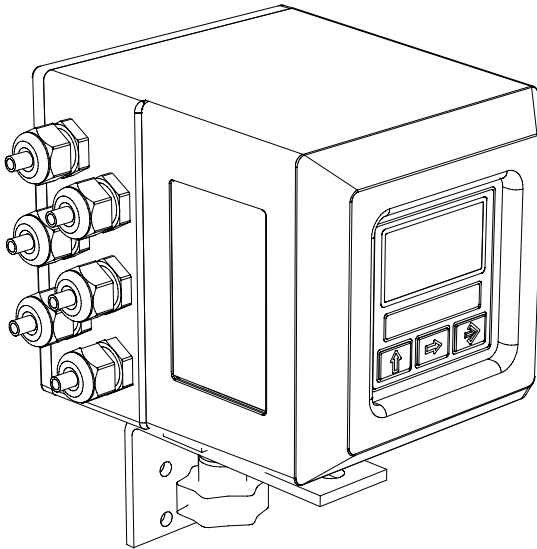


OPERATING AND INSTALLATION MANUAL

CONVERTER

ML 250



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INTRODUCTION

This manual is integral part of the product. Read carefully the instructions contained it since it contains important indications for a safe of use and maintenance.

Technical information and relative products in this manual could undergo modifications without any previous notice.

The flow meter must be used for what it has been built for. The improper use, possible tampering of the instrument or parts of it and substitutions of any not original components, makes the warranty to decay automatically.

The manufacturer is considered responsible only if the instrument in used in his original configuration.

The reproduction of the present manual and of possible software supplied with the instrument it's strictly forbidden

Symbols Used on the manual



ATTENTION



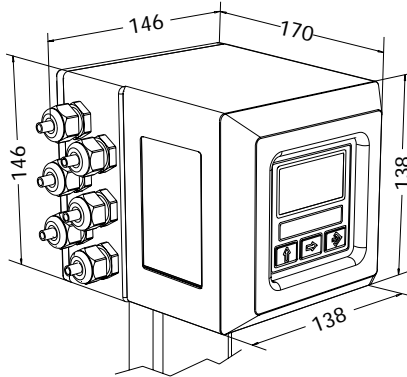
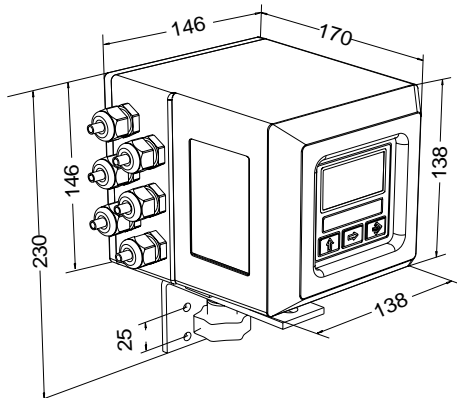
DANGER ELECTRIC SHOCK



WARNING

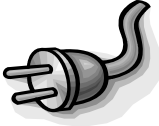


PRECAUTIONS

OVERALL DIMENSIONS**COMPACT VERSION****SEPARATE VERSION**

Converter power supply

NET POWER SUPPLY



With main power supply the batteries are automatically excluded.
The converter always works at the maximum sampling rate (continuous sampling).

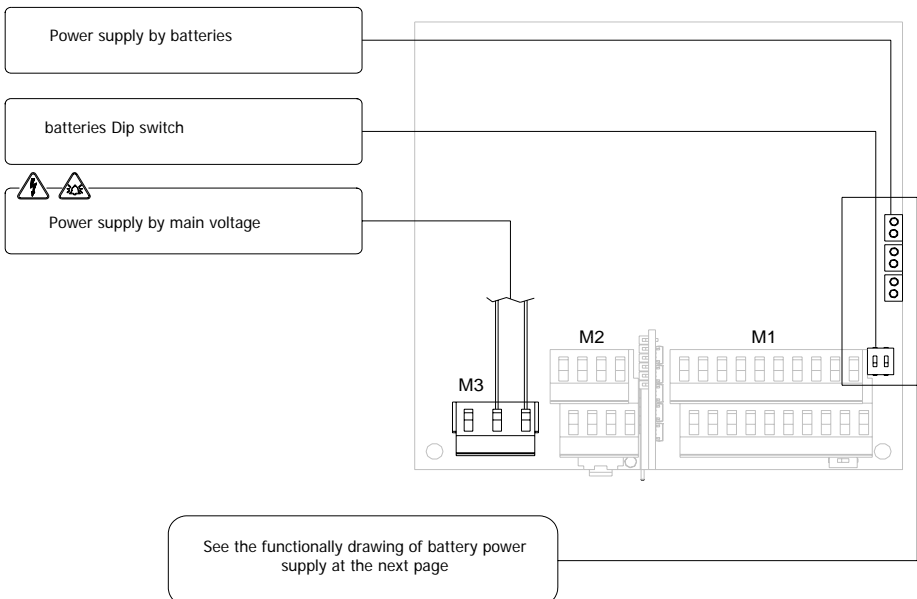
and/or

BATTERIES



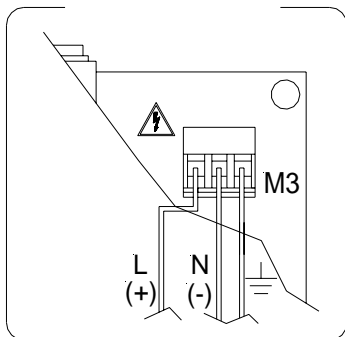
To avoid to exhaust the batteries in short time, activate the function 3.5 "energy saving" and set the function 3.6 "measure interval " with a proper time. This function disable the converter to works always to the maximum sampling rate (continuous sampling).

IMPORTANT NOTE: at the beginning, if the converter was switch-off for a long period MAY HAPPEN the "BATTERY LOW" message. This is pretty "normal" and it's due to "chemical reaction"; normally the battery value became correct after 2/3 hours from converter switch on





POWER SUPPLY FROM MAIN VOLTAGE (OPTIONAL)



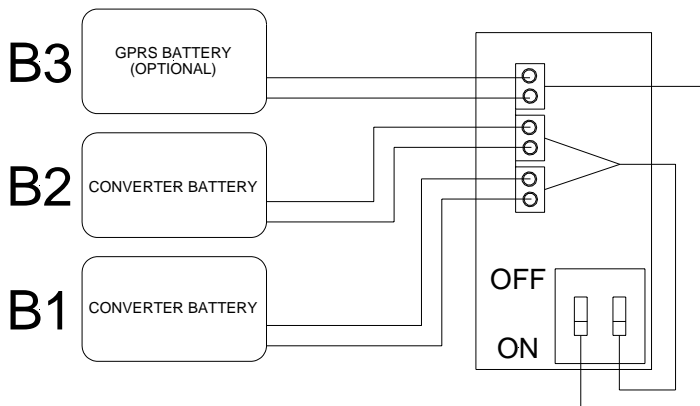
- ❑ before connecting the power supply, verify that the mains voltage is between the limits indicated on the data plate

WARNING

- ❑ For the wiring use only approved conductors, with fireproof properties.
- ❑ The power supply line must be equipped with an external protection for current overload (fuse or automatic line breaker with limiting capacity not greater than 1A).
- ❑ Provide in the proximity of the instrument a circuit breaker that must be easily accessible from the operator and clearly identified.

