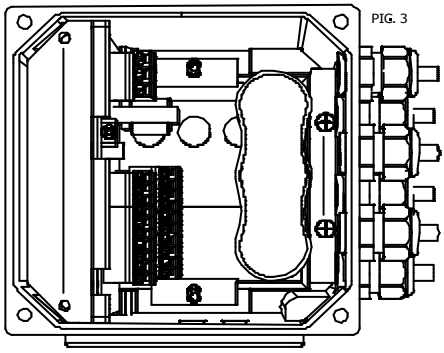


PIG. 2

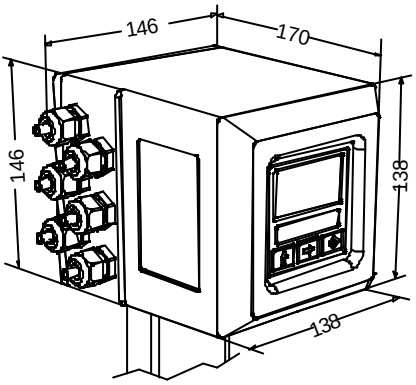

PIG. 1



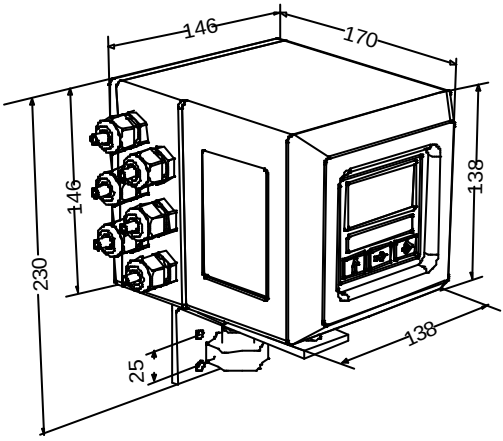
PIG. 4


PIG. 3

CONVERTER OVERALL DIMENSIONS

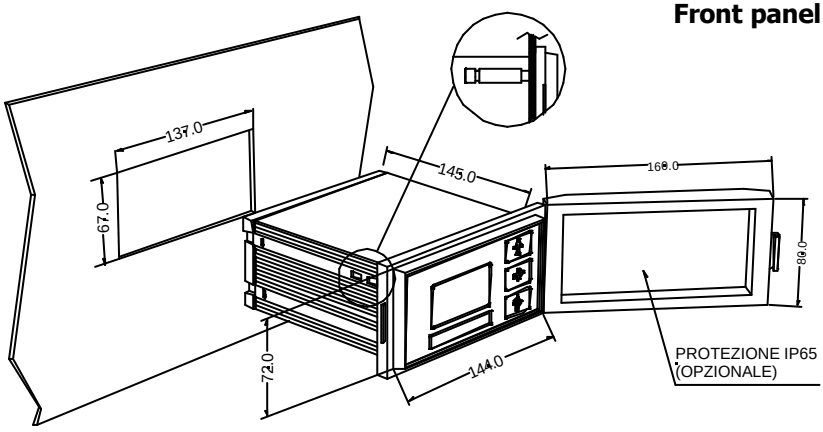


Compact version



Wall version

Front panel version



TECHNICAL CHARACTERISTICS

ELECTRIC CHARACTERISTICS

Classification of the instrument: class I, IP 67, category of installation II

Power supply version	Power supply voltage	Power supply frequency	Max power	Max Current
AU	10÷400 Vdc 15÷265 Vac	0 Hz 44÷66 Hz	300mW	30mA
LITIUM BATTERY	3,6 V – 16,5 A/h	-	-	-

INPUT/OUTPUT ISOLATION

- **Input/output are insulated up to 500V**
- **Module 43/Module 45 : Port RS 232 NON is not insulated**

ENVIRONMENTAL CONDITIONS OF USE

- **The instrument can be installed inside or outside of buildings**
- **Altitude: from –200 a 6000 m (from -656 to 19685 feet)**
- **Humidity range: 0÷100% (IP 67)**
- **Line voltage range: (see table on technical characteristics)**

OPERATING TEMPERATURE

CONVERTER			
Amb. Temp.			
Min.		Max	
°C	°F	°C	°F
-10*	-14*	50	122

MEASURE/ CONSUMPTIONS

The converter is able be used in two different modes:

1. with continuous sampling
2. with sampling to preset unit of time.

- **CONTINUOUS SAMPLING** (pic.1) **(ENERGY SAVING OFF)**

In this mode the converter effects the measure in accordance with the classical diagram of the flow meter; the consumption of the system, with any diameter of the sensor is 0,1 W ; **the life of battery is about 1 month (4 with 4 battery)**
The accuracy of the system is definite in this conditions.

- **SAMPLING TO PRESET UNIT TIME** (fig. 2) **(ENERGY SAVING ON)**

This mode works sampling the range to intervals of preset time (see MEASURE menu, func. 3.7); it allows a great saving of energy

In this conditions the consumptions are:

sampling range (s)	1 battery life (years)	4 batteries life (years)
1	3 months	1
5	1.5	6
15	2	8
30	4	10
60	7	10
>= 90	10	10

FIG. 1

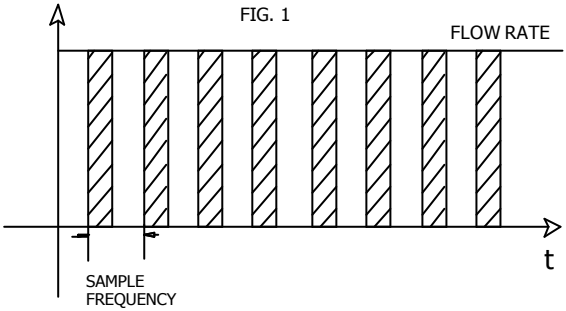
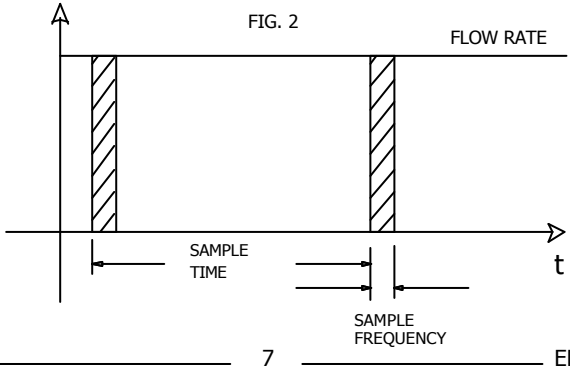
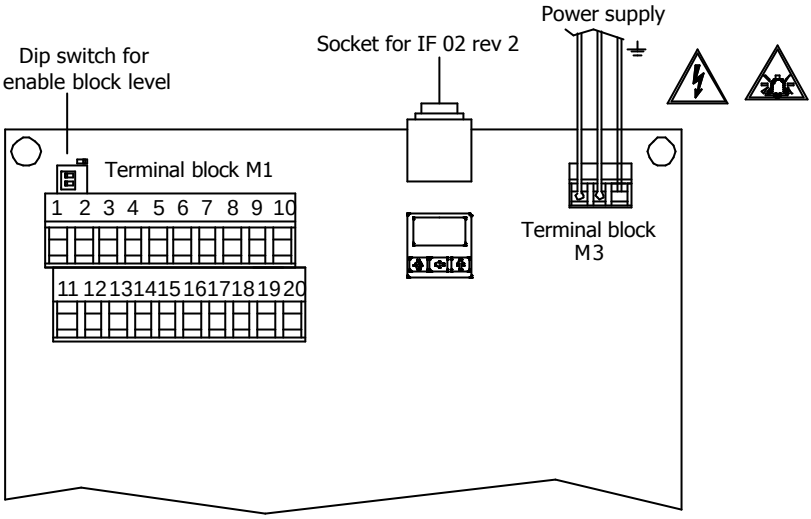


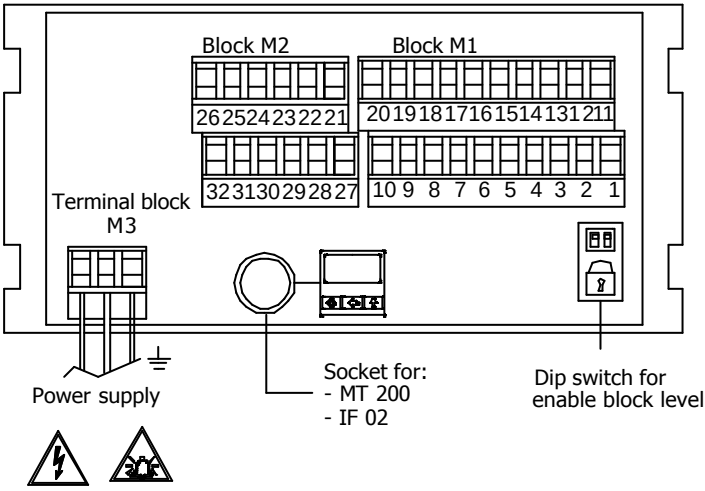
FIG. 2



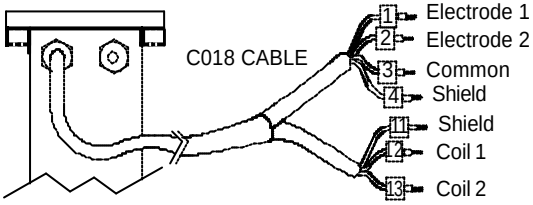
TERMINAL BLOCK M1 FOR COMPACT/SEPARATE VERSIONS



