

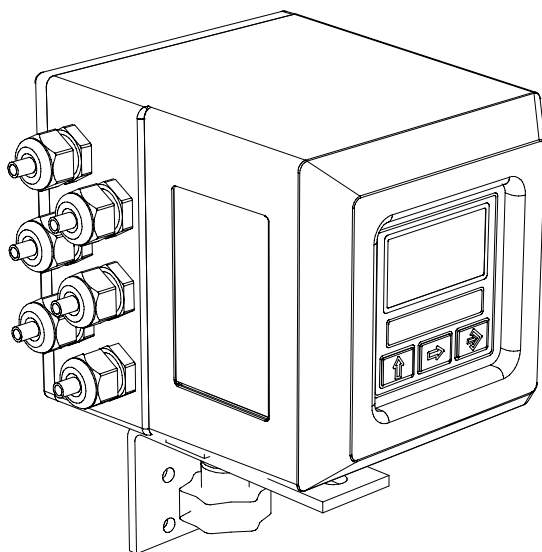
ISOMAG ™

The friendly magmeter

OPERATING AND INSTALLATION MANUAL

CONVERTER

ML 210



CE

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INDUSTRIA
The solutions that count

CONTENTS

INTRODUCTION	6
SYMBOLS USED IN THIS MANUAL	6
INTRODUCTION TO THE ML210	7
TECHNICAL CHARACTERISTICS	7
ELECTRIC CHARACTERISTICS	7
INPUT/OUTPUT ISOLATION	7
ENVIRONMENTAL CONDITIONS OF USE	7
OPERATING TEMPERATURE	8
OVERALL DIEMENSIONS	8
GROUNDING INSTRUCTIONS	9
CONVERTER POWER SUPPLY	9
ELECTRICAL CONNECTIONS	10
ELECTRICAL CONNECTIONS SENSOR TO CONVERTER	11
INPUT/OUTPUT	12
INPUT/OUTPUT	13
DIGITAL INPUT	14
OPERATION ON INPUT ON/OFF	15
INPUT OPERATION STAGE (GENERIC FUNCTIONS)	15
OPERATION STAGE ON INPUT 1 AND 2 (BATCH FUNCTION)	17
OUTPUTS WIRING	18
START UP AND MAINTENANCE OF THE INSTRUMENTS	19
FLAGS INTERPRATION AND LED	20

VISUALIZATION PAGES AT START-UP	22
ACCESS TO THE CONFIGURATION MENUS	24
QUICK START MENU FUNCTIONS	24
EXAMPLE: modifying the full scale value from 4dm ³ /s to 5dm ³ /s.....	25
from "Quick start menu"	25
ACCESS CODES FACTORY PRE-SET ACCESS CODES.....	26
EXAMPLE: modifying the full scale value from 4dm ³ /s to 5dm ³ /s.....	27
from "Main Menu" (quick start menu enabled)	27
ML210 MAIN MENU FUNCTIONS.....	28
FUNCTIONS DESCRIPTION.....	31
VISUALIZATION PAGE WITH BATCH FUNCTION ENABLED	39
IMPORTANT NOTES.....	40
ALARM MESSAGES, CAUSES AND ACTIONS TO BE TAKEN.....	41
ANOMOLIES CODES	41
APPENDIX 1 DISPLAY ROTATION PROCEDURE	42
DECLARATION OF CONFORMITY	43

INTRODUCTION

This manual is an integral part of the product. Read carefully the instructions contained, they give important indications for its safe use and maintenance. Technical information and related products in this manual may undergo modifications without prior notice.

The flow meter must be used within the specified limits. The improper use, possible tampering, or substitutions of one or any of the original components renders the manufacturer's warranty void with immediate effect. The manufacturer accepts responsibility only if the instrument is used within the published or prior agreed specification.

Reproduction of this manual and any software supplied with this converter is strictly forbidden.

SYMBOLS USED IN THIS MANUAL



ATTENTION



DANGER ELECTRIC SHOCK



WARNING



PRECAUTIONS

INTRODUCTION TO THE ML210

The converter is the reporting, input and output control device for the sensor, it allows the measurements, functional programming, control of the sensor and data recording to be communicated through the display and hardwired inputs/outputs.

The converter's display allows the status of the (Sensor and converter) to be analysed. The converter has its status and functions controlled through a number of menus working on different levels. On immediately powering on the converter its metering conditions can be seen by scrolling through the screens using the key pad (remote link option maybe available). From these initial screens a 'Quick start' menu allows the user to program some basic reporting, alarm and data display functions. The Quick start menu gives access to the 'Main menu'.

The Main menu controls the measuring, set-up, calibration, input and output parameters of the system. Through the Main menu the user can set input and output signals of the converter. The input signals allow the control from a location away from the converter by applying a voltage through a cable. This allows measuring parameters, calibration, and programming of the converter to be enabled or disabled. As with inputs, the converter can send output signals giving system status information to the user.

This manual will give the user the information to install and connect the converter to the sensor; how to link the wired inputs/outputs where required, and the various means of program the converter with the reporting and controlling parameters. This manual gives important safety information that should be read and understood before attaching the converter to an electrical power source.

TECHNICAL CHARACTERISTICS



ELECTRIC CHARACTERISTICS

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

Power supply versions	Power supply voltage	Power supply frequency	Pmax	current max
HV	90 - 265 Vac	44 - 66 Hz	20W/25VA	0.25 A
LV	18 - 45 Vac/dc	0-44 - 66 Hz	20W/25VA	1.6 A
LLV	10 - 35 Vdc		20 W	1.5 A

INPUT/OUTPUT ISOLATION

- Input/output are insulated up to 500V
- The output 4.20 mA and the output 24 Vdc are electrically connected



ENVIRONMENTAL CONDITIONS OF USE

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



OPERATING TEMPERATURE

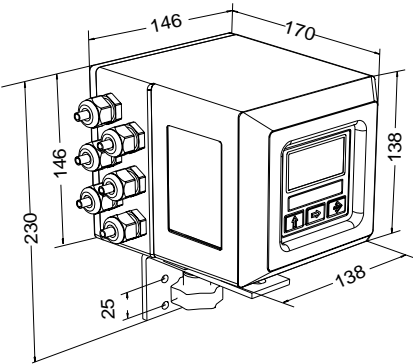
CONVERTER			
Ambient Temp.			
Min.		Max	
°C	°F	°C	°F
-20*	-4*	60	140



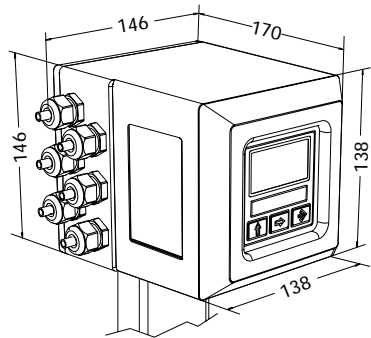
* For discontinuous use, the installation of a heating resistance is necessary

OVERALL DIMENSIONS

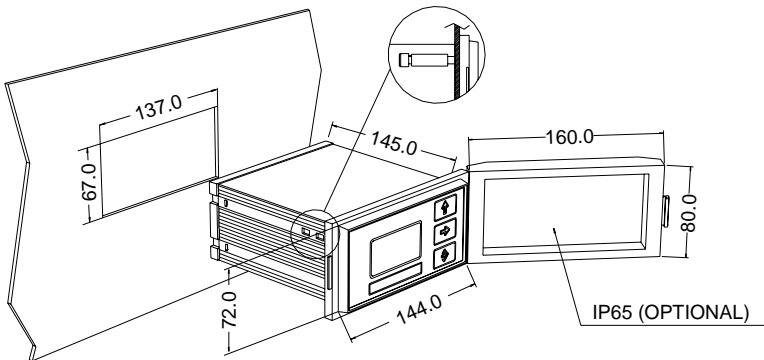
SEPARATE VERSION



COMPACT VERSION



PANEL VERSION





GROUNDING INSTRUCTIONS

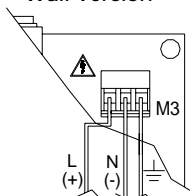
For the correct operation of the sensor and the meter it is necessary for both the **sensor** and the **converter** to be connected to the round.



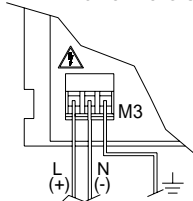
CONVERTER POWER SUPPLY

- ❑ Before connecting the power supply, verify that the mains voltage falls between the limits indicated on the tag plate
- ❑ **ATTENTION:** the converters on dc power supply line are not protected against the inversions of polarity.
- ❑ **WARNING:** When 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 10 A).
- ❑ In the proximity of the instrument Provide a circuit breaker that must be easily accessible from the operator and clearly identified.