NOTE: characteristics of meter's power supply, see page 8

POWER SUPPLY FROM BATTERIES



START UP AND MAINTENANCE OF THE INSTRUMENTS

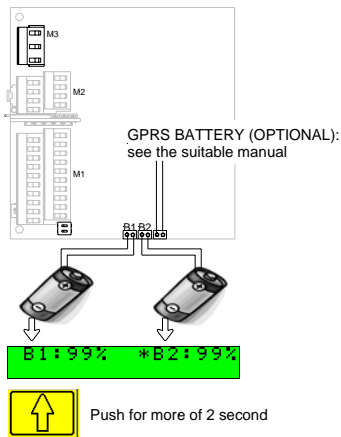
Before to switch on the instrument verify the following:

- ❑ Power supply voltage must correspond to that specified in the name plate
- ❑ Electric connections must be done as described from page 10
- ❑ 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

CHARGE VISULIZATION



IMPORTANT

- The converter is delivered in **STAND BY MODE**; to switch **ON** the converter, push for more of 5 seconds the key
- To see the battery status (charge) push for more than 2 seconds . The symbol "*" it's aside to the battery in use. (B1 or B2)
- If there are 2 batteries (or 2 battery packs), the converter will use **AS FIRST B2** and when the battery B2 will be discharge (low voltage), the converter switch automatically to B1 and give an alarm

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
LITUM 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 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			
Ambient Temp.			
Min.		Max	
°C	°F	°C	°F
-10*	-14*	50	122



* For discontinuous use, the installation of heating resistance is necessary

MEASURE/ CONSUMPTIONS

The converter can be used in two different modes:

- with continuous sampling
- with sampling to preset unit of time.

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

In this mode the converter make the measure in accordance with the classical diagram of the flow meter; the consumption of the system, with any diameter of the sensor is 0,05 W ; **the life of battery is about 1 month (6 with 6 battery)**

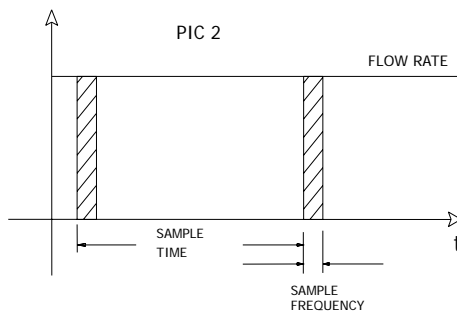
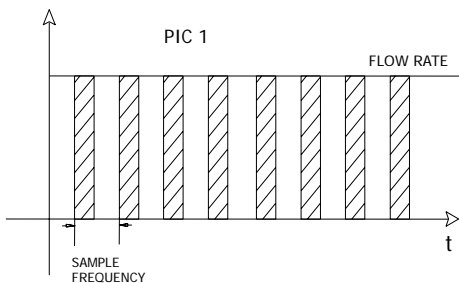
The accuracy of the system is definite in those conditions.

SAMPLING TO PRESET UNIT TIME (pic. 2) (ENERGY SAVING ON)

This mode works sampling the range to intervals of preset time (see MEASURE menu, func. 3.5); it allows a great saving of energy

In this conditions the consumptions are:

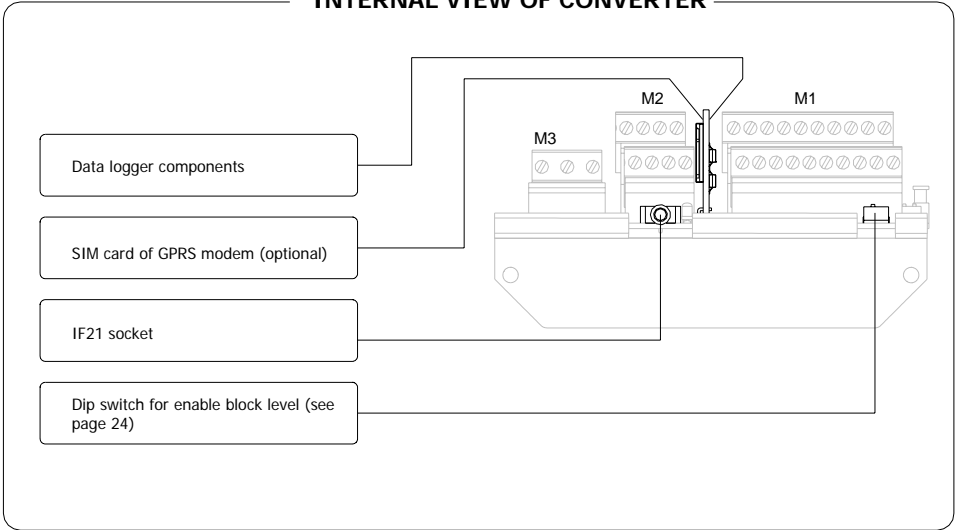
Sampling time (s)	Battery life - n° 1 battery (years)	Battery life – " N " batteries (years)	
1	0,7	0,7 * N	Whatever the results , the maximum time is limited to 10 years
2	1.3	1.3 * N	
5	2.1	2.1 * N	
10	2.7	2.7 * N	
15	3.0	3.0 * N	
>= 30	5	5.0 * N	



ATTENTION: the consumptions on the table are without optional IF2 cable connected to the converter. This device accelerate the consumption of the batteries even if the instrument is in standby mode. **Recommends to disconnect the IF2 cable from the converter after every his uses or switch off the converter by the dip-switches (see page 6)**

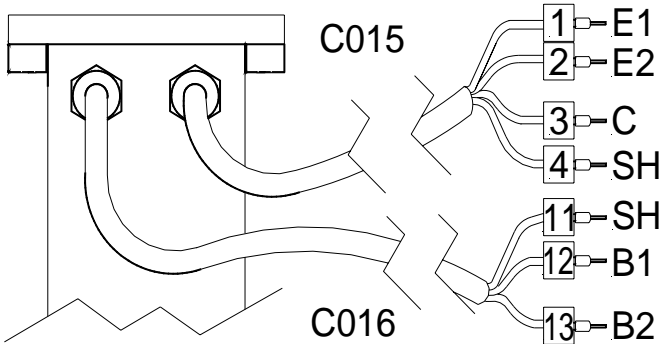
ELECTRICAL CONNECTIONS

INTERNAL VIEW OF CONVERTER



SENSOR-CONVERTER CONNECTIONS

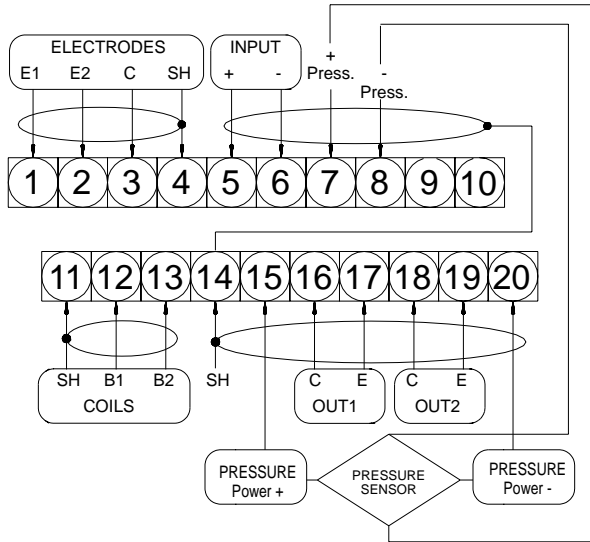
SEPARATE VERSION



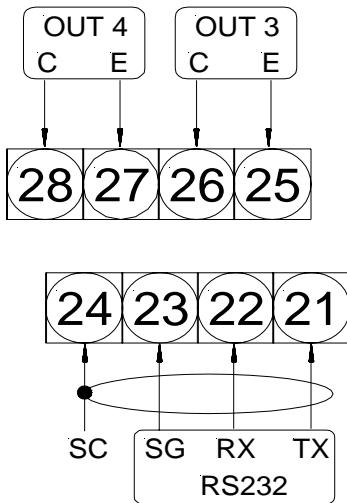
THE CABLE MUST BE INSIDE OF METALLIC CONDUIT AND ELECTRICAL CONNECT WITH THE CONVERTER HOUSING AND THE GROUND ! MAX LENGTH 20 m