TERMINAL BLOCK M1 FOR PANEL VERSIONS

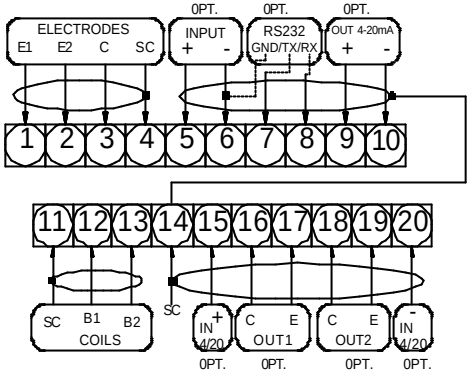


SENSOR-CONVERTER CONNECTIONS
(MAX. C018 CABLE LENGHT 20 m)



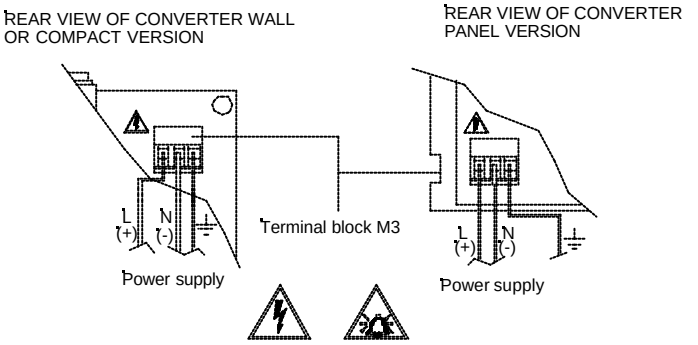
Sudden movements of the electrodes cable, can cause noises on measure

TERMINAL BLOCK M1



0PT. = OPTIONAL

CONVERTER POWER SUPPLY



- before connecting the power supply, verify that the mains voltage falls between the limits indicated on the tag plate
- For the wiring use only approved conductors, with fire-proof properties.
- The power supply line must be equipped with a external protection for current overload (fuse or automatic line breaker with limiting capacity not greater than 10 A).
- Provide in the proximity of the instrument a circuit breaker that must be easily accessible from the operator and clearly identified.
  N.B.: For information concern the characteristics of meter's power supply, see "technical characteristics"

OPTIONAL INPUT (SEE TERMINAL BLOCK M1 – PAG. 9)

- **Analogical input 4/20 mA (the measure can be record by data-logger)**

With this optional input, it is possible acquire a remote measure 4/ 20 how for instance a pressure. Besides is possible record this measure on Data Logger and visualize the instant value on the display. ATTENTION : the elaboration of the input happens ONLY when the measure is in ACTIVE PHASE (400 mS each X seconds , X = interval of select sampling time)

OPTIONAL MODULES (SEE TERMINAL BLOCK M1 – PAG. 9)

- **ME 41 : n. 1 Analogical out 4/20 mA (give the measure and power supply of converter: "two wire transmitter)**

This option allows to use the converter like transmitter with technique " 2 wire": the current 4/20 beyond to give the measure also feeds the converter . The MINIMUM value of current, correspondent to "0" FLOW RATE , it is 4 mA . The sampling frequency with 4/ 20 mA it is 1 Hz. The battery is however necessary and could not be disarmed; if the loop 4/ 20 mA must stop, the withered system change automatically to the battery supply. For this reason is OBLIGATORY set the ENERGY SAVING to ON and set to 15 second the interval of sampling, otherwise the risk is rapid discharge of the batteries.

- **ME 42 : n. 2 out on/off + 1 Input on/off – programmabile**

This option allows to have 2 ON/ OFF out , that could be uses for give volume pulses or for alarms, and 1 ON/OFF input
IMPORTANT: the elaboration of the input/output happens ONLY when the measurer is in ACTIVE PHASE. This means that:

- **ALARMS: in presence of alarm, the out will be intermittent at frequency around 1/X, X is the interval of select sampling; the output in alarm condition is ON for 400 [mS].**

FIG. 1

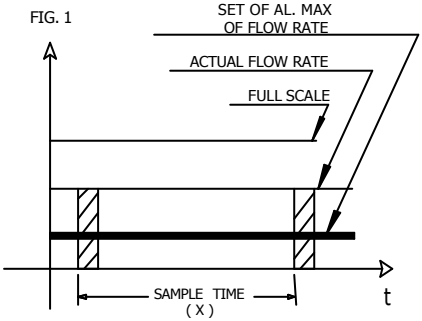
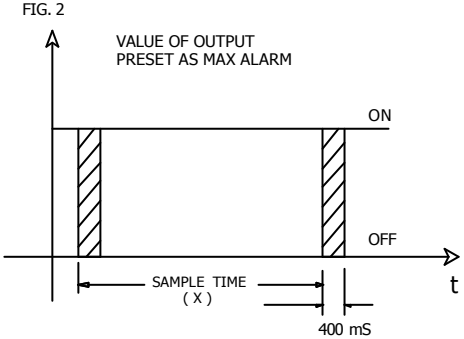
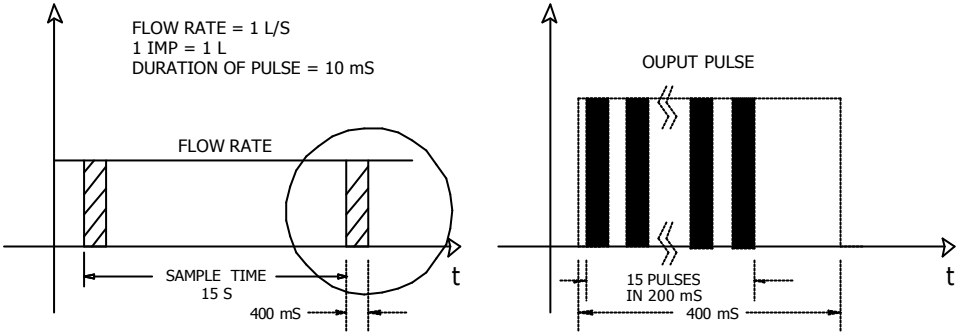


FIG. 2

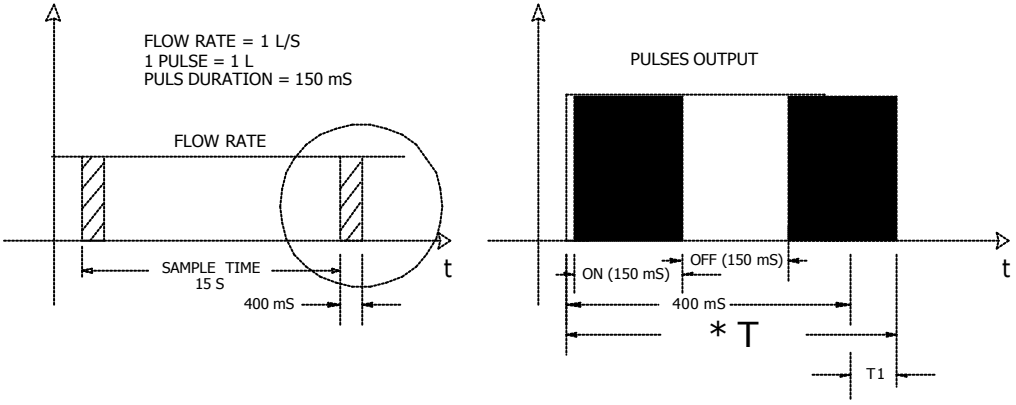


- **PULSES: the generation of the pulses happens ONLY for 400 mS each X seconds, where X is the interval of select sampling TIME . Therefore is important that the value of unity volume and time of duration pulse are fit with this value, BECAUSE BEFORE TO ACTIVATE THE ENERGY SAVING, THE CONVERTER WAIT THE END OF CURRENT PULSE.**
  IT'S NECESSARY AVOID HIGH VALUE OF DURATION PULSE: WRONG SELECTION COULD INTRODUCE A RAPID DISCHARGE OF BATTERY
  The impulses not give to the output are not lost but accumulated on the converter memory.
  The figures of the page following show two examples of selection of the unity volume and duration pulse.
  NOTE: THE MIN TIME OFF, OF PULSE, IS THE SAME OF THE TIME PULSE DURATION PRESETTING (DUTY CICLE 50%).