Wall version



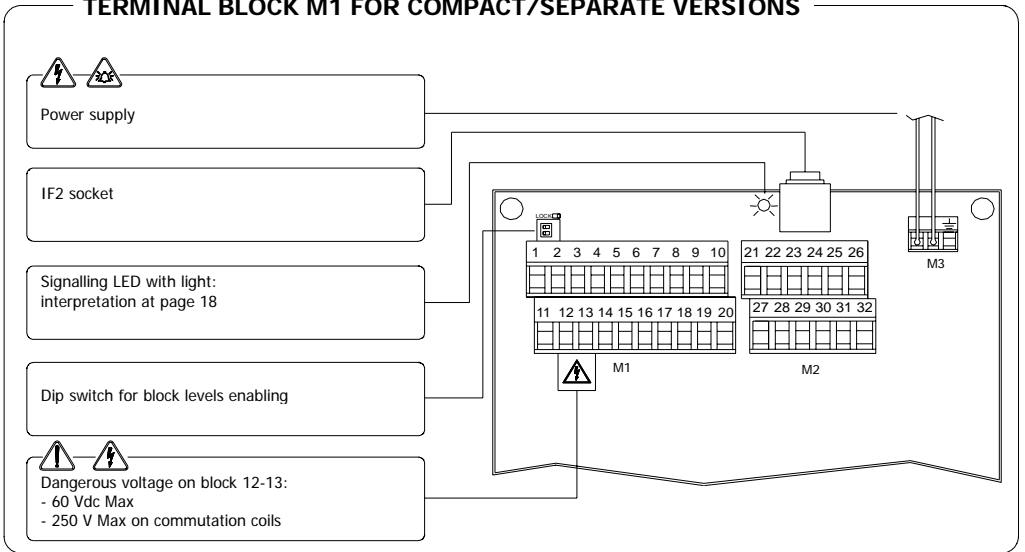
Panel version



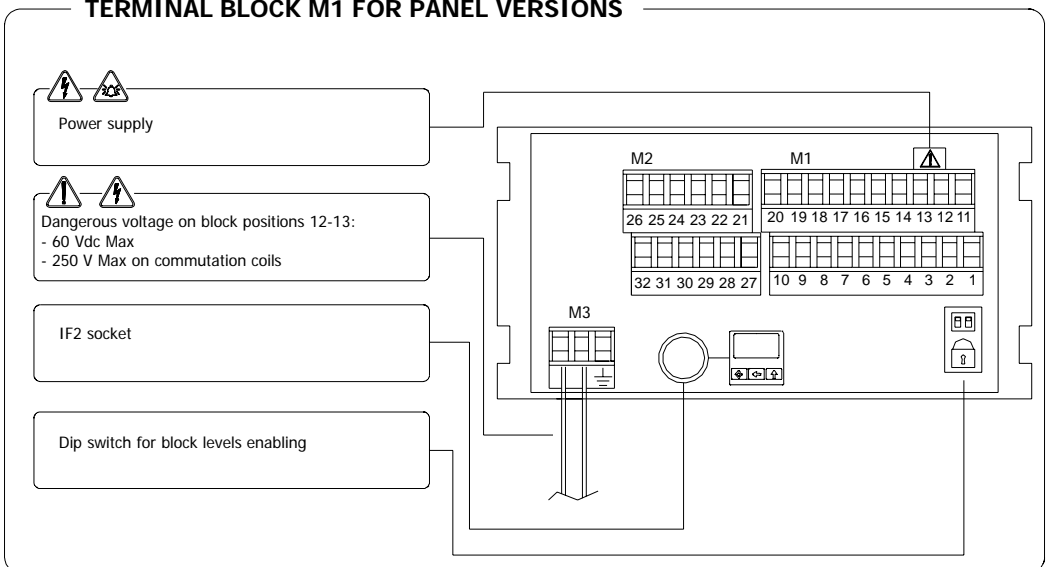
NOTE: characteristics of meter's power supply, see page 7

ELECTRICAL CONNECTIONS

TERMINAL BLOCK M1 FOR COMPACT/SEPARATE VERSIONS

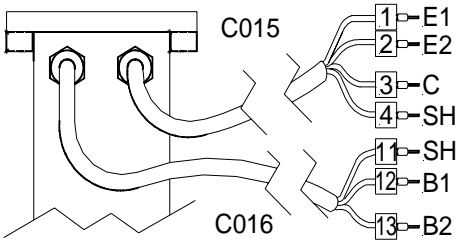


TERMINAL BLOCK M1 FOR PANEL VERSIONS



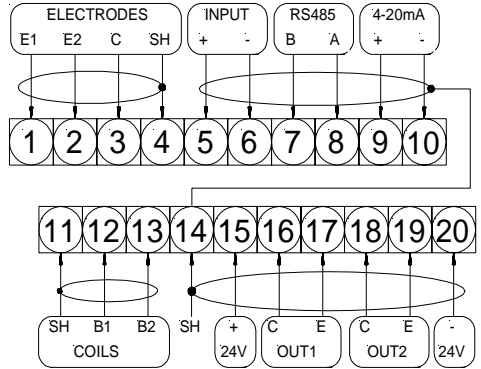
ELECTRICAL CONNECTIONS SENSOR TO CONVERTER

SEPARATE VERSION



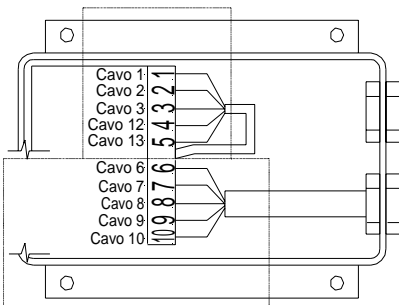
Sudden movements of the electrodes cable, can cause noise on measure
Max length of cable: m 20

TERMINAL BLOCK M1

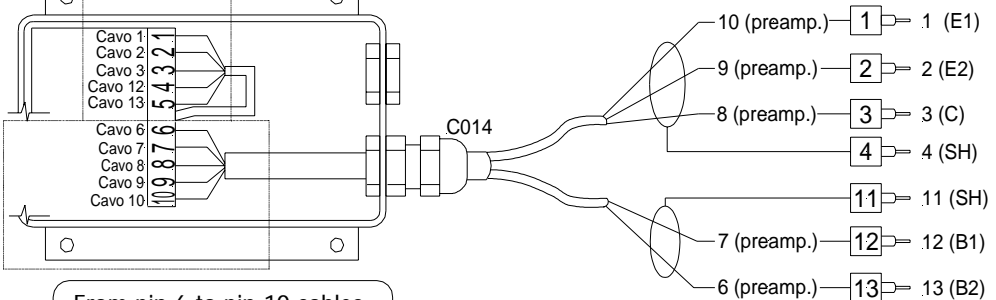


PREAMPLIFIER VERSION

From pin 1 to pin 5 cables connected to the sensor



From pin 6 to pin 10 cables connected to the converter



Max length of the cable C014 : 500 m

INPUT/OUTPUT

OPTIONAL MODULE (NO RELE MODULE)

- ❑ **ME200:** 2 programmable on/off outputs
- ❑ **ME201:** 1 programmable on/off output + 1 high frequency output
- ❑ **ME202:** 1 0/4...20mA output + 2 programmable on/off output
- ❑ **ME203:** 1 RS232 port + 2 programmable on/off outputs
- ❑ **ME204:** 1 RS232 port + 2 programmable on/off outputs + 1 0/4...20mA out
- ❑ **ME220:** see the manual

LEGENDA

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

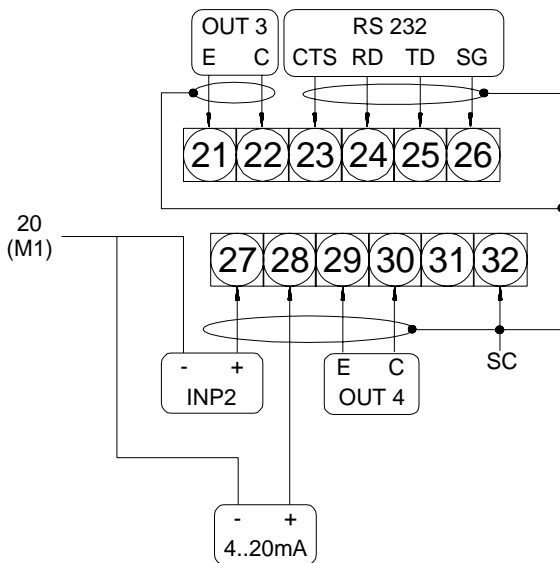
CTS: Input terminal of the signal "CLEAR TO SEND" of the RS232 port

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

TD: 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



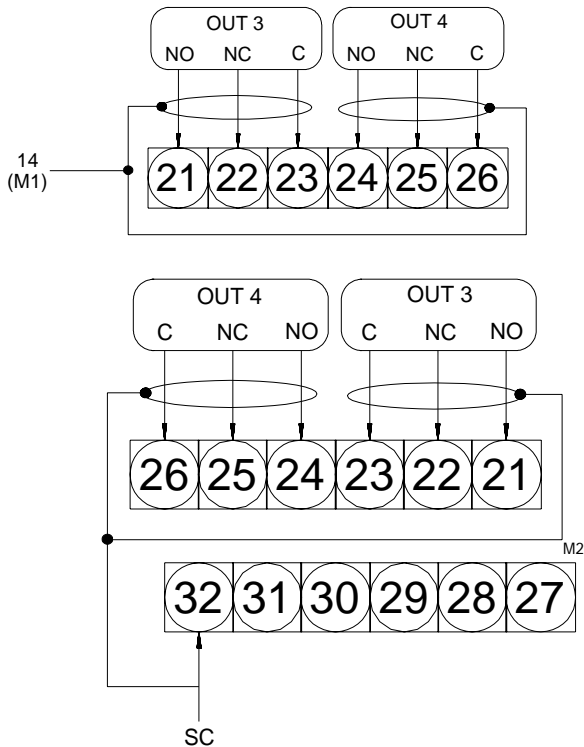
INPUT/OUTPUT

OPTIONAL RELE' MODULE

1. **ME205**: 2 relay outputs with 1 NO contact + 1 NC contact each, 2A 60Vac, 60W/125Va
- 2.
3. **ME207**: 2 relay outputs with 1 NO contact + 1 NC contact each, 2A 250Vac, 60W/125Va