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

TERMINAL BLOCK M1



TERMINAL BLOCK M2 (OPTIONAL)



LEGENDA

SC: Cable shield, electrically connected to ground and to the casing

RX: Input terminal of the signal "RECEIVE DATA" RS232 port

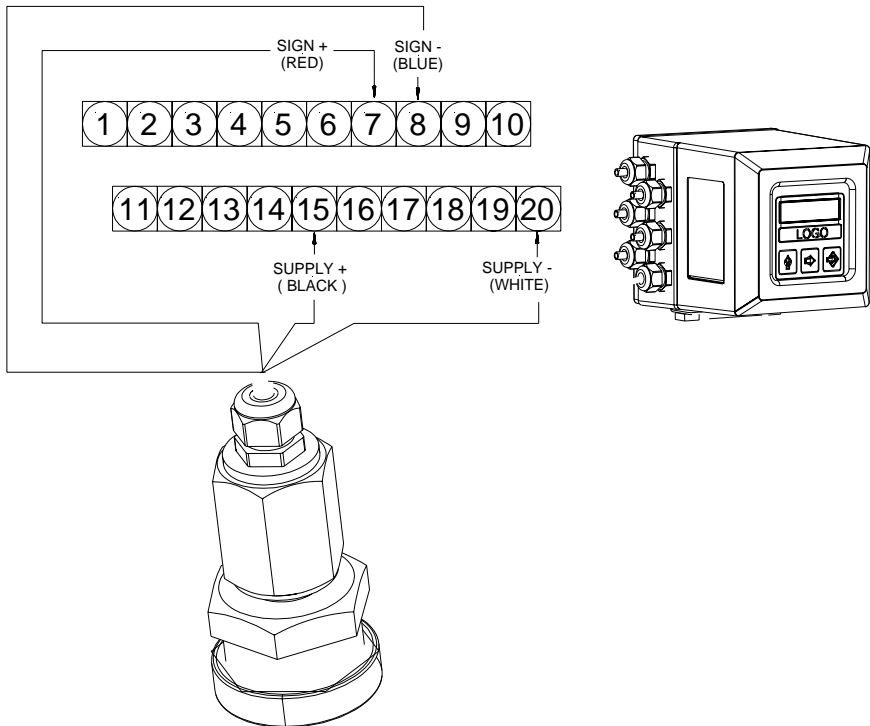
TX: Output terminal of the signal "TRASMIT DATA" of the RS 232 port

SG: Terminal "SIGNAL GROUND" common to all signals of the RS232 port

C: Terminal connected with the COLLECTOR of the transistor of the on/off output

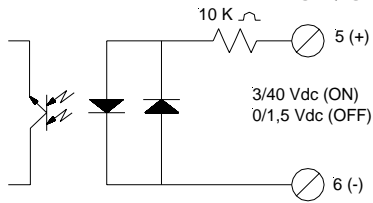
E: Terminal connected with the EMITTER of the transistor of the on/off output

TERMINAL BLOCK: Electrical connection pressure probe

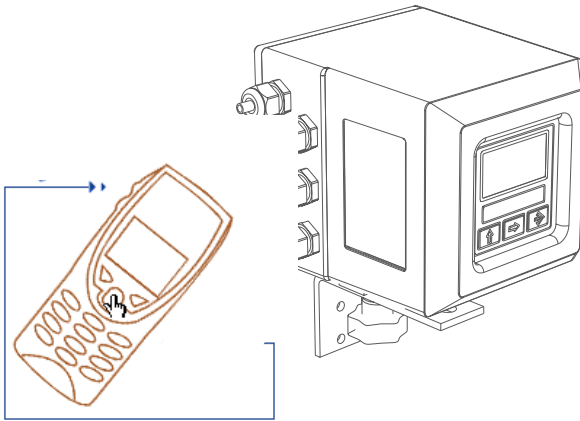


OPTIONAL MODULE (IN/OUT)

- ❑ **ME42:** 2 on/off output + 1 on/off input
- ❑ **ME43:** port RS232 (**N.B.:** not galvanically isolate from the other circuits)
- ❑ **ME44:** GPRS communication module
- ❑ **ME45:** all the functions of module ME41 + ME42 + ME43

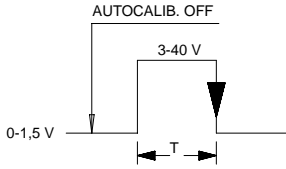
ON/OFF INPUT**External power supply****ME 44** : ME44 : module with GPS/GPRS modem

See the specific operation manual available when the converter is equipped with this module !



FUNCTIONS OF "ON/OFF" INPUT

"Autozero" calibration

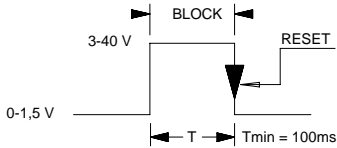


$T_{min} < T < 1 \text{ sec.} = \text{autocalibration}$
 $T > 1 \text{ sec.} = \text{Autozero}$

Necessary conditions for enable the function

- POS. 5.7 ENABLED

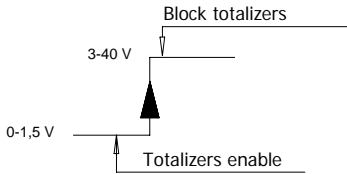
Reset totalizers



Necessary conditions for enable the function

- POS. 5.1 ÷ 5.4 ENABLED at least one
- N.B.: This function is even assignable to the input 2

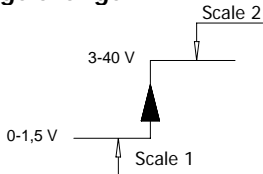
Block totalizers



Necessary conditions for enable the function


1. POS. 5.6 ENABLED

Range change



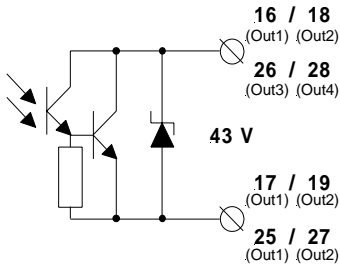
Necessary conditions for enable the function

3. POS. 5.8 ENABLED

Speed rate	T_{min}	 <p>ATTENTION: the time T must be $\geq T_{min}$</p>
10 Hz	220 ms	

OUT ON/OFF (MAX 50Hz)