1- CORRECT SELECTION VOLUME/ TIME OF PULSE



2- SELECTION VOLUME/ TIME OF PULSE NOT CORRECT



* T IS A REAL TIME OF CYCLE: DUE TO HIGH TIME OF PULSE, THERE IS A DELAY T1 OF AROUND 50 mS AND 13 PULSES WILL BE ACCUMULATES

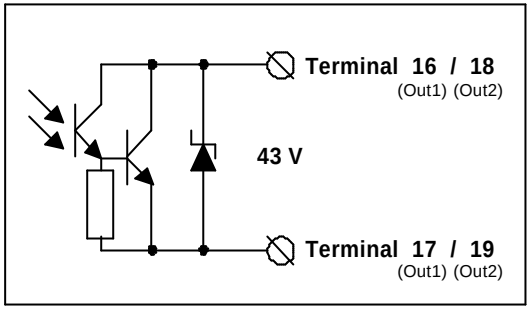
- **ME 43 : COMMUNICATION PORT RS232**

This options is a RS232 port .
Attention : the port IS NOT separated from the circuit by galvanic barrier

- **ME 45 : options of modules ME41+ME42+ME43**

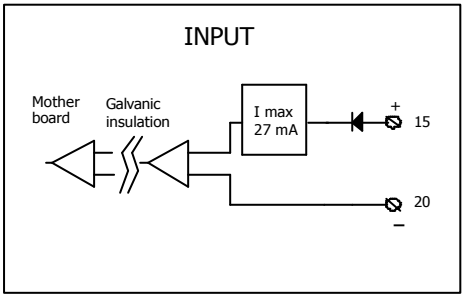
With this module are available all the functions of module **ME41+ME42+ME43**

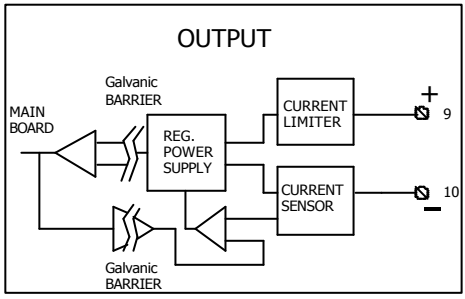
ON/OFF OUTPUTS WIRING



- **Opto-insulated output with floating collector and emitter terminals freely connectable**
- **Maximum switching voltage: 40 Vdc**
- **Maximum switching current: 10mA**
- **Maximum saturation voltage between collector and emitter @10mA: 0,8 V**
- **Maximum switching frequency (load on the collector or emitter, RL=240W, VOUT=24Vdc): 50Hz**
- **Maximum revers current bearable on the input during and accidental polarity reversion (VEC): 100mA**
- **Insulation from other secondary circuits: 500 Vdc**

CHARACTERISTIC ANALOGIC INPUT / OUTPUT 4/20 mA





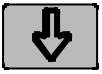
- **Minimum voltage to have maximum range of 4..20 mA : 8.5 Vdc**
- **Maximum applicable continuous voltage: 35Vdc**
- **Maximum input current 35Vdc: 30 mA**
- **Working voltage : 19,2 ÷ 35 Vdc**
- **Protected against persistent over voltages and reverse of polarity**

ACCESS TO INSTRUMENT

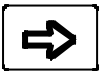
KEY BOARD

The programming keyboard is made by three keys :

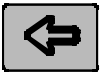
SHORT PRESSING (< 1 SECOND):
It increases the numeric figure or the parameter selected by the cursor
It goes to the previous subject on the menu
batch start/stop (when enabled)



LONG PRESSING (> 1 SECOND):
It decreases the numeric figure or the parameter selected by the cursor
It goes to the next subject on the menu



SHORT PRESSING (< 1 SECOND):
It moves the cursor rightward on the input field
It goes to the following subject of the menu
It change the display of the process data



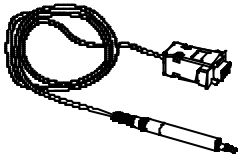
LONG PRESSING (> 1 SECOND):
It moves the cursor leftward on the input field
It goes to the previous subject on the menu

SHORT PRESSING (< 1 SECOND):
It enter /leaves the selected function
It enables the main menu for the intrument configuration
It cancels the selected function under progress

LONG PRESSING (> 1 SECOND):
It leaves the current menu
It enables the totaliz . reset request (when enabled)
It confirms the selected function

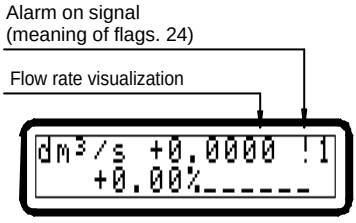
BLIND VERSION

Per i convertitori sprovvisti di tastiera (versione cieca), è possibile accedere alle funzioni tramite uno dei seguenti dispositivi opzionali:

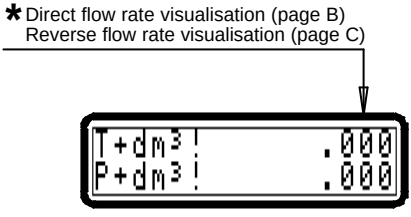


NOTE :
the IF2 must be ver. 2

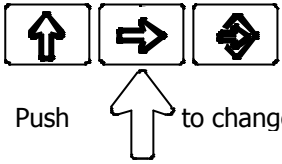
VISUALIZATION PAGE

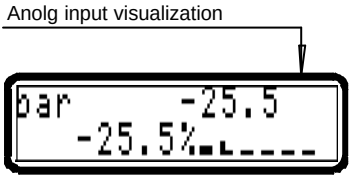


VIS. A

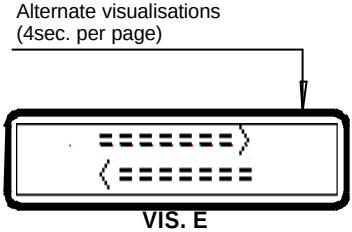


VIS. B - C





VIS. D



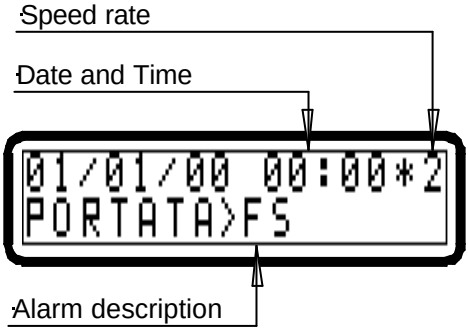
VIS. E

* The maximum number shown from the totaliz . is 999 999 999 independently from the number of decimal selected. Beyond this value the totaliz . are reset.

Alarms

In case of alarm signal (!) or for date and time visualization push (left button on display)

Examlpe

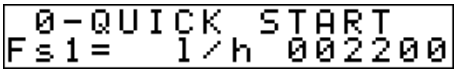


FACTORY PRE-SETTINGS

The converter is delivered according to the following STANDARD configuration:

- Dip switch: ON (Positioned switch as the drawing below)
- Security level: 3 (page 23 pos. 11.2)
- Access code L" = 11111 (page 23 pos. 11.1)

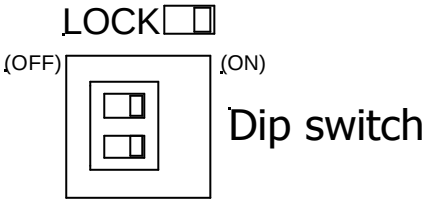
With such pre-setting, when powered on the instrument will show one of the 4 visualisation pages (page 12). By pressing the button you can get to the "Quick start menu":



the visualisation page shown aside may contain different parameters from those shown on your instrument, depending on the pre-setting required by the customer

The "Quick start menu" may be set without entering any access code (see example 1 on page 17).

To enter the Main Menu, position the cursor on the word "Main menu" and press the key then enter the level 2 access code L" = 11111 and press the key .
All the functions of the converter are now available, apart those reserved to the service (access code of higher level).