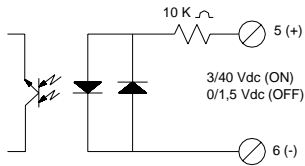
LEGENDA

- **SC**: Cable shield, electrically connected to ground and to the casing
- **C**: Relay – common
- **NC**: Normally closed contact
- **NO**: Normally open contact

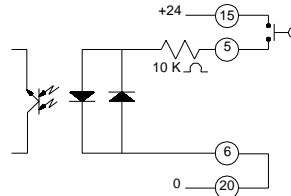


DIGITAL INPUT

External power supply



Internal power supply



The functions referring to the inputs could be divided in three groups:

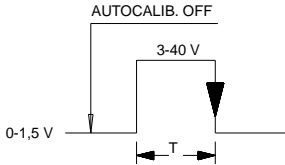
- 1) only assignable functions to the input 1 (page 13)
- 2) Functions that act directly on the inputs independently from the select input (page 13)
- 3) only assignable functions to the input 1 and only to the input 2 which interact between them (some examples to page 16)

Remember that the activation of any functions of batch automatically disable the other. The list of such functions is suitable in the tab at page 38.

OPERATION ON INPUT ON/OFF

INPUT OPERATION STAGE (GENERIC FUNCTIONS)

Auto-calibration



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

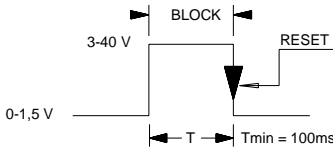
Necessary conditions for enabling the function

POS. 5.7 ENABLED (Autozero calibration external command)

POS. 5.9 DISABLED (batch on input 1)

POS. 5.10 DISABLED (batch functions assign to input 2 (optional))

Reset totalizes

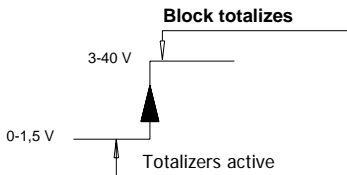


Necessary conditions for enabling the function

POS. 5.1 to 5.4 ENABLED (partial positive or reverse flow totalise reset enable).

N.B.: This function is even assignable to the input 2

Block totalizes



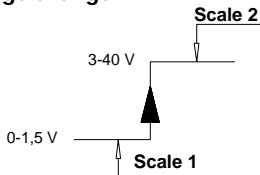
Necessary conditions for enabling the function

POS. 5.6 ENABLED (totalise counting lock command)

POS. 12.5 DISABLED (auto-batch)

POS. 12.7 DISABLED (batch consent)

Range change



Necessary conditions for enabling the function

POS. 5.8 ENABLED (range change)

POS. 5.9 DISABLED (batch on input 1)

POS. 5.10 DISABLED (batch functions assign to input 2 (optional))

POS. 6.1-6.4 DISABLED (end-batch functions assign to output 2)

Speed rate

T_{min}

10 Hz	220 ms
20 Hz	110 ms
50 Hz	45 ms
80 Hz	30 ms
150 Hz	15 ms



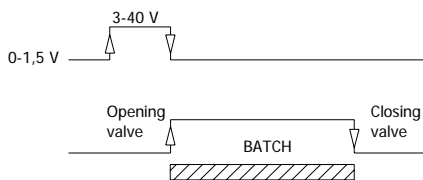
ATTENTION: time T must be \geq to T_{min}



N.B.: THE FUNCTIONS ABOVE INDICATED ARE ENABLED ONLY ON INPUT 1

OPERATION STAGE ON INPUT 1 OR 2 (BATCH FUNCTION)

Start batch from remote input

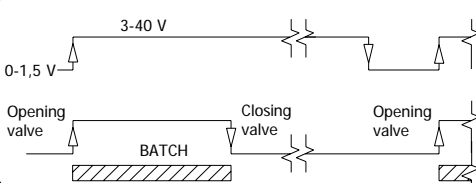


INPUT
OUTPUT

Necessary conditions for enabling the function

- POS. 5.9 or POS. 5.10 ENABLED on batch
- POS. 6.1 to 6.4 on end batch

Start batch from consent (remote)

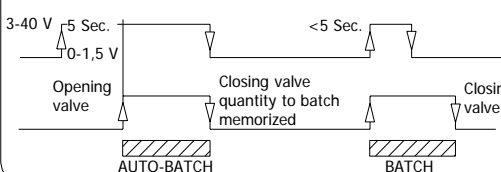


INPUT
OUTPUT

Necessary conditions for enabling the function

- POS. 5.9 ENABLED or POS. 5.10 on batch
- POS. 6.1 to 6.4 on batch
- POS. 12.7 ENABLED (Consent mode)

Start batch from remote input with auto-batch enabled

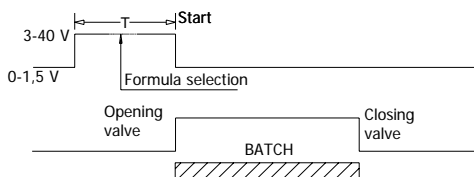


INPUT
OUTPUT

Necessary conditions for enabling the function

- POS. 5.9 or POS. 5.10 ENABLED on BATCH
- POS. 6.1 to 6.4 on END BATCH
- POS. 12.5 ENABLED (auto-batch)
- POS. 12.7 DISABLED (consent mode)

Start batch from remote input with automatic selection of formula 00/03



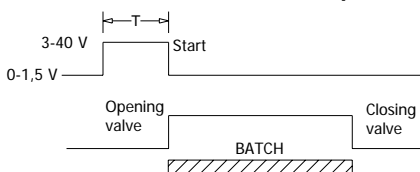
INPUT
OUTPUT

T = 100ms ±50ms for select the formula 00
 T = 200ms ±50ms for select the formula 01
 T = 300ms ±50ms for select the formula 02
 T = 400ms ±50ms for select the formula 03
 In case of stop batch from remote input the time of input

Necessary conditions for enable the function

- POS. 5.9 ENABLED on BATCH or POS. 5.10
- POS. 6.1 to 6.4 on END BATCH
- POS. 12.6 ENABLED (automatic selection of formula)
- POS. 12.7 DISABLED (consent mode)
- POS. 5.10 DISABLED selection function for the formula 00/01 assigned to input 2 (optional)

Start batch from remote input 1 reset p+ enabled on remote input 1



INPUT
OUTPUT

T BETWEEN 1 E 4 = RESET TOTALIZER
 T < 1 = START E RESET TOTALIZER

Necessary conditions for enabling the function

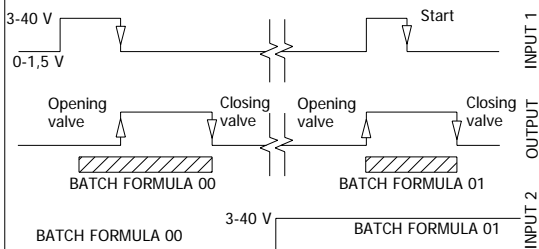
- POS. 5.9 ENABLED (Batch on input 1)
- POS. 6.1 - 6.4 on BATCH
- POS. 5.2 ENABLED (reset P+)



N.B.: THE ACTIVATION OF BATCH FUNCTIONS ON INPUT 2 PREVENTS THE ACTIVATION OF BATCH FUNCTIONS ON INPUT 1

OPERATION STAGE ON INPUT 1 AND 2 (BATCH FUNCTION)

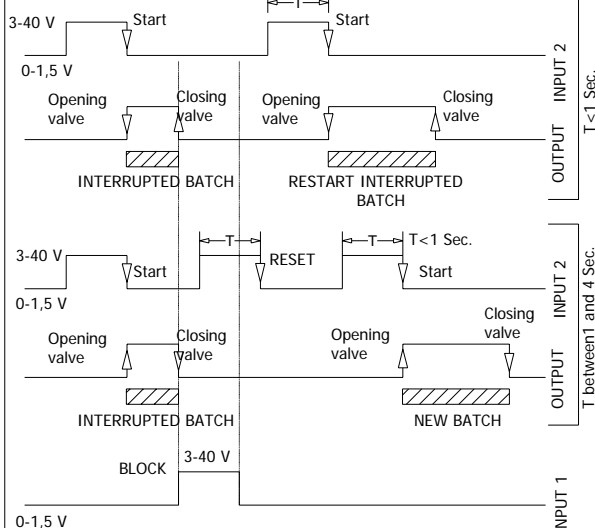
Start batch on remote input 1 stop from output selection formula 00 o 01 from remote input 2



Necessary conditions for enabling the function

- POS. 5.9 ENABLED
- POS. 6.1 or 6.4 on BATCH
- POS. 5.10 ENABLED function of formula selection 00/01 assigned to input 2 (optional)