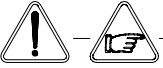
Electric wiring



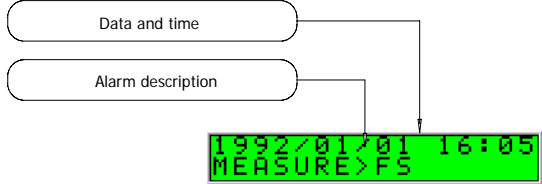
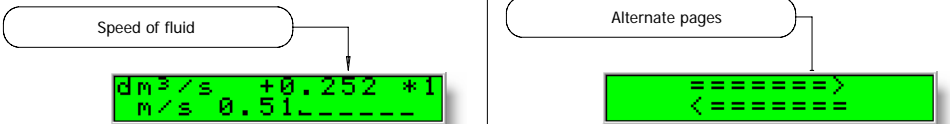
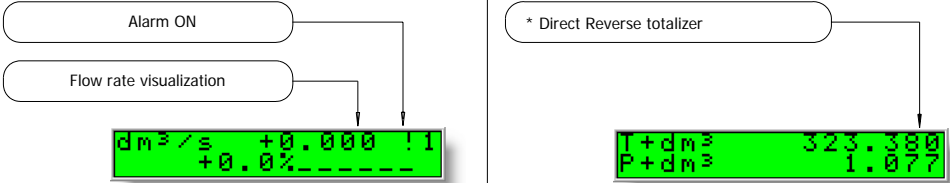
Technical characteristics

- Opto-insulated output with floating collector and emitter terminals freely connectable
- Maximum switching voltage: 40 Vdc
- Maximum switching current: 100mA
- Maximum saturation voltage between collector and emitter @10mA: 0,8 V
- Maximum switching frequency (load on the collector or emitter, $R_L=240\Omega$, $V_{OUT}=24V_{dc}$): 50Hz
- Maximum reverse current bearable on the input during and accidental polarity reversion (VEC): 100mA
- Insulation from other secondary circuits: 500 Vdc

VISUALIZATION PAGES



The direct exposure of the converter to the solar rays, could damage the liquid crystals display.



* The maximum number shown from the totalizer is 999999999 independently from the number of selected decimals. Beyond this value the totalise are reset.

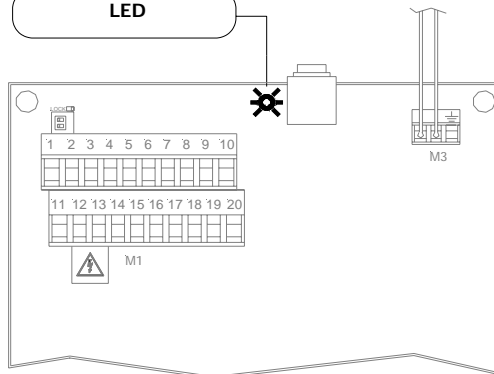
FLAG AND LED INTERPRETATION

FLAGS

dm³/s +0.3795 M
P+dm³ 125526.829

FLAGS INTERPRETATION	
FLAG	DESCRIPTION
M	Alarm max activated
m	Alarm min activated
!	- Interruption coils circuit - Signal error - Empty pipe
C	Calibration running
B	Poor power batteries
*	Power supply from: <input type="checkbox"/> 4÷20mA <input type="checkbox"/> mains

LED



LED INTERPRETATION

The led it flashes every time that the meter executes a measure cycle of coils.

The led marks the alarm presence during the visualization of one of the pages indicated from page 16

ACCESS TO THE INSTRUMENT

KEYBOARD



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
Visualizes the remaining charge of the batteries



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):

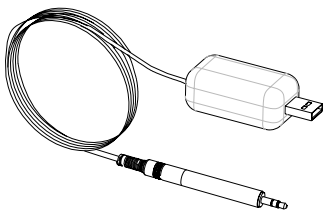
It enter /leaves the selected function
It enables the main menu for the instrument configuration
It cancels the selected function under progress



LONG PRESSING (> 1 SECOND):

It leaves the current menu
It enables the totalizer reset request (when enabled)
It confirms the selected function

IF2 INTERFACE



The converter it can be programmed by the IF2 serial interface.

Recommends to disconnect the IF2 cable from the converter after every his uses or switch off the converter

ML250 Functions

(for detail functions with symbol "*" see the manual from page 25)

Attention: The function in grey colour are visualized on display only with other active functions or with optional modules

MAIN MENU 1-Sensor

```

1-SENSOR
ND=mm      00025
KA=        +00.9900
S.model=   00
Ins.Position= 0
KL=[0]    +00.0000
KL=-[0]   +00.0000
E.P.detect= OFF
E.P.calibr.
Autozero cal.
Autozero res.
  
```

- 1.1 Insert ND of sensor (0-3000)
- 1.2 Calibration data of sensor visualized on sensor's label
- 1.3 Sensors model: Enter the first two characters of the serial number of the sensor
- 1.4 Position for insertion sensors: 0=1/8DN, 1=1/2DN, 2=7/8DN
- 1.5 Factory parameter
- 1.6 Enables the empty pipe detection feature
- 1.7* Enables the automatic calibration procedure of the empty pipe detection
- 1.8* Enables the automatic zero calibration system
- 1.9 Reset the preceding function

MAIN MENU 2-Scales

```

2-SCALES
Fs1=dm³/s  05.000
Fs2=dm³/s  05.000
Tot.MU=dm³  1.000
Imp1=dm³   025.000
Imp2=dm³   025.000
TPul1=s    0.01
TPul2=s    0.01
  
```

- 2.1* Full scale value set for range N.1
- 2.2* Full scale value set for range N.2
- 2.3* Unit of measure and number of decimal totalizes
- 2.4* Pulse value on channel 1
- 2.5* Pulse value on channel 2
- 2.6* Duration of the pulse generated on channel 1
- 2.7* Duration of the pulse generated on channel 2

MAIN MENU 3-Measure

```

3-MEASURE
Tconst=s   0001.0
Cut-off=%  01.0
Autocal.=  OFF
Autorange= OFF
E.saving=  OFF
Interval=s 00005
  
```

- 3.1* Time constant
- 3.2 Low flow zero threshold: 0-25% of full scale value
- 3.3 Enable every hour an internal cycle of calibration. The measure it's stopped for 8-15 sec.
- 3.4* Automatic change of scale
- 3.5* Energy saving
- 3.6 Interval of time among a measure and the other (see page 6)

MAIN MENU 4-Alarms

```

4-ALARMS
Max thr+=% 000
Max thr-=% 000
Min thr+=% 000
Min thr-=% 000
Hyst.=%    03
E.P.thr.=  075
  
```

- 4.1 Maximum value alarm set for direct flow rate
- 4.2 Maximum value alarm set for reverse flow rate
- 4.3 Minimum value alarm set for direct flow rate
- 4.4 Minimum value alarm set for reverse flow rate
- 4.5 Hysteresis threshold set for the minimum and maximum flow rate alarms
- 4.6 Empty pipe detection threshold. It's automatically set by the function 1.9

MAIN MENU

5-Inputs

5-INPUTS		
T+ reset=	OFF	5.1* Total direct (positive) flow totalise reset enable
P+ reset=	OFF	5.2* Partial direct (positive) flow totalise reset enable
T- reset=	OFF	5.3* Total reverse (negative) flow totalise reset enable
P- reset=	OFF	5.4* Partial reverse (negative) flow totalise reset enable
Count lock=	OFF	5.6 Totalise counting lock command (see page 12)
Calibration=	OFF	5.7* Autozero calibration external command
Range change=	ON	5.8 Range change external command (see function 3.4)
Wake-up=	OFF	5.9* Auto- swtch on command