ACCESS CODES

The information of this manual are related to all functions available with L2 security level.
All functions available through access codes of higher level are protected and reserved to the service.
Access code description: L2 (menu "11 Internal Data, page 23 pos. 11.1)

A) **with code L2 = 11111** (with this code only) you access to "Quick start menu", and you can follow the programming procedure as described on page 13
B) **with code L2 = 22222** (with this code only) you disable the request of code L2 and you can proceed with the programming without entering any access code (up to L2 security level)
NOTE: the availability of the functions is related to the selected block (see below)
C) * **with L2 customised (freely chosen by the user)** you can proceed programming all the functions up to L2 security level, entering its code whenever you enter the Main menu

*ATTENTION: take note very carefully of the customised code you have chosen, since there is no way for the user to retrieve it is forgotten

BLOCK LEVELS

If for several reasons you need to change the level of block of the instrument, follow the steps:

- ❑ Set the dip switch on OFF position
- ❑ Access the Main Menu
- ❑ Press several times the key [→], till you reach the menu "11: Internal data" and then press [↑].
- ❑ Press the key [→] and [↑] to enter the function "Block level"
- ❑ Choose the desired level of block by pressing the key [↑] and confirm the choice by pressing the Key [↑]. To enable the level of block selected the DIP switch to the original ON position

The available levels of block are the following:

Level 0: it completely disables the access to the functions. You can perform the following functions through the keyboard:

- ❑ Changing the display mode
- ❑ Dosing Start/stop (when such a function is enabled)
- ❑ Data printing (when such a function is enabled)

Level 1: it enables the access to the following functions:

- ❑ Totalisers re-setting
- ❑ Dosing functions modifications

Level 2: it enables the access to the following functions:

- ❑ Quick start menu (see code level 2 = 11111)
- ❑ Scale (full enabling)
- ❑ Display (partial enabling)
- ❑ Diagnostics (partial enabling)

Livello 3: it enables the access to all the functions of level 2

When the Dip-switches are on OFF position, all the functions are enabled.

The functions requiring an access code higher than L2 are reserved to the service.

ACCESS TO CONFIGUARATION MENU'

From any visualization pages push this key: 

For choose a item of menu push: 

To enter in a item of menu: 

EXAMPLES

EX. 1 : Set full scale from "quick start menu"

FROM VISUALIZATION PAGES PUSH:

FS1

choose the volume unit with the key:

dm³, dal, hl, m³, ml....

choose the type of unit with the key:

metric volume units
British or American volume units
metric mass units
British or American mass units

choose the time unit of measure with the key:

s, m, h, d,

Set the numeric value with the key:

Use the key:

for move in the numeric side

EX. 2 : Set full scale from main menu

FROM VISUALIZATION PAGES PUSH:

KEYCODE: 00000

FS1

choose the volume unit with the key:

dm³, dal, hl, m³, ml....

choose the type of unit with the key:

metric volume units
British or American volume units
metric mass units
British or American mass units

choose the time unit of measure with the key:

s, m, h, d,

Set the numeric value with the key:

Use the key:

for move in the numeric side

1.SENSOR	1.1 ND	1.2 COEFF. KA	1.3 COEFF. KL+ / KL-	1.4 TEST EMPTY PIPE
	SET ND	SET KA	SET KL	EMPTY PIPE : ON/OFF

2.SCALES	2.1 FS1	2.2 MU.TOT	2.3 IMP1	2.4 IMP2
	FULL SCALE 1 SET	MEASURE UNIT	PULSE VALUE FOR CH. 1	PULSE VALUE FOR CH. 2
	VOLUME UNIT	TYPE OF UNIT	MISURE UNIT	MISURE UNIT
	TYPE OF UNIT	DECIMAL TOTALIZER	TYPE OF UNIT	TYPE OF UNIT
	UNIT TIME		NUMERIC VALUE	NUMERIC VALUE
	NUMERIC VALUE			

3.MEASURE	3.1 T. CONST	3.2 SKIP THR	3.3 PEAK THR	3.4 CUT-OFF
	TIME CONTANT SET	ACCELERATION THRESHOLD	SIGNAL PICK CUT THRESHOLD	FLOW RATE CUT OFF

4.ALARMS	4.1 MAX THR	4.2 MIN TRH	4.3 HYSTERESIS	4.4 V.ALL.mA
	MAX FLOW RATE ALARM	MIN FLOW RATE ALARM	SET HYST. THRESHOLD	4/20 mA-FAILURE

5.INPUTS	5.1 RESET T+	5.2 RESET P+	5.3 RESET T-	5.4 RESET P-
	FUNCTION ACTIVE WITH INPUT IN VOLTAGE			

6.OUTPUT	6.1 D.O. OUT.1	6.2 D.O. OUT.2	6.3 USC.mA1
	SEE THE TAB REFER TO OUTPUTS		SET CURRENT VALUE
			SCALE (4-20/22 mA) AND SIGN (+,-,±)

7. COMMUNIC	7.1 ADDRESS	7.2 SPEED
	NETWORK ADDRESS SET	

8. DISPLAY	8.1 LANGUAGE	8.2 RESET T+	8.3 RESET P+	8.4 RESET T-
		RESET TOT. TOTAL +	RESET TOT. PART. +	RESET TOT. TOTAL -

9.DATA LOGGER	9.1 ACQUISITION	9.2 INTERV. (h)	9.3 DD/MM/YY 00:00	9.4 DISPLAY DATA
		INTERVAL FOR DATA LOGING	DATE AND TIME SET	DISPLAING DATA STORED

10.DIAGN.	10.1 CALIBRATION	10.2 SELFTEST	10.3 SIMULATION	10.4 STAND-BY
	ENABLES CALIBRATION	METER AUTOTEST	FLOW RATE SIMULATION	

11.INT. DATA	11.1 L2 KEYCODE	11.2 LOCK LEVEL	11.3 LOAD FACT. PRES.	11.4 LOAD USER PRES.
	LEVEL 2 ACCESS CODE	LOCK LEVEL SET	FACTORY DATA RECALL	USER DATA RECALL

CONVERTER

Some functions are available and visualised on display, only with the additional modules or if is enable a specific function.

1.5 AUTOZERO CAL.	1.6 AUTOZERO RES.
START ZERO CALIBR.	RESET ZERO CALIBR.

2.5 TPUL1	2.6 TPUL2	2.7 I. IS	2.8 I. FS
DURATION PULSE CH.1	DURATION PULSE CH.2	MIN VALUE INP. 4÷20	MAX VALUE INP. 4÷20
		UNIT OF MEASURE	UNIT OF MEASURE
		TYPE OF UNIT MEAS.	TYPE OF UNIT MEAS.
		SIGN	SIGN
		VALUE	VALUE

3.5 AUTOCAL.	3.6 E. SAVING	3.7 INTERV.=S
	ENERGY SAVING ENABLE	SAMPLING INTERVAL

5.5 COUNT LOCK	5.6 CALIBRATION
LOCK TOTALISER	
FUNCTION ACTIVE WITH INPUT IN VOLTAGE	

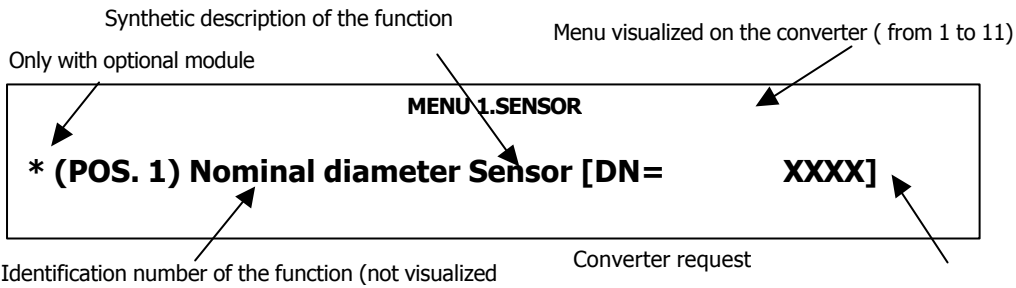
8.5 RESET P-	8.6 CURRENCY	8.7 CUR. DECIM.	8.8 XXX/dm³ +	8.9 XXX/dm³ -
RESET TOT. TOTAL -		CHOICE DECIMAL CURR.	CONV. FACTOR + FLOW RATE	CONV. FACTOR - FLOW RATE

9.5 DISPLAY EVENTS	9.6 DISP MIN/MAX	9.7 CLEAR DATA	9.8 CLEAR EVENTS	9.9 CLEAR MIN/MAX

11.5 SAVE USER PRES.	11.6 HOURS	11.7 KS
USER DATA SAVE		

FUNCTION MENU

(description of the function with access code< 3)



MENU 1.SENSOR

(POS. 1.1) Nominal diameter Sensor [ND= XXXX]

Sensor nominal diameter. The value shown in the plate on the sensor must be entered. Its value has to be within the range from 0 to 3000 mm.

IMPORTANT: if you want to know the speed of the liquid passing through the sensor, set this parameter at 0. The instrument will show the liquid speed expressed in meter per second (m/s). **Attention:** in this case all the totalised values will be expressed in metres (m) and will then be without any meaning

(POS. 1.2) Coefficient KA [KA=±XX.XXXX]

Coefficient KA set. This parameter is calculated during the sensor calibration. It has to be set at the value shown in the sensor plate

(POS. 1.3) Coefficiente KL [KL= +/-XX.XXXX]

Coefficient KL set. Leave the value at default.