Block totalizer from remote input 1 start batch from remote input 2



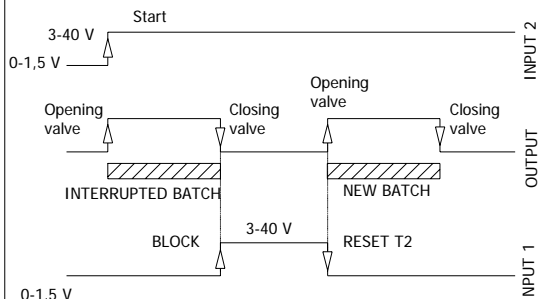
The block of the totalizer always determines the interruption of the batch. By re-energizing input 2 is possible to get 2 results:

- 1) $T < 1 \text{ Sec}$ = restart interrupted batch
- 2) T between $1 \text{ e } 4 \text{ Sec}$ = reset interrupted batch. N.B.: will be necessary to give a new start impulse to the input 2 ($T < 1 \text{ Sec}$) to begin a new batch

Necessary conditions for enabling the function

- POS. 5.6 ENABLED (Block totalize)
- POS. 6.1 OR 6.4 on END BATCH
- POS. 5.10 ENABLED (Batch function for input 2 (optional))
- POS. 5.2 ENABLED (P+)

Block and reset totalize from remote input 1 start batch from remote input 2 consent mode to batch enable



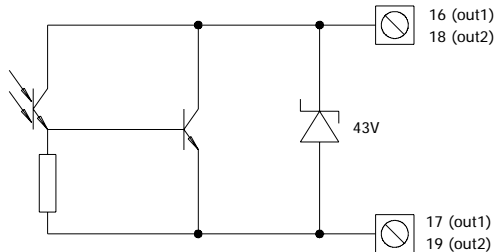
The block of the totalizer (Input 1 signal) always determines the stopping of the batch. With the T2 reset function enabled through the stopping of the input 1 signal the batch totalizer goes to zero. With the totalizer at zero a new pulse on Input 2 will restart a new batch.

Necessary conditions for enabling the function

- POS. 5.6 ENABLED (Block totalizer)
- POS. 5.10 ENABLED Batch function assigned to input 2 (optional)
- POS. 12.7 ENABLED (consent mode)
- POS. 5.2 ENABLED (P+)

OUTPUTS WIRING

Output on/off 1250 Hz

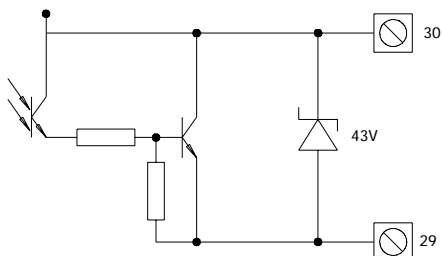


- ❑ Opto-insulated output with collector and emitter terminals floating and freely connectable
- ❑ Maximum switching voltage: 40 Vdc
- ❑ Maximum switching current: 100mA
- ❑ Maximum saturation voltage between collector and emitter @100mA: 1,2V
- ❑ Maximum switching frequency (load on the collector or emitter, $R_L=470\Omega$, $V_{OUT}=24Vdc$): 1250Hz
- ❑ Maximum reverse current bearable on the input during and accidental polarity reversion (VEC): 100mA
- ❑ Insulation from other secondary circuits: 500 Vdc



OUTPUT 1/ 2 standard - OUTPUT 3/ 4 with modules (page 9)

Output on/off 12500 Hz

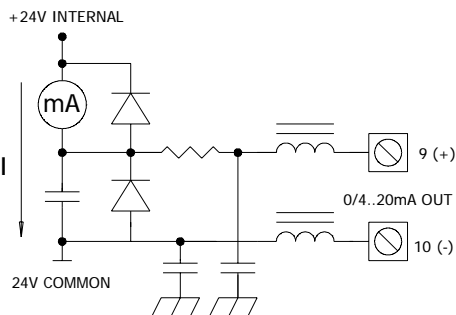


- ❑ Opto-insulated output with collector and emitter terminals floating and freely connectable. In order to get the maximum speed performances it is necessary to connect the emitter to the common terminal of the outputs (0V), while the load has to be on the collector. This output is internally connected to the power supply source 24 Vdc available on the terminal block.
- ❑ Maximum switching voltage: 40Vdc
- ❑ Maximum switching current: 100mA
- ❑ Maximum saturation voltage between collector and emitter 100mA, load on the collector and internal power supply: 0,3V
- ❑ Maximum saturation voltage between collector and emitter 100mA, load on the emitter and internal power supply: 3V
- ❑ Maximum switching frequency, load on the collector and internal power supply: ($R_L=470\Omega$, $V_{OUT}=24Vdc$): 12500Hz
- ❑ Maximum switching frequency, load on the emitter or external power supply: ($R_L=470\Omega$, $V_{OUT}=24Vdc$): 2500Hz
- ❑ Insulation from the other secondary circuits (except 24V and 4...20mA outputs): 500 Vdc



Only with ME 201 module

Output 0-4 to 20mA



- ❑ Opto-insulated output
- ❑ Maximum load 1000 ohm
- ❑ Maximum voltage without load 27 Vdc
- ❑ Refresh frequency equal to the sample frequency of the connected sensor
- ❑ Protected against persistent over voltages up to 30 Vdc



The converter detect a loss of load on the 4 to 20mA output; to disable this function set the value "mA val. fault" to 0 (pag 33 Pos. 4.7)

START UP AND MAINTENANCE OF THE INSTRUMENTS

Before starting up the equipment please verify the following:

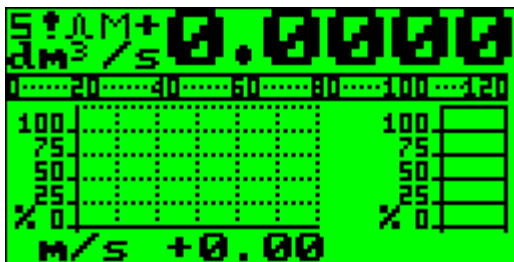
- ❑ Power supply voltage must correspond to that specified on the name plate
- ❑ Electric connections must be completed as described on page 8
- ❑ Ground (earthed) connections must be completed as specified on page 8

Verify periodically:


- ❑ The integrity of the power supply cables, wiring and other connected electrical parts
- ❑ The integrity of the converter's housing (this must not have dents or other damage that may compromise its hermetical sealing)
- ❑ The suitable tightness of the sealing elements (cable glands, covers, etc.)
- ❑ The integrity of the front panel (display and keyboard), any damage may compromise the equipment sealing
- ❑ The mechanical fixing of the converter to the pipe or wall stand

FLAGS INTERPRATATION AND LED

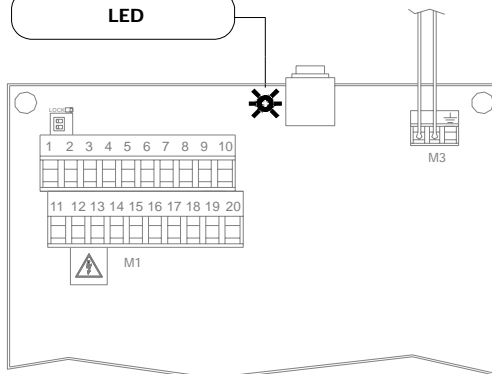
FLAGS



INTERPRETATION FLAGS

FLAG	DESCRIPTION
M	Alarm max activated
m	Alarm min activated
!	- Interruption coils circuit - Segnal error - Empty pipe
C	Calibration running
S	Simulation
	Pulse output saturation (reduce TIME PULSE)

LED



LED INTERPRETATION

PERMANENT LIGHT: initialisation

FLASHING LIGHT (1 sec.): normal function

FLASHING LIGHT (<1 SEC.): alarm on

The LED signals the real alarm status only if the display visualizes one of the visualization pages suitable to page 17

ATTENTION: The LED is not visible in the panel version of the converter

KEYBOARD**SHORT PRESSING (< 1 SECOND):**

Increases the numeric figure or the parameter selected by the cursor
Returns to the previous subject on the menu
Batch start/stop (when enabled)

**LONG PRESSING (> 1 SECOND):**

Decreases the numeric figure or the parameter selected by the cursor.
Proceeds to the next subject on the menu

**SHORT PRESSING (< 1 SECOND):**

Moves/positions the cursor rightward on the input field
Proceeds to the following subject of the menu
Change the display of the process data

**LONG PRESSING (> 1 SECOND):**

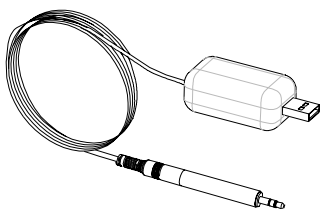
Moves/positions the cursor leftward on the input field
Returns to the previous subject on the menu

**SHORT PRESSING (< 1 SECOND):**

Enter /leave the selected function
Enables the main menu for the instrument configuration
Cancels the selected function under progress