MAIN MENU

6-Outputs

6-OUTPUTS		
Out1=	IMP1	6.1* Output 1 functions
Out2=	OFF	6.2* Output 2 functions

MAIN MENU

7-Communication

7-COMMUNICATION		
IF2 Prot.=	DPP	7.1 Choice of the communication protocol for the IF2 device
Address=	000	7.2 Address value of converter (range 0 – 255)
RS232 bps=	19200	7.3 Speed of the RS232 output (possible choices: 2400, 9600, 19200, 38400 bps)
RS232 Prot.=	DPP	7.4 Choice of the communication protocol for the RS232 port
SCADA Prot.=	OFF	7.5 Enable SCADA protocol*
Interval=	1h	7.6 Interval of e-mail sending*
Int.SMS=h	1	7.7 Interval of SMS checking*
Send time =	00:30	7.8 Time of sending data*
SMS=	OFF	7.9 Enable the SMS operations*
Send data=	OFF	7.10 Enables or disable the emails sending*
S.event SMS=	OFF	7.11 Enable the SMS over event*
S.data SMS=	OFF	7.12 Sms Process Data Send Enable*
Send SDL=	OFF	7.13 Enables the sending of STATIC DATA LOGGER by e-mail*
Send DDL=	OFF	7.14 Enables the sending of DINAMIC DATA LOGGER by e-mail*
Send EVT=	OFF	7.15 Enables the sending of EVENTS by e-mail*
M.units=	OFF	7.16 Enables the sending of measure units by e-mail*
Clock sync.=	OFF	7.17 enables clock synchronization with a specified server via the HTTP protocol*
Roaming=	OFF	7.18 Roaming enable*
Send delay=m	000	7.19 Delay of data sending (SCADA)*
Send data		7.20 Send data through e-mail immediately (according to settings of above functions)
Send config.		7.21 Send config through e-mail immediately*
S.data SMS		7.22 Send data through sms immediately(according to settings of above functions) *

* = see wireless specific manual for more details

MAIN MENU
8-Display

```

8-DISPLAY
Language=      EN
T+ reset
P+ reset
T- reset
P- reset
D.time=s      060
Quick start=  OFF
Net total.=   OFF
Currency=      OFF
Curr.decim.=  2
EUR/dm3+ 01.0000
EUR/dm3- 01.0000

```

- 8.1 Choice of the language: E= English, I=italian, F= French, S= Spanish
- 8.2* Total direct (positive) flow totalise reset from keyboard
- 8.3* Partial direct (positive) flow totalise reset from keyboard
- 8.4* Total reverse (negative) flow totalise reset enable from keyboard
- 8.5* Partial reverse (negative) flow totalise reset enable from keyboard
- 8.6 Time for switch off display (shown with function 3.7 enabled)
- 8.7 Visualization of "Quick start menu"
- 8.8 Enable the page of net totalizer (difference between direct and reverse. see page 16)
- 8.9 Visualizes the values of the partial totalise in the unit of selected currency
- 8.10 Choice of the numbers of decimals for the visualization currency value: From 0 to 3
- 8.11* Value of conversion/currency for direct totalizer
- 8.12* Value of conversion/currency for reverse totalizer

MAIN MENU
9-Data logger

```

9-DATA LOGGER
Acquisition=  ON
Interval=m    1
1992/01/06 23:14
Disp.dyn.data
Display data
Display events
Disp.min/max
Clear dyn.data
Clear data
Clear events
Reset min/max

```

- 9.1* Automatic data logger enable
- 9.2* Interval time for the data logging function: 1, 2, 3, 5, 15, 30, 60 minutes
- 9.3* Date and time set
- 9.4* Display dynamic data
- 9.5 Displaying of the data stored in the data logger
- 9.6 Displaying of the last 64 alarms stored in the data logger
- 9.7 Visualization function of minimum and maximum peak of flow rate
- 9.8 Logged dynamic data cancel function
- 9.9 Logged data cancel function
- 9.10 Reset all alarm events
- 9.11 Reset all minimum and maximum peak of flow rate stored

MAIN MENU
10-Diagnostic

```

10-DIAGNOSTIC
Calibration
Self test
Simulation=  OFF
Stand-by

```

- 10.1* Enable the calibration of the converter
- 10.2* Converter auto-test
- 10.3* Flow rate simulation enabling
- 10.4* Stand-by function

MAIN MENU
11-Internal data

```

11-INTERNAL DATA
L2 keycode=00000
Lock level=  3
Load fact.pres.
Load user pres.
Save user pres.
Hours=      000015
KS=        +1.0000

```

- 11.1 Level 2 access code enter
- 11.2 Block level function can be set from 0 to 3
- 11.3 Load factory data pre-set
- 11.4 Load user data saved
- 11.5 Save user data
- 11.6 Visualisation of the total operation hours of the converter (function not editable)
- 11.7 Ks Coefficient

ACCESS TO THE CONFIGURATION MENUES

The access to the configuration menu can take place in two different modes:

- ❑ Through the **“Quick start menu”** where is possible to access directly to some of the principal functions
- ❑ Through the **“Main menu”** where is possible to access to all function with access code ≤ 2

Below are brought some examples relating to the change of the value in the function “2.1 Fs1”

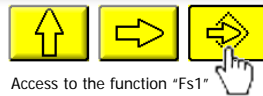
EXAMPLE: modifying the full scale value from $4\text{dm}^3/\text{s}$ to $5\text{dm}^3/\text{s}$. from “Quick start menu”

1 $\text{dm}^3/\text{s} +0.416 *1$
P+ $\text{dm}^3 124129.089$



Enter in the “Quick start menu”

2 0-QUICK START
Fs1= $\text{dm}^3/\text{s} 04.000$



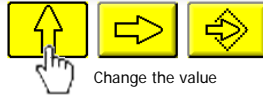
Access to the function “Fs1”

3 0-QUICK START
Fs1: $\text{dm}^3/\text{s} 04.000$



Push repeatedly

4 0-QUICK START
Fs1: $\text{dm}^3/\text{s} 04.000$



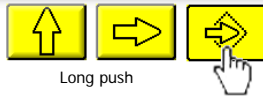
Change the value

5 0-QUICK START
Fs1= $\text{dm}^3/\text{s} 05.000$



Confirm the new value

6 0-QUICK START
Fs1= $\text{dm}^3/\text{s} 05.000$



Long push

7 $\text{dm}^3/\text{s} +0.416 *1$
P+ $\text{dm}^3 124129.089$

Main page

**EXAMPLE: modifying the full scale value from 4dm³/s to 5dm³/s.
from "Main Menu" (quick start menu enable)**

1 dm³/s +0.416 *1
P+dm³/s 124129.089



Enter in the "Quick start menu"

2 0-QUICK START
Fs1=dm³/s 04.000



X 3 TIMES

3 0-QUICK START
Main menu



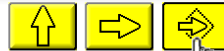
Access to the "Main Menu"

4 0-QUICK START
keycode L2:00000



X 5 TIMES

5 0-QUICK START
keycode L2:11111



6 MAIN MENU
1-Sensor



7 MAIN MENU
2-Scales



Access to the "Scale" menu

8 2-SCALES
Fs1=dm³/s 04.000



Access to the function "Fs1"

9 2-SCALES
Fs1:0m³/s 04.000



Push repeatedly

10 2-SCALES
Fs1:dm³/s 04.000



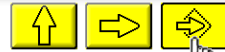
Change the value

11 2-SCALES
Fs1=dm³/s 05.000



Confirm the new value

12 2-SCALES
Fs1=dm³/s 05.000



Long push

13 MAIN MENU
2-Scales



Long push

1 dm³/s +0.416 *1
P+dm³/s 124129.089

Main page

ACCESS CODES

Some functions in the converter are enabled by the access codes. The information of this manual are related to all the functions available with L2 level. All the functions available through higher level are protected and reserved to the service.