(POS. 1.4) Test "empty pipe" [E.P. DETECT XXX]

This function enables/disables the empty pipe detection feature.To determine the empty/full pipe condition the signal is analysed within a one second time window. In case the pipe is detected to be empty, then the measure is lock. For a proper behaviour a calibration of this function should be performed in site as described below. Its value hat to be either ON or OFF.

(POS. 1.5) "Autozero" calibration [AUTOZERO CAL.]

This function enables/disables the automatic zero calibration system. It is necessary to perform this function at the first sensor installation or after a long period the sensor has been empty. To perform the sensor it is absolutely necessary the sensor is full of liquid and that the liquid is perfectly staying still. Even very small movement of the liquid may effect the result of this function, and, consequently, the accuracy of the system**. Pressing the key : start a automatic calculation** (time= 60 s) that zeroing the instrument; at the end of the time push to go out of function.

(POS. 1.6) RESET "Autozero" [AUTOZERO RES.]

This function deletes the previous (zero calibration) if was effected a wrong zero calibration : press and ; press to delete the operation.

MENU 2.SCALES

(POS. 2.1) Full scale n° 1 [FS1=dm³/S X.XXXX]

Full scale value set for range N.1. There are four fields to fill in order to set this parameter, from left to right: 1) volume unit of measure, 2) type of unit, 3) time unit of measure and 4) numeric value. The selection is made by positioning the cursor on the field to modify. To change the type of unit of measure (metric, British or American, mass or volume) the cursor has to be positioned on the symbol "/" (field N. 2). When the nominal diameter is set to zero it is possible to modify only the numeric field, since the unit of measure stays at m/sec. The following tables show the units of measure available and the conversion factor by comparison with 1 dm^3 and 1 kg. The converter accepts any kind of combination of units of measure satisfying both the following conditions:

- Numeric field value ≤ 99999

- $^1/_{25}$ $fs_{max} \leq$ numeric field value $\leq fs_{max}$.

where fs_{max} is the maximum full scale value corresponding to the sensor, equal to a 10 m/sec liquid speed. The units of measure are shown as appear on the display. The British and American units are diversified by using capital and small characters.

Available units of mass and volume

cm^3	Cubic centimetre
ml	Millilitre
l	Litre
dm^3	Cubic decimetre
dal	Decalitre
hl	Hectolitre
m^3	Cubic metre

in^3	Cubic inch
Gal	American gallon
GAL	British gallon
ft^3	Cubic foot
Bbl	Standard barrel
BBL	Oil barrel
yd^3	Cubic yard
kgl	KAmerican gallon
KGL	KBritish gallon

Oz	Ounce
Lb	Pound
Ton	short tons

G	Gram
Kg	Kilogram
T	Ton

When a mass unit of measure is set, the specific gravity function is automatically enabled by the system. Please, note that the mass measure is heavily effected by the temperature and therefore with certain liquids this may cause significant measure errors. The units of measure of time may be chosen among the following values: **s** = second, **m** = minute, **h** = hour, **d** = day.

(POS. 2.2) Unit of measure and number of decimal totaliz . [tot. UM.:dm³ X.XXX]

Setting the unit of measure and number of decimals for visualized the totaliz .

For set the unit of measure , position the cursor on field of the actual unit of measure; For set the type of unit, position the cursor on the blank space between the unit of measure and the numeric value; For set the number of decimal totaliz . position the cursor on numeric field and choose one of the possible combinations: 1000-01.00-001.0-00001.

*** (POS. 2.3)Pulse value channel 1 and unit of measure of totaliz . [IMP1=dm³X.XXXXX]**

Setting of the volume corresponding to each pulse of channel 1 and totaliz . unit of measure. There are three fields to fill in to set this parameter, from left to right: 1) unit of measure, 2) type of unit of measure and 3) numeric value. The selection is performed positioning the cursor on the field to modify. To change the type of unit of measure just position the cursor on the blank space between the unit of measure and the numeric value. Then the nominal diameter is set to zero, it is possible to modify only the numeric field since the unit of measure stays at metre (m). the possible units of measure are those above described.

(POS.2.4)Pulse value channe 2 and unit of measure of totaliz . [IMP2=dm³X.XXXXX]

Setting of the volume corresponding to each pulse of channel 2 and totaliz . unit of measure.

This function is identical to the previous one and is active only if the pulse emission on channel 1 has been set as enabled.

***(POS. 2.5) Pulse duration channel 1 [TPUL2=msXXXX.XX]**

Setting of the duration of the pulse generated on channel 1. Its value is expressed in milliseconds and has to be between 0.4 and 9999.99.

***(POS. 2.6) Pulse duration channel 1 [TIMP2=ms XXXX.XX]**

Setting of the duration of the pulse generated on channel 2.

***(POS.2.3) Minimum value for input 4÷20mA [I. IS=bar ±XXX.XX]**

Setting the minimum value for external device with 4÷20mA output. There are four fields to fill in to set this parameter, from left to right: 1) unit of measure, 2) type of unit of measure and 3) sign, 4) numeric value. The selection is performed positioning the cursor on the field to modify. To change the type of unit of measure (pressure, temperature or percentage of f.s) just position the cursor on the blank space between the unit of measure and the numeric value. This function is active only with additional module.

***(POS. 2.8) Maximum value for input 4÷20mA [I. FS=bar ±XXX.XX]**

Setting the maximum value for external device with 4÷20mA output.

This function is identical to the previous one and is active only with additional module.

MENU 3. .MEASURE

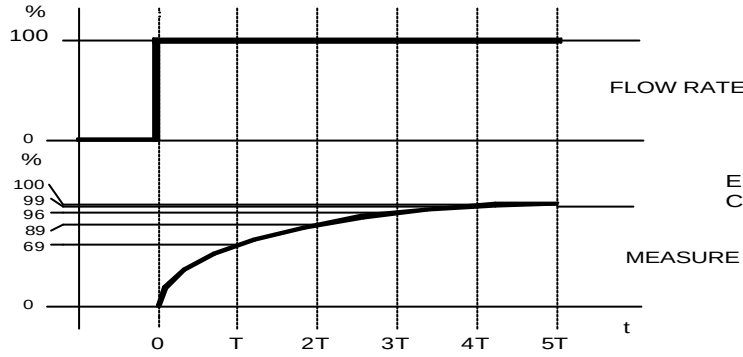
(POS. 3.1) Time constant [T. COST=sXXXX.X]

Time constant set. This parameter effects the integrating filter making the instrument response quicker or slower, depend to the set value. A higher value corresponds to a more stable but slower measure, a smaller

value the opposite. The most common values are from 1 to 5 seconds. The value of this parameter has to be within the range from 0 (integral filter disabled) to 6000.0 seconds. The following diagram shows the response of the instrument for a flow rate variation from 0 to 100% within the T time constant period.

(POS. 3.2) Acceleration threshold [SKIP THR.=% XXX]

Acceleration threshold set. The acceleration threshold stands for the limit beyond which a flow rate variation determines an immediate response at the output, without being filtered by the time constant. This system allows the instrument to have an immediate response in case of big variations of the flow rate, filtering (and delaying) the response to small variations. The result of that is a very stable measure, ready to follow the process. The value is set as percentage of the full scale value from 0 to 125%. If such a value is set to zero any flow rate variation bigger than 0.5% of the full scale value will immediately effect the outputs. The following diagram shows the instrument response in two cases: a flow rate variation from 0 to 10% completely absorbed by the time constant effect and a variation form 10% to 100% exceeding the acceleration threshold and then immediately sent to the output. In actual fact there is always a minimum time between the measure acquisition and the outputs update.



(POS. 3.3) Peak cut off threshold [PEAK THR =%XXX]

Anomalous signal pick cut off threshold set. This parameter allows to set the maximum value of deviation of the actual measure sample by comparison with the average one. If the new value is higher than the set limit, a new value is "cut" to the limit value. This function is used to make the meter less sensitive to big perturbations on the flow rate measure, as it may happen when there are solids in suspension in the liquid hitting against the electrodes determining a high electrical noise. The permitted values of this function is

from 0 up to 125 % and are referred to the full scale value. If this parameter is set to zero the peak detection function is disabled and any new measure ample will be accepted and processe by the converter.

(POS. 3.4) Low flow zero threshold [CUT-OFF=%XX.X]

Low flow zero threshold set. When the flow rate value falls below this parameter the flow rate is assumed to be zero. This parameter can be set from 0 to 25.0% of the full scale value. When this parameter is set to zero this function is disabled.