**LONG PRESSING (> 1 SECOND):**

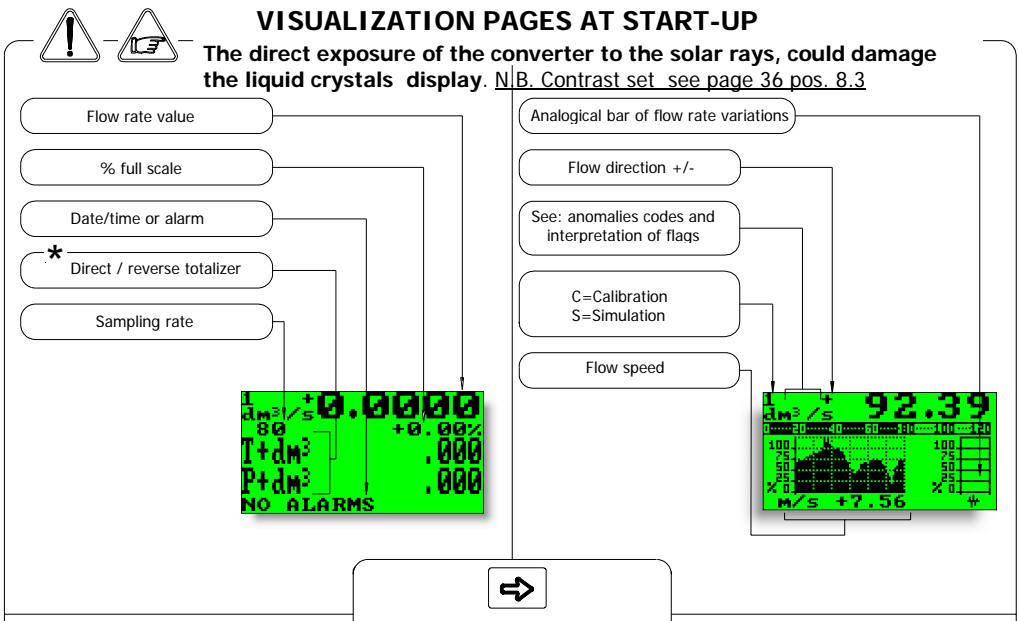
Leaves the current menu
Enables the totalizer reset request (when enabled)
Confirms the selected function

BLIND VERSION

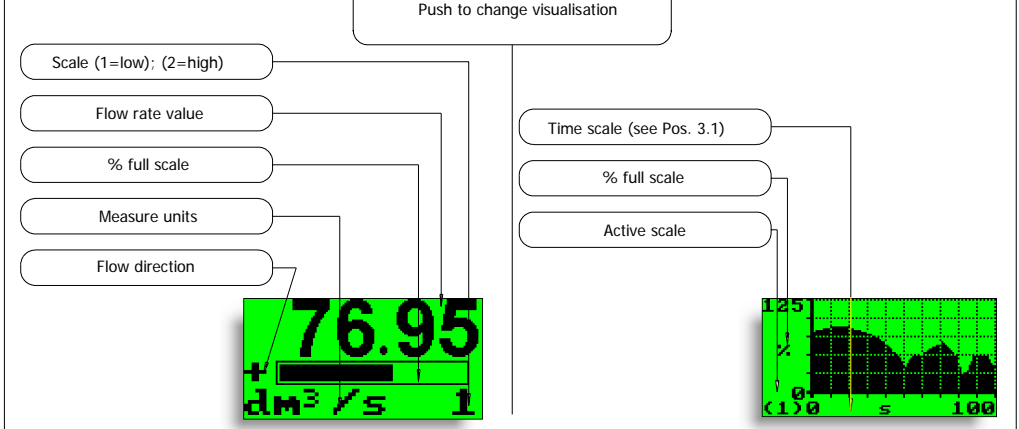
For converters without a keyboard (blind version), the programming of functions is made up by the IF2 serial device:

VISUALIZATION PAGES AT START-UP

The direct exposure of the converter to the solar rays, could damage the liquid crystals display. N.B. Contrast set see page 36 pos. 8.3

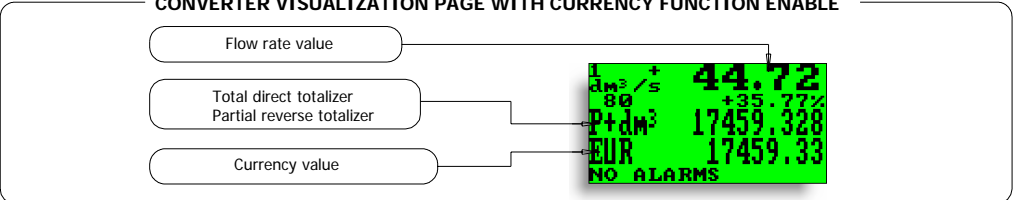


➔
Push to change visualisation



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

CONVERTER VISUALIZATION PAGE WITH CURRENCY FUNCTION ENABLE

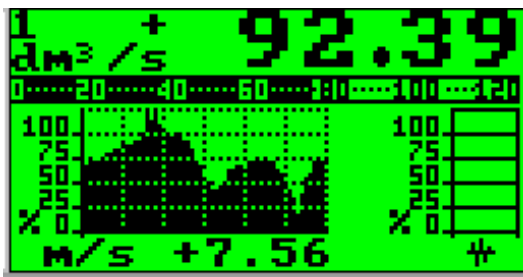


NOTE

The visualization of the pages can be change respect to some functions enabled o disabled (Pos. 8.4 - 8.8 - 8.10 and batch functions)



FLOW RATE VISUALIZATION



The ML210 permits to show a 5 digit character display for flow rate units. This mean the maximum flow rate value that can be represent on the display is **99999** (no matter the positioning of the decimal point) and the minimum is **0.0025**.

The converter's calculation is based on the following formula:

- **DN x DN x 0,008**

The results of above calculation give the maximum flow rate, **in l/s, at 10 m/s of speed** according to sensor's diameter; the permitted units for the display are the unit measure that, in reference to this calculated value, do not exceed the number **99999 (higher limit) and 0,0025 (lower limit)**

Example for DN 300 :

- Full scale value : $300 \times 300 \times 0,008 = 720 \text{ l/s}$
- **PERMITTED** unit of measure (example) : l/s (720,00) ; mc/h (2592,0) ; m3/s (0,7200) ...
- **NOT PERMITTED** unit of measure (example) : l/h (259200)

ACCESS TO THE CONFIGURATION MENUS

The converter's configuration menus can be accessed in two different modes:

- ❑ The **"Quick start menu"** makes it possible to access directly a range of principal functions for setting the scale reading and display characteristics of the sensor
- ❑ Through the **"Main menu"** it is possible to access functions with an access code ≤ 2 , which control more of the sensor monitoring, data processing and output, as well further display options.

The following example illustrates how to change the Quick Start Menu Fs1 display field.

QUICK START MENU FUNCTIONS



```



0-QUICK START
Fs1=dm3/s 5.0000
Fs2=dm3/s 8.1920
Tot.MU=dm3 1.000
Pls1=dm3 1.00000
Pls2=dm3 1.00000
Tpls1=ms 0050.00
Tpls2=ms 0050.00
Tconst=s 0001.0
ND=mm 00032
Simulation= OFF
Contrast= 7
Language= EN
Batching setup
Regulat.setup
Flow meas.setup
Main menu
  
```

Description function from page 20

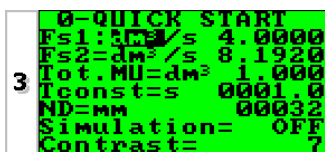
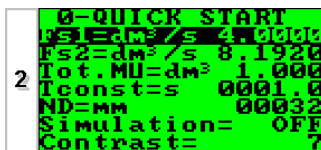
Automatic optimization of the parameters (see below)

Access to all functions

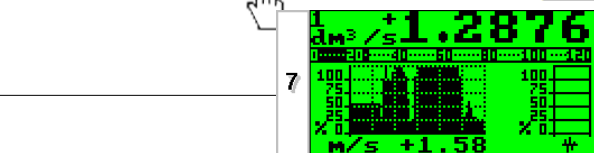
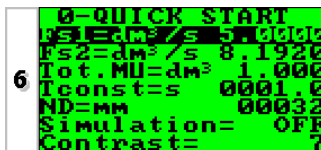
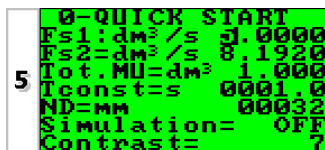
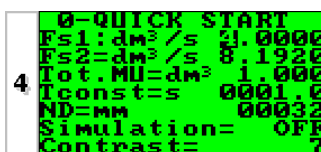
The user has immediate access to the Quick Start menu when the converter is powered up by pressing the  key. If access to the quick start menu does not occur, then it has been disabled through function 8.5. Press the  key again to access the 8.5 function and access the Quick Start menu.

The functions 'Batching set-up, regulation set-up, and flow measure setup' are accessed through the Quick Start menus. These allow the basic optimised set-up of the converter and sensor through the three Quick Start functions. To enable one of three types of operation press the key  while the function is highlighted, to confirm the changes press the  key.

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



repeatedly



Main page

ACCESS CODES

Functions in the converter's 'Main menu' are enabled by the access codes. The information of this manual is related to all the functions available within the L2 level. All higher level functions are reserved for servicing and not available.

Description of the L2 access code

- ❑ **with code L2 = 00000** (with this code only) you can disable the request of code L2


***with L2 customized** (freely chosen by the user) you can program all the functions up to L2 security level, entering this code whenever you enter the Main menu.

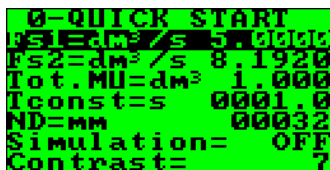
***ATTENTION:** take careful note of the customized code you have chosen, there is no way for the user to retrieve or reset it if lost.