Description of the L2 access code

(menu "11 Internal data" pos. 11.1)


- with code L2 = 0000** (with this code only) you disable the request of code L2
NOTE: the availability of the functions is related to the selected block
- * **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 if it is forgotten

FACTORY PRE-SETTINGS ACCESS CODES

The converter is delivered with access code L2:

11111

And with the "Quick start menu" enabled. Pressing the key  from one of the visualization pages to enter in this menu



The "Quick start menu" may be set without entering any access code (see example 1 on page 23).

The last function of the "Quick start menu" allows the access to the main menu.

BLOCK LEVELS

The block level enables or disables the access to the functions of the converter.

The available levels of block are the following:
(menu "11 Internal data" pos. 11.2)

- Level 0:** it completely disables the access to the functions. You can perform the following functions through the keyboard:
 - Changing the display mode
 - Data printing
- Level 1:** it enables the access to the following functions:
 - Totalizer re-setting
 - Dosing functions modifications
- Level 2:** it enables the access to the following functions:
 - Quick start menu
 - Scale (full enabling)
 - Display (partial enabling)
 - Diagnostics (partial enabling)
- Level 3:** it enables the access to all the functions of level 2

FACTORY PRE-SETTINGS BLOCK LEVELS

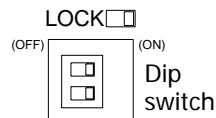
The converter is delivered with the following block level:

3

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

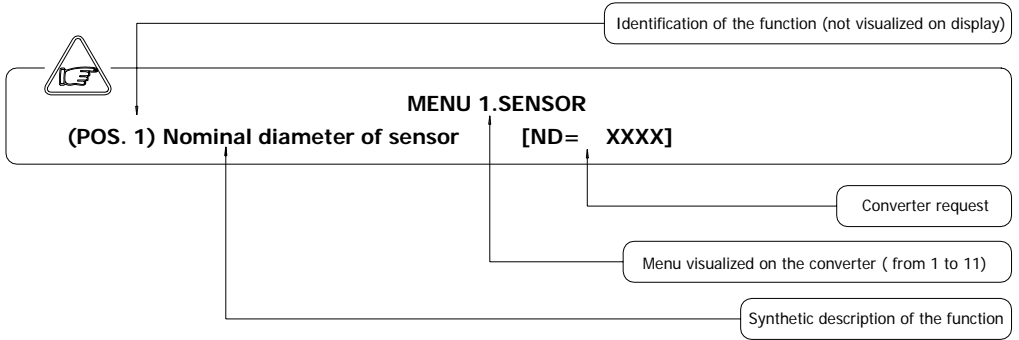
- Set the dip switch on OFF position
 - Access to the function "Block level" of menu 11 (main menu)
 - Choose the desired level of block
- To enable the level of block select place the DIP switch to the ON position

When the Dip-switch it's on "OFF", are available all the functions.



FUNCTIONS DESCRIPTION

(description of the functions with access code < 3)



MENU 1.SENSOR

(POS. 1.7) "empty pipe" calibration

[E.P. CALIBR.]

This function enables/disables the automatic calibration procedure of the empty pipe detection function. Before enabling this function, the Empty Pipe test should be enabled first as above described. Before performing this function, the sensor has to be completely filled with the liquid so that both the lining and the electrodes are wetted. The sensor has then to be emptied again and then you should press the key : the operation will have to be confirmed by pressing the key or cancelled by pressing the key . By this function the system sets the value of a parameter that could also be manually changed (see function "E.P.thr" menu 4-ALARMS).

(POS. 1.8) "Autozero" calibration

[AUTOZERO CAL.]

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 affect the result of this function, and, consequently, the accuracy of the system. Once you are sure the a.m. conditions are fulfilled press for more than one second the key ; will start one counter for 60 s, after that check if the zero is correct , otherwise repeat the operation again. Press to go out the function.

MENU 2.SCALES

(POS. 2.1-2.2) Full scale n° 1-2

[FS1-2= dm^3/S X.XXXX]

Full scale value set for range N.1-2. 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
- $1/25 f_{s_{max}} \leq \text{numeric field value} \leq f_{s_{max}}$

where $f_{s_{max}}$ 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

cm³	Cubic centimetre
ml	Millilitre
l	Litre
dm³	Cubic decimetre
dal	Decalitre
hl	Hectolitre
m³	Cubic metre

in³	Cubic inch
Gal	American gallon
GAL	British gallon
ft³	Cubic foot
Bbl	Standard barrel
BBL	Oil barrel
yd³	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 temperature heavily affects the mass measure 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. 2.3) 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 totalizer

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. 2.4-2.5) Pulse value output 1&2 and unit of totaliz. [IMP1-2=dm³X.XXXXX]

Setting of the pulse volume corresponding to channel 1-2 and of the totalizers measure units.

There are three fields to fill in to set this parameter, from left to right: 1) measure unit, 2) unit type and 3) numeric value. The selection is performed by positioning the cursor on the field to be modified. To change the unit type (metric, British or American, mass or volume) just position the cursor on the blank space between the measure unit and the numeric value. When the nominal diameter is set to zero it is possible to modify only the numeric field since the measure unit stays at meter (m) or feet (ft). The possible measure units are those above described

(POS. 2.6-2.7) Pulse duration OUTPUT 1 & 2 [TPUL1-2=msXXXX.XX]

Choose the duration of the pulse generated on output 1 or 2. The allowed values are: 1s; 2s; 16ms; 31ms; 63ms; 125ms; 250ms; 500ms.

MENU 3. - MEASURE

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

Time constant set. This parameter affects 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. 3.4) Automatic scale change enable [AUTORANGE=ON/OFF]

Enables the automatic change of scale. The meter may have two different working ranges in order to suit to the variable process conditions. In order to get the best results out of this function it is important that range N.2 is bigger than N.1. When the flow rate increases and reaches the 100% of the full scale 1, then the meter automatically switches to scale 2. When the flow rate decreases again reaching a value on scale 2 equal to the 90% of full scale N.1, then the active scale is 1 again. Allowed values for this parameter: ON / OFF. **N.B.:** the autorange doesn't allow using the manual change of range (see pos. 5.8)

(POS. 3.5) Energy saving enable [E.SAVING=ON/OFF]

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

MENU 5. INPUT**(POS. 5.1-5.2-5.3-5.4) Enable reset partial/total totalizers [RESET T+/-/P+/-=ON/OFF]**

When this function is active, the totaliz. may be reset applying a voltage on the on/off input or from keyboard.

(POS.5.7) Autozero calibration external command enable [CALIBRATION=ON/OFF]

Autozero calibration external command enables. 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.

(POS. 5.9) External power on command [EXT. POW.ON= ON/OFF]

If this function is enable and it's installed an optional module with RS232 serial port and On/off input, applying a voltage to the input the meter remains in active mode for all the that applied voltage to the input. During this time it's possible connect the serial communication with the meter, but the display remains switch off to preserve energy. This operational mode is only valid if the function " 3.5 energy saving" is active and the converter is not supply by the main voltage.