(POS.3.5)Auto-calibration [AUTOCAL=ON/OFF]

Enables/disables the auto-calibration function. When enabled the converter performs a calibration cycle once every hour. During such a cycle the measure is "frozen" at the latest measured value. The calibration lasts from 8 to 15 seconds from case to case and allows to remove completely the thermal derivation error effects on the measure. This function is recommended to be enabled is the instrument undergoes strong temperature variations during its working. Allowed values for this parameter: ON / OFF.

(POS. 3.6) Risparmio energia [RISP. ENERGIA=ON/OFF]

Abilitazione della funzione automatica di risparmio energetico.

Enable automatic energy saving function.

This function IF ON, ENABLES THE OPERATION OF THE METER IN ACCORDANCE WITH INTERVALS OF FIXED TIME WITH THE FOLLOWING FUNCTION; if OFF the measure is continuous at 10 Hz of frequency. Allowed values for this parameter: ON/OFF

(POS. 3.7) MEASURE INTERVAL [INTERVAL =sXXXXX]

This function determines the interval of time among a measure and the other (see pag. 6)

MENU 4.ALARMS

***(POS. 4.1) Maximum direct flow rate threshold [MAX THR =%XXX]**

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

***(POS. 4.2) Minimum flow rate threshold [MIN THR =%XXX]**

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

***(POS. 4.3) Hysteresis [HYST =% XX]**

Hysteresis threshold set for the minimum and maximum flow rate alarms.

***(POS.4.4)Out current value in case of Alarms [V.all.mA=% XX**

Setting of the value the 4...20 mA current output has to be in one of the following cases:
coils interrupted ; ADC error ; battery low . Minimum value 20% (4 mA)

MENU 5.INGRESSI

***(POS. 5.1) Enable of reset T+ [RESET T+=ON/OFF]**

Total direct (positive) flow totaliz . reset enable. When this function is active, the totaliz . may be reset applying a voltage on the on/off input or from keyboard.

***(POS. 5.2) Partial + totaliz . reset enable [RESET P+=ON/OFF]**

Partial direct (positive) flow totaliz . reset enable. See the previous function.

***(POS. 5.3) Total – totaliz . reset enable [RESET T-=ON/OFF]**

Total reverse (negative) flow totaliz . reset enable. See the previous function.

***(POS. 5.4) Partial – totaliz . reset enable [RESET P-=ON/OFF]**

Total reverse (negative) flow totaliz . reset enable. See the previous function.

***(POS. 5.5) Totaliz . counting lock enable [COUNT LOCK = ON/OFF]**

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

***(POS.5.6) Autozero" calibration external command enable [CALIBRATION=ON/OFF]**

Autozero calibration external command enable. 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 1 sec., the meter performs a calibration cycle for compensate possible thermal drifts. If the voltage pulse is more 1 sec, the meter performs a zero calibration of measure. This function enables/disables the automatic zero calibration system.

MENU 6. OUTPUT

(POS. 6.1) Choice of the function corresponding to on/off output 1 [OUT 1=XXXXXX]
Choice of the function corresponding to digital Output 1. The functions are listed in the table below
(POS. 6.2) Attribuzione funzione uscita on / off n.2 [USC.2=XXXXXX]
Choice of the function corresponding to digital Output 2. The functions are listed in the table below

FUNCTION FOR OUTPUT 1, 2

OFF: DISABLED
IMP+#1: PULSE ON CHANNEL 1 FOR POSITIVE FLOW RATE
IMP-#1: PULSE ON CHANNEL 1 FOR NEGATIVE FLOW RATE
IMP. ±#1: PULSE ON CHANNEL 1 FOR POSITIVE AND NEGATIVE FLOW RATE
IMP+#2: PULSE ON CHANNEL 2 FOR POSITIVE FLOW RATE
IMP-#2: PULSE ON CHANNEL 2 FOR NEGATIVE FLOW RATE
IMP. ±#2: PULSE ON CHANNEL 2 FOR POSITIVE AND NEGATIVE FLOW RATE
SEGNO: FLOW DIRECTION OUTPUT (ENERGISED = -)
AL.MIN: AL. MIN FLOW RATE (ENERGISED = AL. OFF)
AL. MAX : AL. MAX FLOW RATE (ENERGISED = AL. OFF)
OVERFLOW.: OUT OF RANGE ALARM OUTPUT (ENERGISED = FLOW RATE OK)
HW ALARM: CUMULATIVE ALARM OUTPUT : interrupt coils, measure error, low battery (ENERGISED=NO AL.

***(POS. 6.3) Choice of the function and the range of current output [OUT.mA1=X÷XX±]**

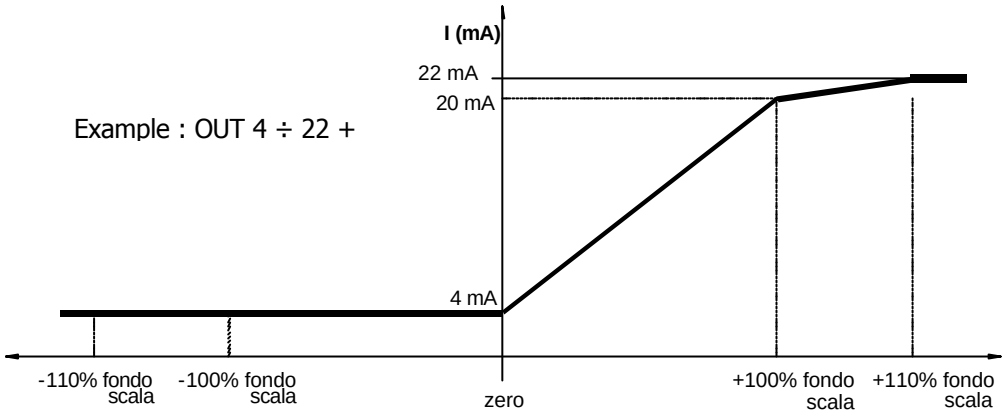
Choice of the function and the range of current output N.1. The current output is **optional**; there are three fields to modify for this function:

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

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

CURRENT VALUES IN mA ASSOCIATE TO THE % VALUE OF FULL SCALE					
POSSIBLE FIELD	REVERSE FLOW VALUE		**ZERO**	DIRECT FLOW VALUE	
	£ **-110%**	**-100%**	**0%**	**+100%**	3 **+110%**
Usc.mA = 4 ÷ 20 +	**4**	**4**	**4**	**20**	**20**
Usc.mA = 4 ÷ 22 +	**4**	**4**	**4**	**20**	**22**
Usc.mA = 4 ÷ 20 -	**20**	**20**	**4**	**4**	**4**
Usc.mA = 4 ÷ 22 -	**22**	**20**	**4**	**4**	**4**
Usc.mA = 4 ÷ 20 ±	**20**	**20**	**4**	**20**	**20**
Usc.mA = 4 ÷ 22 ±	**22**	**20**	**4**	**20**	**22**
Usc.mA = 4 ÷ 20 –0+	**4**	**4**	**12**	**20**	**20**
Usc.mA = 4 ÷ 22 –0+	**4**	**4.8**	**12.8**	**20.8**	**22**

In hardware alarm conditions "HW ALARM" the current value is programmed by the function "mA VALL. FAULT" and it is expressed as percentage of a fixed current range, where: 20% = 4 mA e 110% = 22 mA.



MENU 7.COMMUNICATION

***(POS. 7.1) Network address set [ADDRESS =XXX]**
Network address set. The address is to identify the instrument when connected via serial interface. The allowed values are from 0 to 255.
***(POS. 7.2) RS232 serial interface communication speed [SPEED1=XXXXX]**
Serial interface communication speed for the RS232 output. This parameter may be set at one of the following values:: 480, 9600, 19200 and 38400 bps.