FACTORY PRE-SET ACCESS CODES

The converter is delivered with the default L2 (level 2) access code. The code is required for accessing 'Main menu' functions from the 'Quick start menu'.

11111

The first level configuration "Quick start menu" can be automatically accessed without the access code by pressing the key  out from one of the visualization pages at start up (power on) of the converter. See page 22 to see the screens from which the Quick start menu can be accessed



The "Quick start menu" is enable by 8.6 function (display menu)

BLOCK LEVELS

The block levels enable or disable access to the functions of the converter.

The available levels of the block are set by following:

- ❑ **Level 0:** Completely disables access to the functions. You can perform only the following functions through the keyboard:
 - Changing the display mode
 - Dosing Start/stop
 - Data printing
- ❑ **Level 1:** Enables access to the following functions:
 - Totalise re-setting
 - Dosing functions modifications
- ❑ **Level 2:** Enables access to the following functions:
 - Quick start menu
 - Scale (full enabling)
 - Display (partial enabling)
 - Diagnostics (partial enabling)
- ❑ **Level 3:** Enables the access to all the Level 2 functions

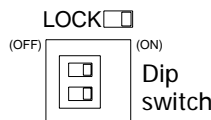
FACTORY PRE-SETTINGS BLOCK LEVELS

The converter is delivered with the following block level:

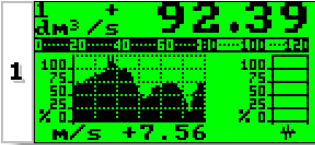
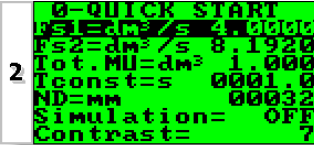

3




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

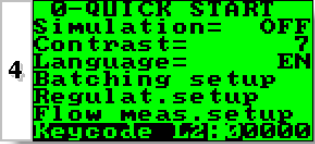
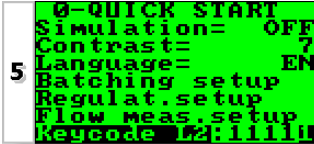

- ❑ Set the dip switch to the OFF position
 - ❑ Access the function "Block level" of menu 11 (main menu)
 - ❑ Choose the desired level of block
- To enable the selected block level place the






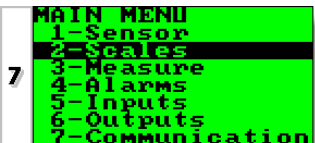
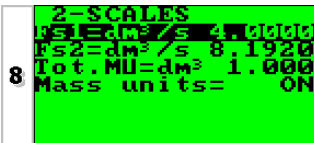
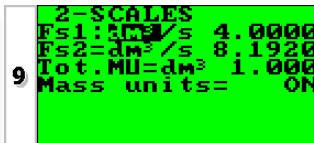
**EXAMPLE: modifying the full scale value from $4\text{dm}^3/\text{s}$ to $5\text{dm}^3/\text{s}$.
from "Main Menu" (quick start menu enabled)**




1   

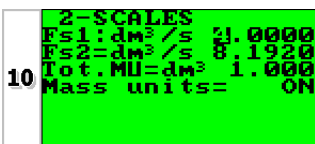
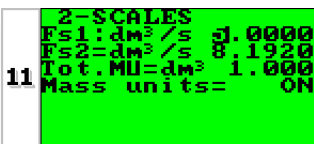
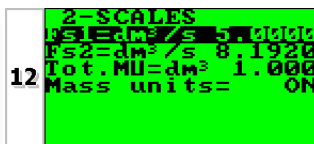
 Enter in the "Quick start menu"   Access to the "Main Menu"




4  **5**  **6** 

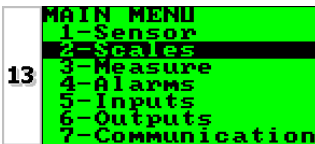
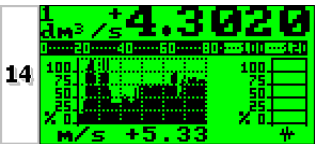
 X 5 TIMES  


7  **8**  **9** 

 Access to the "Scale" menu  Access to the function "Fs1"  Push repeatedlv

10  **11**  **12** 

 Change the value  Confirm the new value  Long push

13  **14** 

 Long push Main page

ML210 Main Menu Functions

(for detail functions with symbol ****** see the manual from page 30)

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 00032
KA= +01.0000
Sens. type= 000
Ins. position= 00
KL=+|0| +02.1500
KL=-|0| +02.1500
Cable len.=m 000
E.P.detect= OFF
E.p.thr.= 250
Autozero cal.
  
```

- 1.1 Insert ND of sensor (0-3000mm)
- 1.2 Sensor calibration data, visualized on sensor's label
- 1.3 Type of sensor: 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 parameters
- 1.6 Length of the cable connecting the sensor to the converter
- 1.7 Enables the empty pipe detection feature
- 1.8 Value of empty pipe sensibility detection
- 1.9* Enables the automatic zero calibration system

MAIN MENU 1-Sensor 2-Scales

```

2-SCALES
Fs1=dm³/s 5.0000
Fs2=dm³/s 8.1920
Tot. MU=dm³ 1.000
Pls1=dm³ 1.00000
Pls2=dm³ 1.00000
Tpls1=ms 0050.00
Tpls2=ms 0050.00
Frq1=Hz 1000.00
Frq2=Hz 1000.00
Mass units= ON
Sg=kg/dm³ 01.0000
  
```

- 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
- 2.8 Full scale freq. for channel 1 (0.1Hz-1000.0Hz) (0.1Hz-10000Hz con modulo opt.)
- 2.9 Full scale freq. for channel 2 (0.1Hz-1000.0Hz) (0.1Hz-10000Hz con modulo opt.)
- 2.10 Enable/disable the selection of mass units on full scale set
- 2.11 Specific gravity set in kg/dm³

MAIN MENU 1-Sensor 2-Scales 3-Measure

```

3-MEASURE
Iconst=s 0001.0
Filter=s 0.1
Skip thr=% 010
Peak thr=% 125
Cut-off=% 05.0
Frq1=Hz 000
Autocal.= OFF
Autorange= OFF
E.saving= OFF
  
```

- 3.1* Time constant
- 3.2 Filter on the power supply: 0.1s="ready" measure; 0.5s=filter of noise on the liquid
- 3.3* Acceleration threshold
- 3.4* Anomalous signal pick cut off threshold
- 3.5 Low flow zero threshold: 0-25% of full scale value
- 3.6 Enable every hour an internal cycle of calibration. Measurement stopped for 8-15 sec.
- 3.7* Automatic change of scale
- 3.8* Energy saving mode

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

```

4-ALARMS
Max thr+=% 000
Max thr-=% 000
Min thr+=% 000
Min thr-=% 000
Hyst.=% 03
E.p.thr.= 075
mA v.fault=% 000
Hz v.fault=% 125
Timeout=s 00.0
  
```

- 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
- 4.7*Current output value in case of failure
- 4.8*Frequency output value in case of failure
- 4.9*Batch safety timer

```

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

```

5-INPUTS
T+ RESET= ON
P+ RESET= ON
T- RESET= OFF
P- RESET= ON
Puls. reset= OFF
Count lock= ON
Calibration= OFF
Range change= OFF
Batch= OFF
Inp. 2= OFF
    
```

- 5.1* Total direct (positive) flow totalise reset enable
- 5.2* Partial direct (positive) flow totalise reset enable
- 5.3* Total reverse (negative) flow totalise reset enable
- 5.4* Partial reverse (negative) flow totalise reset enable
- 5.5 Reset totalise of pulse from digital input (see page 15)
- 5.6 Totalise counting lock command (see page 15)
- 5.7* Autozero calibration external command
- 5.8 Range change external command (vedi funzione 3.7)
- 5.9 Batch start/stop external command (see batch functions)
- 5.10* Functions assigned to input 2

```

4- Alarms
5-Inputs
6-Outputs
    
```

```

6-OUTPUTS
Out1= #1 IMP+
Out2= SIGN
Out3= OFF
Out4= #2 IMP+
Duty cycle1= % 50
Out mA1= 4.000
Out mA2= 4.000
    
```

- 6.1* Output 1 functions
- 6.2* Output 2 functions
- 6.3* Output 3 functions
- 6.4* Output 4 functions
- 6.5* Duty cycle value for pulses/frequency output
- 6.6* Choice of the function and the range of current output n.1
- 6.7* Choice of the function and the range of current output n.2

```

6-Outputs
7-Communication
    
```

```

7-COMMUNICATION
IF2 prot.= DPP
RS232 prot.= DPP
Address= 000
RS485 bps= 19200
RS232 bps= 4800
Printer= OFF
Print batch= OFF
Print data= OFF
Print events= OFF
Rem. addr.= 000
Remote u.conn.
    
```