MENU 6. OUTPUT**(POS. 6.1-6.2) Function corresponding to on/off output 1-2 [OUT 1-2=XXXXXX]**






Choice of the function corresponding to digital Output 1-2. The functions are listed in the table below

FUNCTION FOR OUTPUT 1, 2,3

- OFF: DISABLED
- #1 IMP+: PULSE ON CHANNEL 1 FOR POSITIVE FLOW RATE
- #1 IMP-: PULSE ON CHANNEL 1 FOR NEGATIVE FLOW RATE
- #1 IMP±: PULSE ON CHANNEL 1 FOR POSITIVE AND NEGATIVE FLOW RATE
- #2 IMP+: PULSE ON CHANNEL 2 FOR POSITIVE FLOW RATE
- #2 IMP-: PULSE ON CHANNEL 2 FOR NEGATIVE FLOW RATE
- #2 IMP±: PULSE ON CHANNEL 2 FOR POSITIVE AND NEGATIVE FLOW RATE
- SIGN: FLOW DIRECTION OUTPUT (ENERGISED = -)
- RANGE: RANGE INDICATION OUTPUT (ENERGISED = SCALE 2)
- MAX AL+: MAX DIRECT FLOW RATE OUTPUT (ENERGISSED = AL. OFF)
- MAX AL-: MAX REVERSE FLOW RATE OUTPUT (ENERGISSED = AL. OFF)
- MAX AL±: MAX DIRECT/REVERSE FLOW RATE OUTPUT(ENERGISSED = AL. OFF)
- MIN AL+: MIN DIRECT FLOW RATE OUTPUT(ENERGISSED = AL. OFF)
- MIN AL-: MIN REVERSE FLOW RATE OUTPUT(ENERGISSED = AL. OFF)
- MIN AL±: MIN DIRECT/REVERSE FLOW RATE OUTPUT(ENERGISSED = AL. OFF)
- MAX+MIN±: MAX AND MIN FLOW RATE ALARM OUTPUT (ENERGISSED = AL. OFF)
- EMPTY PIPE: EMPTY PIPE ALARM OUTPUT (ENERGISSED = FULL PIPE)
- OVERFLOW.: OUT OF RANGE ALARM OUTPUT (ENERGISSED = FLOW RATE OK)
- HW ALARM: CUMULATIVE ALARM OUT interrupt coils, empty pipe, meas. error (ENERG. = NO ALARMS)
- EXT. COMM.: ONLY AVAILABLE WITH DATA LOGGER MODULE

MENU 8.DISPLAY**(POS. 8.2-8.3-8.4-8.5) Reset totalizer [T/P+/- RESET=ON/OFF]**

Reset of totalizer by key board;

N.B.: The reset of the totaliz. may be done from the function listed upon pushing the key  and the key . The reset of partial totalizer /currency may be done also from the visualization pages at page 12 like this . Push the key  Set the L2 CODE if request and then push the key . At the question "RESET TOTALIZ.?". Push the key  to proceed with the zeroing. Push any other key to cancel this operation.

(POS. 8.9) Enable conversion currency [CURRENCY =ON/OFF]

This function visualizes the values of the partial totalizers converts in the unite of selected currency.

(POS. 8.10) 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. 8.11-8.12) Conversion factor for flow rate totalizers**[EUR/dm³+ =X]**

Set the value of conversion/currency for totalizers. 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:

- choice of one of the 7 predetermined monetary tokens (standard ISO 4217-REV81):
EUR = Eur, USD = USA dollar, CAD = Canadian dollar, AUD = Australian dollar, GBP = English pound, CHF = Swissfranc, JPY = Japanese yen.

MENU 9.DATA LOGGER**(POS. 9.1) Automatic data logging enable****[ACQUISITION =ON/OFF]**

Enable data logging; 8192 values in packets with flow rate, partial volumes + and - , input 4/20mA or pressure, date and time of record.

(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, 1, 2, 3, 5, 15, 30, 60 minutes **(only for Eeprom data logger)**

(POS. 9.3) Date and time set**[☉ = DD/MM/YY 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 in RAM**[DISP. DYN DATA]**

Displaying of the data stored in the RAM memory of data logger. This values are the last 512 sample (shift register): min time. 1 s, or to intervals according to the sampling time (example: 1 sampling every 15 s); is possible scroll down the data 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 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 the 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**[SIMULATION]**

Flow rate simulation enabling. With this function it is possible to generate an internal signal that simulates the flow rate, allowing the outputs and all the connected instruments test.

After enabling it, the flow rate simulation can be:

set: by pushing for more 1 second the key  from one of four visualization pages



started: by pushing the key  after set it

finished: by 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  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 μ A

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 a value at 22222 the access code for levels lower than level 3 is disabled. (see pag. 18)

(POS. 11.2) Block level

[BLOCK LEVEL =X]

Block level function can be set from 0 to 3. Every level enables and disables specific functions (see pag. 23).

N.B.: the block levels are enabled only if the dip-switches on the back of converter are on

(POS. 11.3) Factory pre-set data loading

[LOAD FACT PRES.]

Re-set the default factory data. Any previous programming is cancelled getting back to the manufacturer's standard values

(POS. 11.4) User pre-settings loading

[LOAD USER PRES.]

This function recalls the values saved from the user.

(POS. 11.5) User pre-settings saving

[LOAD USER PRES.]

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

(POS. 11.6) Operation time

[HOURS=XXXXXX]

This function allows the visualisation of the total operation hours of the converter

(POS. 11.7) Set KS

[KS= \pm X.XXXX]

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

(POS. 11.8) Ignore calibration error

[Ign.cal.err= ON/OFF.]

This function if ON , ignore the calibration error during the switch on test. Default setting OFF, the converter give alarm if present during the initial test.

Alarm message, causes and action to be taken

Messaggio	Cause	Action
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 the sufficient number of impulses	Set a bigger unit of volume or, if the connected counting device allows it, reduce the pulse duration value
EMPTY PIPE	The measuring pipe is empty or the detection system has not been properly calibrated	Check whether the pipe is empty or perform again the empty pipe function calibration procedure
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
CURR. LOOP OPEN	The 0/4...20mA output on board or the optional one are not correctly closed on a valid load	Verify the load is applied to the output (max 1000 ohm). To disable the alarm, set the "mA VAL.FAULT" value (menu alarm) to 0.
P.SUPPLY FAIL	Power supply different from that indicated on the label.	Verify that the power supply is that indicated on the label
BATTERY LOW	Low voltage on battery (battery exhausted)	Replace The Battery

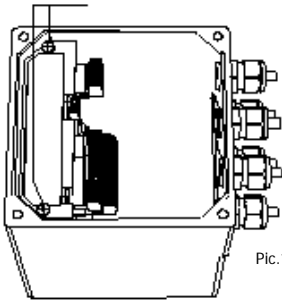
Anomalies codes

CODICE	ANOMALIES DESCRIPTION	ACTION
0001	problem with watch-dog circuit	<p style="text-align: center;">ADDRESS TO SERVICE</p> 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
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)	
0020	Power supply voltage (+3.3) is out of range	
0040	Power supply voltage (+13) is too low (<10V)	
0080	Power supply voltage (+13) it's too high (>14V)	
0200	timeout calibration input (input circuit is broken)	
0400	Input stage gaining is out of range	
0800	Interruption on the coils circuit	Check the status of the cables connecting the sensor to the converter
0C00	Cumulative alarm 0800 + 0400	see single code
0001	problem with watch-dog circuit	ADDRESSING TO SERVICE
1000	Low voltage on battery (battery exhausted)	Replace the battery