MENU 8.DISPLAY

(POS. 8.1) LANGUAGE [LANGUAGE =XX]
Choice of the layout language: E = English, I = Italian, F = French, S = Spanish.
(POS. 8.2) Total Totaliz . + reset enable [RESET T+=ON/OFF]
Reset of totaliz. Total ; when this function is ON is possible reset the totaliz. by key board
(POS. 8.3) Partial + totaliz . reset enable [RESET P+=ON/OFF]
Reset partial direct (positive) flow totaliz . .
(POS. 8.4) Total – totaliz . reset enable [RESET T-=ON/OFF]
Reset total reverse (negative) flow totaliz . .
(POS. 8.5) Reset Partial reverse (negative) flow totaliz . . [RESET P-=ON/OFF]
Reset Partial reverse (negative) flow totaliz . .
N.B.: The reset of the totaliz . may be done from the function listed upon pushing the key and the key for more than 2 sec. The reset of partial tolizer and currency may be done also from the visualization pages at page 12 like this . Push for more than 2 sec. the key . Set the L2 CODE if request and then push the key. At the question "RESET TOTALIZ.?". Push for more than 2 sec, the key to proceed with the zeroing. Push any other key to cancel this operation.
(POS. 8.6) Enable conversion currency [CURRENCY =ON/OFF]
This function visualizes the values of the partial totalizators converts in the unite of selecteded currency.
(POS. 8.7) Decimal currency [CURR DECIM =X]
This function allows the choice of the numbers of decimals to use for the visualization of the numerical value converted in the currency. The allows values are from 0 to 3. The function is active only if the currency function is enable
(POS. 8.8) Conversion factor for direct flow rate totaliz . [EUR/dm^3+ =X]
Set the value of conversion/currency for direct totaliz . (positive). There are three fields for this parameter, from left to right:1) monetary token, 2) default/personalized monetary token, 3) conversion coefficient. For the selection setting the cursor over the field to modify. The mode set of monetary token could be two:
1. choice of one of the 7 predetermined monetary tokens (standard ISO 4217-REV81):

EUR = Eur, USD = USA dollar, CAD = Canadian dollar, AUD = Australian dollar, GPB = English pound, CHF = Swissfranc, JPY = Japanese yen.
1) choice three free characters (number or letter) . To change the characters , the cursor has to be positioned on the symbol "/" (field N. 2)

(POS. 8.9) Conversion factor for revers flow rate totaliz . [EUR/dm^3-=X]
Set the value of conversion/currency for reverse totaliz . (negative) . Refer to the previous function.

MENU 9.DATA LOGGER

(POS. 9.1) Automatic data logging enable [ACQUISITION =ON/OFF]
Automatic data logging enable .

(POS. 9.2) Data logging time interval set [INTERV.(h)=X]
Sampling time interval for the data logging function and their printing. The allowed values are: 1, 2, 3, 6, 8, 12, 24, 48 hours..

(POS. 9.3) Date and time set [🕐 = gg/mm/aa hh:mm]
Date and time set. If the real time clock optional module is present, then the time setting is kept also when the power supply is off, otherwise it is frozen till the power supply is back. For example, if the power supply has been off for one hour, when switched on the instrument will be one hour late. The calendar is valid till year 2091.

N.B.: Date and time are visualized only if data logger is ON.

(POS. 9.4) Logged data display [DISPLAY DATA]
Displaying of the data stored in the data logger.

(POS. 9.5) Alarm events visualization [DISPLAY EVENTS]
Visualization function of the events. With this function it's possible visualize in temporal succession all the events of alarm verify during the operation of the meter up to a maximum of 64 events.

(POS. 9.6) Minimum maximum flow rate visualization [DISP. MIN/MAX]
Visualization function of minimum and maximum peak of flow rate. The numerical values stored are refer to the unit of measure set during data relief

(POS. 9.7) Logged data cancel [CLEAR DATA]
Data logger reset

(POS. 9.8) Reset alarm events [CLEAR EVENTS]
Reset all alarm events**.**

(POS. 9.9) Reset minimum maximum flow rate visualization **[RESET MIN/MAX]**
Reset all minimum and maximum peak of flow rate stored.

MENU 10. DIAGNOSTIC

(POS. 10.1) Meter "calibration" [CALIBRATION]
Enable the calibration of the meter. With this function the measure doesn't interrupted but start a cycle calibration of the input circuit of the converter.
The activation of this function happens pressing the key [◆] during the visualization of the function.
Will be visualized the following question: " EXECUTE?" press for more of two second the key [◆] to proceed . Press any other key to delete the operation

(POS. 10.2) "Autotest" function enable [SELF TEST]
Meter auto test function. This function stops the normal functions of the meter and performs a complete test cycle on the measure input circuits and on the excitation generator. To activate this function, after select it, push key [◆] at the question: "EXECUTE?" push for more 1 second key [◆] for start autotest, or any other key for delete operation. The result of the test is shown on the display. At the end of operation will have visualized one of visualization page. This function is automatically performed when switching the device on.

(POS. 10.3) Flow rate simulation enable [SIMULATION]
Flow rate simulation enable. With this function it is possible generating an internal signal applied on the input terminals simulating the flow rate, allowing the outputs tests and all the instruments connected.
After enable the simulation flow rate it could be:

- set: pushing for more 1 second the key [➡] from one of four visualization pages
- start: pushing the key [◆] after set it

- finished: pushing for more 1 second the key [→] from visualization pages and then pushing for more 1 second the key [→].

N.B.: the enable of flow rate simulation disable the contrast regulation.

(POS. 10.4) Stand-by of meter **[STAND-BY]**

Enable the stand-by of the meter. To activate this function, after select it, press the key [◆] and at the request "Execute?" press the key [◆] for more of two second to activate the stand-by of the instrument, any other key to delete the operation. To reactivate the instrument is enough press any key of the keyboard. The consumption of the instrument in stand by is about 50 µA

NOTE : we recommend to enable this function when the meter will be off for long term.

MENU 11. INTERNAL DATA

(POS. 11.1) Level 2 access code set **[L2 KEYCODE =XXXXX]**

Level 2 access code enter. This code is programmable by the user within the range 00001 - 65535. Setting such value at 22222 the access code for levels lower than level 3 is disabled.

(POS. 11.2) Block level **[BLOCK LEVEL =X]**

Block level function can be set from 0 to 3. Every level enables and disables the use of specific functions. N.B.: the block levels are enabled only if the dip-switches on the back of converter are on (turn on the small levels towards the symbol of the padlock)

(POS. 11.3) Load factory pre-settings **[LOAD FACT PRES.]**

Loads the pre-set programming of the factory. Any previous programming is cancelled getting back to the manufacturer's standard values.

(POS. 11.4) Load user pre-settings **[LOAD USER PRES]**

This function recalls the values saved from the user.

(POS. 11.5) Save user pre-settings **[SAVE USER PRES]**

This function saves the current programming as user pre-settings.

(POS. 11.6) OPERATION TIME **[HOURS = XXXXXX]**

Converter working time

(POS. 11.7) Set KS **[KS=X.XXXX]**

Set KS. This parameter give the possibility to change the calibration of the instrument without change the values of plate (KA)

ALARM MESSAGES, CAUSES AND ACTIONS TO BE TAKEN

Messages	ANOMALIES	ACTION TO TAKE
NO ALARMS	All works regularly	-----
MAX ALARM	The flow rate is higher than the maximum threshold set	Check the maximum flow rate threshold set and the process conditions
MIN ALARM	The flow rate is lower than the minimum threshold set	Check the minimum flow rate threshold set and the process conditions
FLOW RATE >FS	The flow rate is higher than the full scale value set on the instrument	Check the full scale value set on the instrument and the process conditions
PULSE/FREQ>FS	The pulse generation output of the device is saturated and cannot generate	Set a bigger unit of volume or, if the connected counting device allows it, reduce the pulse duration value
INPUT NOISY	The measure is strongly effected by external noise or the cable connected the converter to the sensor is broken	Check the status of the cables connecting the sensor to the converter, the grounding connections of the devices or the possible presence of strong and anomalous noise sources
EXCITATION FAIL	The coils or the cable connecting the sensor to the converter are interrupted	Check the status of the cables connecting the sensor to the converter
BATTERY LOW	Low voltage on battery (battery exhausted)	Replace The Battery

ALARM MESSAGES WHEN THE CONVERTER IS SWITCH ON

CODE	ANOMALIE DESCRIPT.	ACTION TO TAKE
0001	problem with watch-dog circuit	ADDRESSING TO SERVICE
0002	wrong configuration work data in eeprom	
0004	wrong configuration safety data in eeprom	
0008	defective eeprom	
0010	defective keyboard (one or more key are pushed during the test)	
0200	timeout calibration input (input circuit is broken)	
0400	Gain input stage is out of range	Check the status of the cables connecting the sensor to the converter, the grounding connections of the devices or the possible presence of strong and anomalous noise sources
0800	Interruption on the coils circuit	Check the status of the cables connecting the sensor to the converter
1000	Low voltage on battery (battery exhausted)	Replace the battery

MEANING OF DISPLAY FLAGS

FLAG	DESCRIZIONE
M	Alarm Max Activated
m	Alarm Min Activated
!	❑ Interruption Coils Circuit ❑ Segnal Error ❑ Flow rate overflow ❑ Pulse overflow
C	Calibration Running
S	Simulation
B	Low Battery
*****	Power Supply From : ❑ 4 ÷ 20 Ma ❑ Main Line

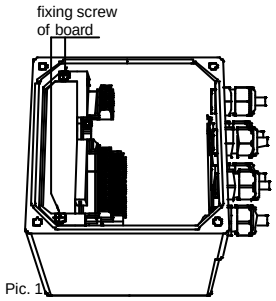
MAINTENANCE OF THE INSTRUMENTS

VERIFY PERIODICALLY:

- ❑ The integrity of the power supply cables, wiring and other electrical parts connected
- ❑ The integrity of the instrument's housing (this must not have bruises or other damages that may compromises the hermetical sealing)
- ❑ The tightening of the sealing elements (cable glands, covers, etc.)
- ❑ The integrity of the front panel (display and keyboard), damages may compromise the sealing
- ❑ The mechanical fixing of the instrument on the pipe or on the wall stand

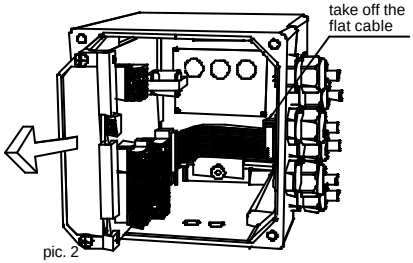
APPENDIX 1

Display rotation



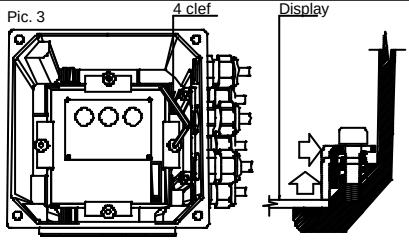
Pic. 1

- Unscrew the screws suitable in pic. 1



pic. 2

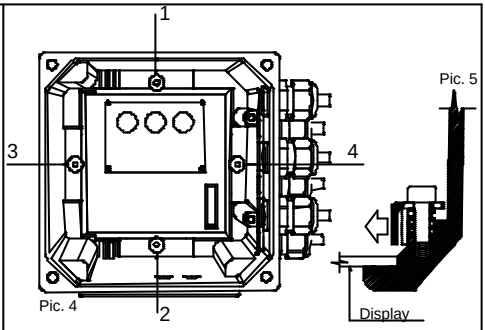
- Lift the board, take off the flat cable from the display pic. 2 and extract definitely the board from the box



Pic. 3

- Unscrew the fixing screw of display to allow the shift of the angular and the extraction of the display

N.B.: don't unscrew entirely the screw



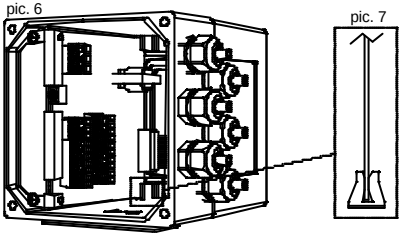
Pic. 4

Pic. 5

- Rotate the display in the desired location, verify the correct set of the seal, the cleaning of the contact surfaces of and set the display in the lodging.

- Shift the angular in the suitable direction (pic. 5) and screw down the scew, till to the support perception of the angular on the display

- Shut definitely the screw in the order 1-2-3-4 suitable in represents pic. 4



- Restore the connection of the flat cable to the display

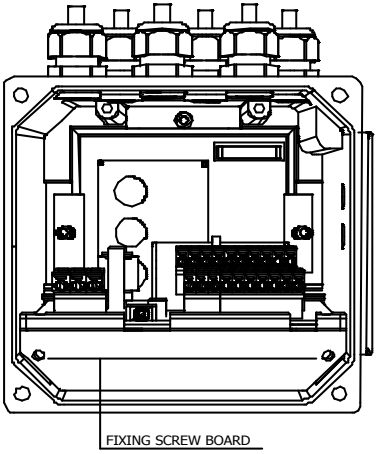
- Verify the correct set of the board in the fixing clip (Pic.7)

- Finish the assemblage fixing to the box the board

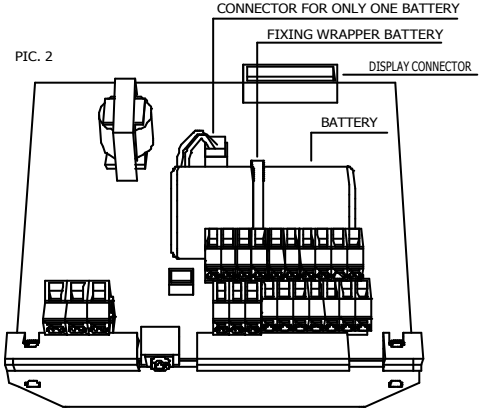
BATTERY SUBSTITUTION

ONLY ONE BATTERY SUBSTITUTION

PIC. 1



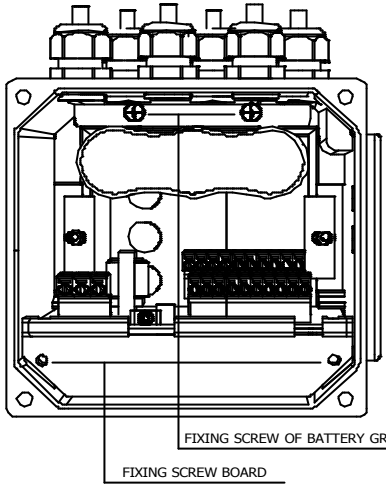
PIC. 2



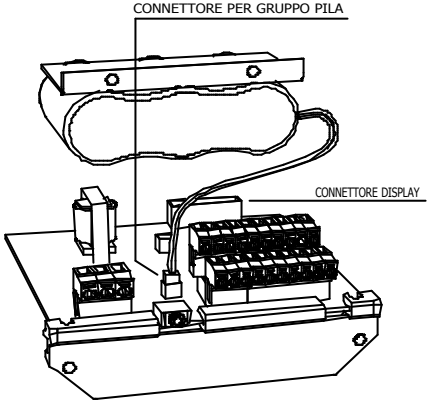
- VERIFY THE ABSENCE OF POWER SUPPLY
- SET IN STAND-BY THE INSTRUMENT (MENU 10)
- EXTRACTS THE BOARD UNSCREWING THE FIXING SCREW OF BOARD
- UNTHREAD THE CONNECTOR OF THE DISPLAY
- UNTHREAD THE BATTERY CONNECTOR
- CUT THE FIXING WRAPPER
- FIX THE NEWS BATTERY WITH THE WRAPPER IN ENDOWMENT
- INSERT THE BATTERY CONNECTOR AS SUITABLE IN PIC. 2
- TO RECONNECT THE FLAT OF THE DISPLAY
- FIX THE BOARD IN THE CONVERTER

BATTERY GROUP SUBSTITUTION

PIC 3



PIC. 4



- VERIFY THE ABSENCE OF POWER SUPPLY
- SET IN STAND-BY THE INSTRUMENT (MENU 10)
- EXTRACTS THE BATTERY GROUP UNSCREWING THE FIXING SCREW SUITABLE IN FIG. 3
- UNTHREAD THE BATTERY CONNECTOR
- INSERT THE BATTERY CONNECTOR AS SUITABLE IN PIC. 4
- FIX THE BATTERY GROUP IN THE CONVERTER

EXHAUSTED BATTERIES MUST BE DISPOSED-OF IN ACCORDANCE WITH LOCAL REGULATIONS

DECLARATION OF CONFORMITY
according to ISO / IEC Guide 22 and EN 45014

ISOIL INDUSTRIA

Product's name: **Electromagnetic flow meter serie's**

ISOMAG *Millennium*

Converter model: **ML250**

Option: **all applicable**

Sensors model **: MS 501 – MS 600 – MS1000 – MS 2410 – MS 2500 – MS 3700 – MS 3770 – MS 5000**

ISOIL INDUSTRIA S.p.A. declares that the above mentioned products satisfy the following requirements:

Safety

EN61010, dielectric strength = 4 kV, installation category II, IP67 (compact and separate version) IP54/65 (front panel version)

EMC

EMC reference : **Immunity: EN 61326-1**
Emission: EN 61326-1

Test :

- **EN55011** (150 kHz – 30 MHz): Groupo 1, class **B**
- **EN55011** (30 MHz – 1GHz): Group 1, class **B**
- **IEC 1000-4-2**: **4 kV** CD, **8 kV** AD
- **IEC 1000-4-3** (f = 80 MHz – 1 GHz, antenna at 3 m, AM modulation 1kHz 80%): **10 V/m**
- **IEC 1000-4-4**: **4 kV** on all ports
- **IEC 1000-4-5** (2kV diff/2kV common mode)

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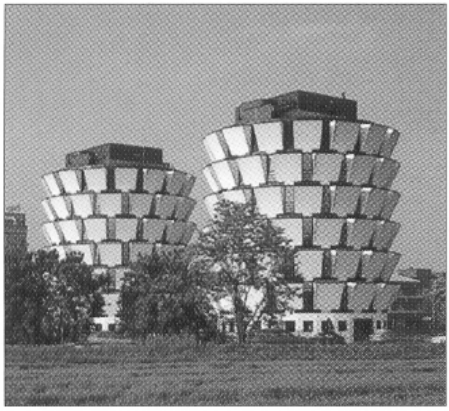

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