- 7.1 Choice of the communication protocol for the IF2 device
- 7.2 Choice of the communication protocol for the RS232 port
- 7.3 Address value of converter (range 0 - 255)
- 7.4 Speed of the RS485 output (possible choices: 2400, 9600, 19200, 38400 bps)
- 7.5 Speed of the RS232 output (possible choices: 2400, 9600, 19200, 38400 bps)
- 7.6 Print function enable (optional; see manual MI200)
- 7.7 Print of the performed batch
- 7.8 Stampa dei dati ad intervalli regolari ed impostabili
- 7.9 Print of the data process on regular intervals
- 7.10 Address of a further converter connected like a terminal
- 7.11 Start remote connection to the terminal. Connection interrupted after 10sec. of inactivity

```

8-DISPLAY
Language= EN
D. rate= Hz 1
Contrast= 7
P. totaliz.= ON
Date/time= OFF
Quick start= OFF
Tot. modif.= OFF
Net total.= OFF
Reset video= OFF
Currency= ON
Curr. decim.= 2
EUR/dm= + 1.00000
EUR/dm= - 1.00000
    
```

- 8.1 Choice of the language: EN= English, IT=italian, FR= French, SP= Spanish, DE=German
- 8.2 Updating frequency on the display: 1-2-5-10 Hz
- 8.3* Display contrast
- 8.4 Partial totalizer visualization (with batch enable the function is always on)
- 8.5 Date and time visualization with data logger enable
- 8.6 Quick start menu visualization
- 8.7 Enable the change value of the totalises (see function 5.1-5.4)
- 8.8* Enable the page of net totalizer (difference between direct and reverse. see page 22)
- 8.9 Reset the processor of the display (useful in case of particular badly operations of the display)
- 8.10 Visualizes the values of the partial totalise in the unit of selected currency
- 8.11 Choice of the numbers of decimals for the visualization currency value: From 0 to 3
- 8.12* Value of conversion/currency for direct totalizer
- 8.13* Value of conversion/currency for reverse totalizer

```

8-Display
9-Data logger
10-Diagnostic
11-Internal data
12-Batch
    
```

```

9-DATA LOGGER
1992/05/10 15:03
Acquisition= ON
Interval=h 24
Display data
Display events
Disp.min/max
Clear data
Clear events
Reset min/max

```

- 9.1* Date and time set
- 9.2 Automatic data logger enable
- 9.3 Interval time for the data logging function: 1, 2, 3, 6, 8, 12, 24, 48 hours
- 9.4 Displaying of the data stored in the data logger
- 9.5 Displaying of the last 64 alarms stored in the data logger
- 9.6 Visualization function of minimum and maximum peak of flow rate
- 9.7 Logged data cancel function
- 9.8 Reset all alarm events
- 9.9 Reset all minimum and maximum peak of flow rate stored

```

8-Display
9-Data logger
10-Diagnostic
11-Internal data
12-Batch

```

```

10-DIAGNOSTIC
Calibration
Self test
Simulation= OFF

```

- 9.2 Automatic data logger enable
- 9.3 Interval time for the data logging function: 1, 2, 3, 6, 8, 12, 24, 48 hours
- 9.4 Displaying of the data stored in the data logger

```

8-Display
9-Data logger
10-Diagnostic
11-Internal data
12-Batch

```

```

11-INTERNAL DATA
L2 keycode=00000
Lock level= 3
Load fact.pres.
Load user pres.
Save user pres.
Hours= 000077
Ign.cal.err= OFF
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 Ignore the calibration error during the switch on test
- 11.8 Ks Coefficient

```

9-Data logger
10-Diagnostic
11-Internal data
12-Batch

```

Menu 12: Menu visualized only with batch active (see from pag. 37)

```

12-BATCH
N.samples= 000
Diff.thr=% 010
V.com=dm³ 00.000
V.pre=dm³ 00.000
Auto batch= OFF
BM auto sel= OFF
Cons.mode= OFF

```

- 12.1* Number of batch cycles to define the value of compensation. Value 0=OFF
- 12.2* % limit of compensation threshold
- 12.3* Compensation value
- 12.4* Prebatch value
- 12.5* Auto-batch
- 12.6* Automatic selection of batch formula
- 12.7* Static consent of batch

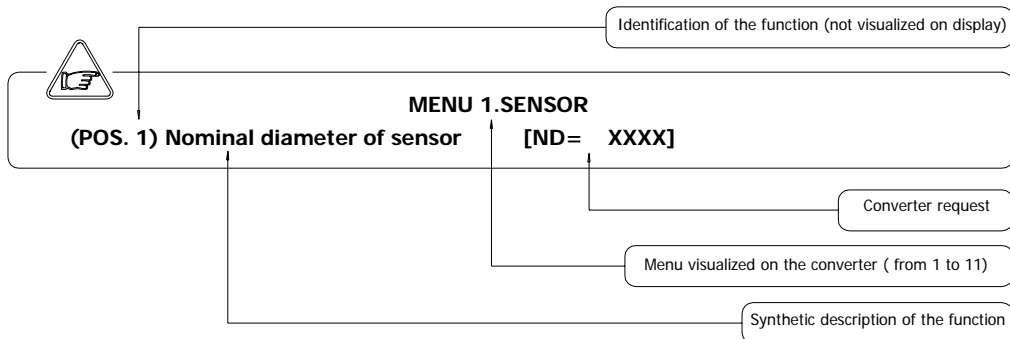
```