APPENDIX 1

Display rotation

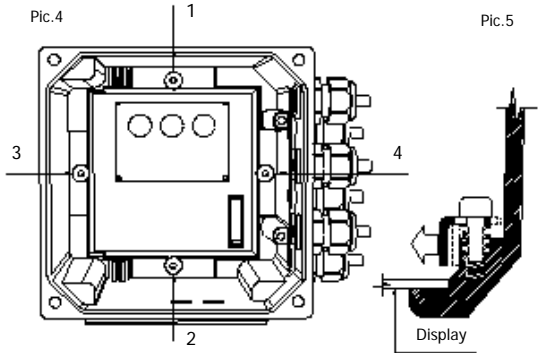
Fixing screw
of board



Pic.1

- ❑ Unscrew the screws suitable in pic. 1

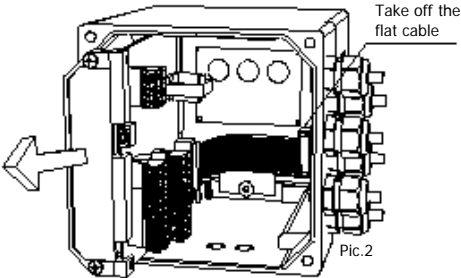
Pic.4



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 screw, 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

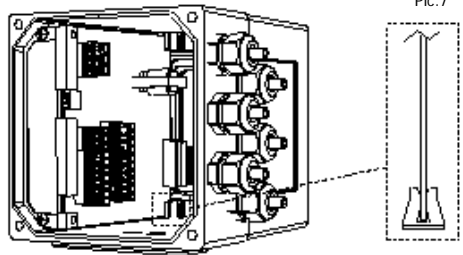
Take off the
flat cable



Pic.2

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

Pic.6

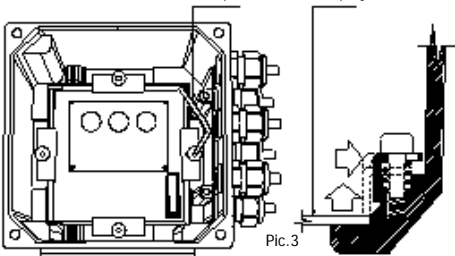


Pic.7

- ❑ 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

4 allen spanners

Display

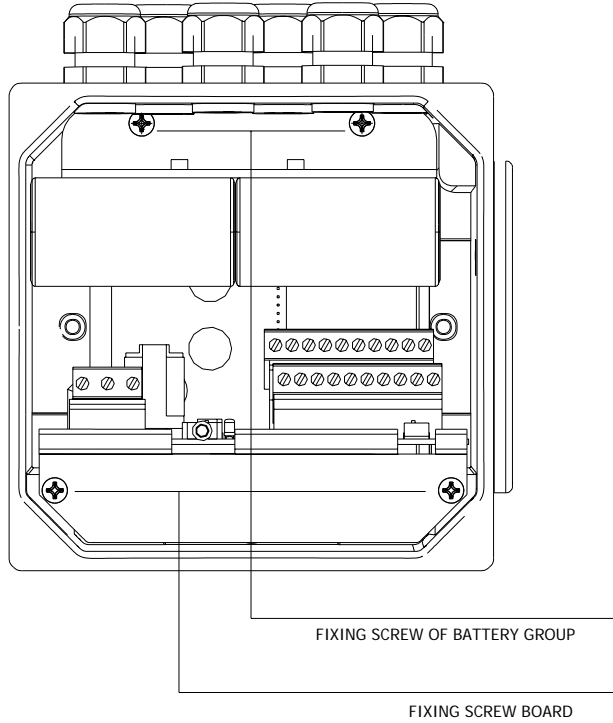


Pic.3

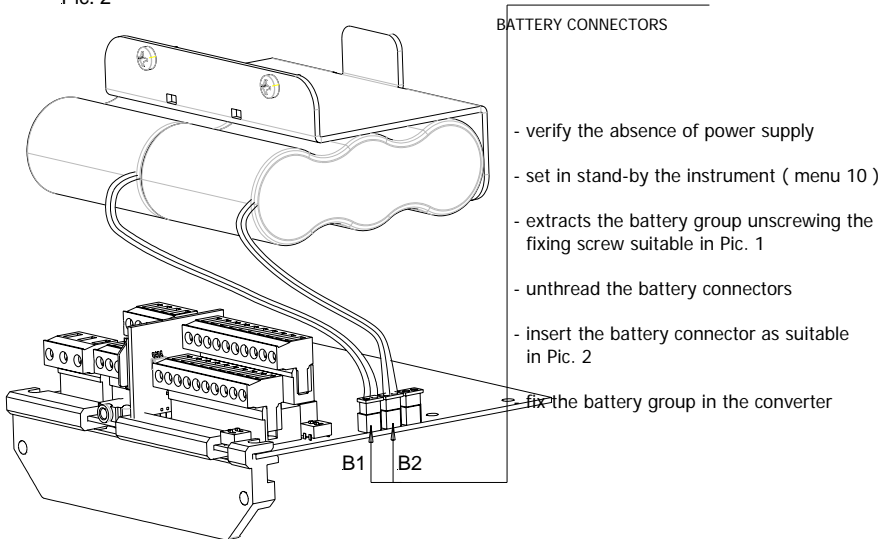
- ❑ Unscrew the fixing screw of display to allow the shift of the angular and the extraction of the display
N.B.: don't unscrew entirely the screw

BATTERY SUBSTITUTION

Pic. 1



Pic. 2



EXHAUSTED BATTERIES MUST BE DISPOSED OF IN ACCORDANCE WITH LOCAL REGULATIONS

DECLARATION OF CONFORMITY**Isoil Industria SpA**

it declares under the own responsibility that the product:

ISOMAG 

Model converters

ML250

Model sensors

MS 500 – MS 501 – MS 600 – MS 1000 – MS 2410- MS 2500 – MS 3700 MS 3770 – MS 5000

to which this declaration refers, is in compliance with the following
Harmonized European Norms:

- **CEI EN 61010-1(2001)**
- **CEI EN 61326-1 (2007)**

and therefore answering to essential requirement of CE directives:

- **2006/95/CE (Low voltage directive – LVD)**
- **2004/108/CE (Electromagnetic compatibilit  Directive – EMC)**

25/11/2007


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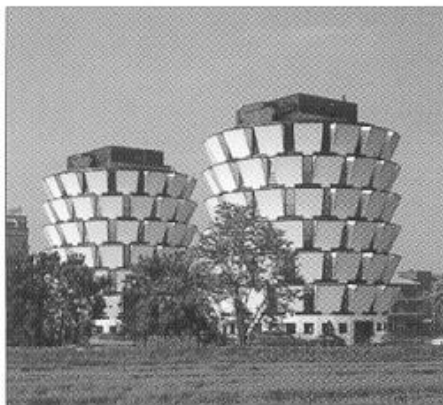
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The last three character of file name , identify the sw version , which the manual is refer . the sw version is visualized during switch on of converter

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