8-Display
9-Data logger
10-Diagnostic
11-Internal data
12-Batch

```

FUNCTIONS DESCRIPTION

(description of the functions with access code < 3)



The following pages give a description of the most important functions and how they can be changed or enabled/disabled by the user

MENU 1.SENSOR

(POS. 1.7) "Autozero" calibration

[Autozero cal.]

This function allow to zeroing the meter . To perform the zero calibration, it is necessary for the sensor to be full of liquid, and the liquid be perfectly still.

Even very small movement of the liquid may affect the result, and, consequently, the accuracy of the system.

Once you are sure the above conditions have been fulfilled (and the percentage flow rate value is stable) press the key for one second or more. Check the percentage flow rate value goes to zero. If this does not occur repeat the operation again. When the value is stable at zero, then press the key.

(POS. 1.7) "Empty pipe" threshold

[E.P. thr.]

Value of empty pipe threshold detection. The span of this function is 0-255.

Since the sensibility of empty pipe detection could be change by the liquid conductivity, ground connections, type of lining, in case of needed it's possible to adjust manually the preset threshold.

It's recommended to check periodically its proper functioning.

Increasing of value means decreasing the sensibility.

MENU 2.SCALES

(POS. 2.1-2.2) Full scale n° 1-2

[Fs1-2= dm^3/S X.XXXX]

The full scale is used to indicate to the sensor and equipment the maximum flow volume of the sensor when fluid is passing through at a stable 10m/s (or equivalent). A flow volume per time period is required. The full scale should be chosen carefully as it's parameters are used for several other parameters (Pls1-2, and 3 Measure). 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
- $1/25 \text{ fsmax} \leq \text{numeric field value} \leq \text{fsmax}$.

cm³	Cubic centimetre
ml	Millilitre
l	Liter
dm³	Cubic decimeter
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

G	Gram
Kg	Kilogram
T	Ton

Oz	Ounce
Lb	Pound
Ton	short tons

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 affected by the temperature. With certain liquids this may cause significant measurement errors. The following measure of time units can be selected: **s** = second, **m** = minute, **h** = hour, **d** = day.

(POS. 2.3) Unit of measure and number of decimal totalizes [Tot.MU:dm³X.XXX]

Setting the unit of measure and number of decimals for visualized totalizes or the volumes to batch. Setting the unit of measure and number of decimals places displayed for the volumes. To set the unit of measure, position the cursor on field of the unit of measure. To set the type of unit, position the cursor on the blank space between the unit of measure and the numeric value; The number of decimal places can be selected by placing the cursor on numeric field and choosing one of the possible combinations: 1000-01.00-001.0-00001.

(POS.2.4-2.5) Pulse value channel 1-2 and unit of measure of tot. [Pls1-2=dm³X.XXXXX]

This function allows the user to set a signal (a pulse) to be given from the converter when a defined amount of liquid has passed through the sensor. The units of measure must be identical to those chosen in (Pos 2.3 Totalizer unit of measure and number of decimal places). To set the parameter, complete the three fields, from left to right: 1) unit of measure, 2) unit type and 3) numeric value. The selection is performed by positioning the cursor in the field to be modified. To change the unit type (metric, British or American, mass or volume) 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 meters(m) or feet(ft). Only those units described above are available to be selected.

***(POS.2.6-2-7) Pulse duration channel 1-2** [Tpls1-2=msXXXX.XX]

With the volume of liquid to generate the pulse value (POS 2.4-2.5) set by the user. The user must set the corresponding duration of the pulse to be outputed. This value is expressed in milliseconds and has to be between 0,4 and 9999,99. When the high frequency output is present, then the minimum value can be set to a minimum of 0,04 milliseconds. ATTENTION: since the converter cannot detect which type of device is connected to the converter, the user must verify that the set pulse duration is compatible with the external device processing such pulses. If, for example, an electro-mechanical pulse counter is connected, one of two problems may occur; firstly, if the pulse is too long the coils may burn out, secondly, if the pulse is too short, the counter may not be able to function, with the possibility of causing damage of the output.

MENU 3. MEASURE

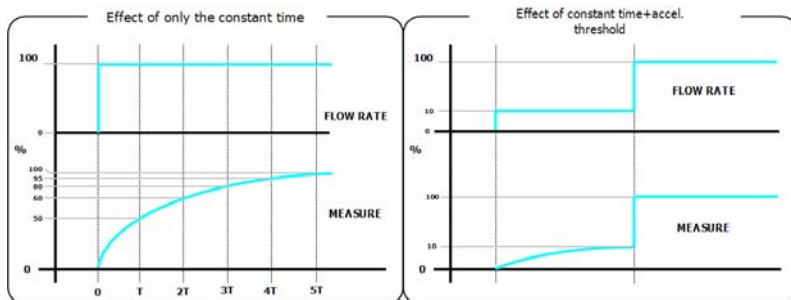
(POS. 3.1) Time constant [Tconst=s XXXX.X]

The time constant function effects the response time of the converter while measuring. The time constant needs to be chosen carefully as it effects accuracy of the flow rate measure. A smaller time constant with a fluctuating flow will lead to unstable flow readings as the integration filter will be measuring over very short periods. Setting a quicker or slower response time, according to the value set. A higher value corresponds to a more stable but slower measure, a smaller gives and faster measure but is more unstable. 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. 3.3) Acceleration threshold

[Skip thr=% XXX]

The acceleration threshold is a value set by the user in accordance with the Time Constant (3.1). The threshold is a maximum fluctuation of the flow rate (as a % of the full scale value). It is useful as it allows the converter to send an output signal when a measure of flow above the % of the full scale value set is recorded (normally due to large flow rate variations), regardless of the Time constant set, while integrating, therefore delaying smaller fluctuations in flow, resulting in very stable measures. The set value is a 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 affect 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 from 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. 3.4) Peak cut off threshold

[Peak thr=% XXX]

Anomalous signal peak cut off threshold set. This parameter allows for setting the maximum value of deviation of the measured sample in comparison to the average. If a successive value is higher than the set limit, than such a value is “cut” to the limiting value. This function is used to make the meter less sensitive to big perturbations of the flow rate measure. This may happen when there are solids suspended in the liquid in contact with the electrodes resulting in higher electrical noise. The permitted values of this function range from 0 to 125 % in reference to the full scale value. If this parameter is set to zero the peak detection function is disabled and any subsequent measured sample will be accepted and processed by the converter.

(POS. 3.7) 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 range N.2 (Fs2) if enabled is bigger than N.1 (Fs1). When the flow rate increases and reaches the 100% of the full scale 1, then the meter automatically switches to scale 2. When the flow rate decreases again reaching a value on scale 2 equal to the 90% of full scale N.1, then the active scale is 1 again. Allowed values for this parameter: ON / OFF. **N.B.:** the autorange doesn't allow using the manual change of range (see pos. 5.8)

(POS. 3.8) Energy saving enable

[E.saving=ON/OFF]

Automatic energy saving function enables. This function is used when the instrument is powered by a battery or solar cells, allowing an energy saving up to the 60-80%. The energy saving function controls the powering cycles ratio of the coils while the measuring cycling remain unaffected. When the energy saving function is enabled and the flow rate is stable the number of “off” cycles is greater than the “on” cycles, reducing the average power consumption. If the flow rate suddenly changes, the meter switches to a higher number of measuring cycles, achieving a higher response time. Once the flow rate resumes stability the number of powering cycles is reduced. If the flow rate varies below the “acceleration threshold” (POS.18) percentage value, the meter assumes the “off” cycles. When the flow rate exceeds such a threshold, the meter increases the measuring cycles. The speed at which the meter will switch between the increased and reduced powering cycles are different. From a constant to a variable flow rate is a very fast process, while from variable to a stable flow rate is much slower. The allowed values for this parameter: ON/OFF. **N.B.:** to optimize this function, a value for the acceleration threshold between 10 – 15 is recommended (POS. 3.3)

MENU 4. ALARMS

(POS. 4.7) Current output value in case of failure **[mA V.fault =% XXX]**

The output current signal can be specified by the user in case of failure of either, empty pipe, coils interrupted, or ADC error. The signal current is set as a percentage (0 to 120%) of the 0/4...20 mA current. 120% corresponds to 24 mA and does not depend on the selected range (0...20 / 4...20 mA). The NAMUR NE43 recommendation asks for a alarms signalling value for the current output lower than 3.6 mA (<18%) or bigger than 21 mA (>105%). It would then be preferable to set the value of this function at the 10%, so that the current value in case of the a.m. cases would be 2 mA, allowing the following diagnostics:

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

N.B.: To set this parameter to zero disables the alarm

***(POS. 4.8) Frequency output value in case of failure** **[Hz V.fault=%XXX]**

To set the frequency value assigned to the on/off output in one or more of the following failure cases:

- Empty pipe; Coils interrupted ; ADC error

Allowable range is from 0 to 125% of the frequency full scale value.

Although there are no specific rules regulating cases such as these, it would be convenient to use the failure information as follows:

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

***(POS. 4.9) Batch safety timer** **[Timeout =s XX.X]**

This function is useful when you need control one or both of the following conditions:

- batch valve open and flow rate is zero
- batch valve closed and flow rate different to zero





When this alarm is activate, the batch operation and power supply to the valve is halted. The allowed values of function are from 0 (disable) to 25.5 seconds and is active only if one or more of the batch functions are enabled.




MENU 5.INPUTS

(POS. 5.1-5.2-5.3-5.4) Modify/reset totalizer enable **[T/P+/-RESET=ON/OFF]**

To reset the totalizer from the key board it is necessary enable the function 8.7 (modify tot.) and one of totlaizer functions from 5.1 to 5.4.

From visualisation pages, proceed in the following mode:

- 1) Push the key . Set the L2 CODE if required and then push the key
- 2) Positioning the cursor on value field to modify the numerical value (it's possible only modify the totalizer enabled) push the key  to confirm the modified value
- 3) Positioning the cursor on "RESET TOTALIZ.?" Push the key  and then the key  to confirm or any other key to cancel this operation.

With function 8.7 disabled it's possible to reset the totalizer by pushing the key  from visualization page, at the prompt "RESET TOTALIZ.?" Push the key  and then the key  to confirm, or any other key to cancel this operation

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

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

(POS. 5.8) Range change external command enable **[Range change=ON/OFF]**

Enables the range change on external command. When this function is enabled, applying a voltage on the on/off input terminals the meter switches to the converter to the second measuring range (Fs2).

N.B.: The autorange doesn't permit the use of the manual range change function (see pos. 3.7)
(POS.5.10)Functions assigned to input 2 [Inp.2=XXXXXX]
 Allows the user to choose the function associated to input 2. The functions are listed in the table below.

FUNCTION FOR INPUT 2

OFF: DISABLE
T+ RESET: RESET TOTAL DIRECT TOTALIZER FOR DIRECT FLOW RATE (+)
P+ RESET: RESET PARTIAL DIRECT TOTALIZER FOR DIRECT FLOW RATE (+)
T- RESET: RESET TOTAL REVERSE TOTALIZER FOR REVERSE FLOW RATE (-)
P- RESET: RESET PARTIAL REVERSE TOTALIZER FOR REVERSE FLOW RATE (-)
BATCH: START/STOP BATCH
MD SELECTION: STATIC SELECTION OF FORMULA

MENU 6.OUTPUT

(POS. 6.1-6.2-6.3-6.4) Function corresponding to on/off output 1-2-3-4 [OUT1=XXXXXX]
 Choice of the function corresponding to digital Output 1. The functions are listed in the following table below. The corresponding time for the output pulse is set in function Pos 6.5 following.
The output 3-4 are optional and the output 4 it' the only output, which can reach a 12.5 KHz frequency.

FUNCTION FOR OUTPUT 1, 2,3,4

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
 #1 FREQ+: FREQUENCY CHANNEL 1 FOR POSITIVE FLOW RATE
 #1 FREQ-: FREQUENCY CHANNEL 1 FOR NEGATIVE FLOW RATE
 #1 FREQ±: FREQUENCY CHANNEL 1 FOR POSITIVE AND NEGATIVE FLOW RATE
 #2 FREQ+: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE
 #2 FREQ-: FREQUENCY CHANNEL 2 FOR NEGATIVE FLOW RATE
 #2 FREQ±: FREQUENCY 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(ENERGISED = AL. OFF)
 MAX AL-: MAX REVERSE FLOW RATE OUTPUT(ENERGISED = AL. OFF)
 MAX AL±: MAX DIRECT/REVERSE FLOW RATE OUTPUT(ENERGISED = AL. OFF)
 MIN AL+: MIN DIRECT FLOW RATE OUTPUT(ENERGISED = AL. OFF)
 MIN AL-: MIN REVERSE FLOW RATE OUTPUT(ENERGISED = AL. OFF)
 MIN AL±: MIN DIRECT/REVERSE FLOW RATE OUTPUT(ENERGISED = AL. OFF)
 MAX+MIN±: MAX AND MIN FLOW RATE ALARM OUTPUT (ENERGISED = AL. OFF)
 EMPTY PIPE: EMPTY PIPE ALARM OUTPUT (ENERGISED = FULL PIPE)
 OVERFLOW.: OUT OF RANGE ALARM OUTPUT (ENERGISED = FLOW RATE OK)
 HW ALARM: CUMULATIVE ALARM OUTPUT interrupt coils, empty pipe, measure error (ENERGISED = NO ALARMS)
 BATCH AL: BATCH ALARM
 EXT. COMM.: ONLY AVAILABLE WITH DATA LOGGER MODULE
 BATCH SIN.: AT THE AND OF BATCH THE OUTPUT CHANGE STATUS
 END BATCH.: END BATCH OUTPUT (ENERGISED =BATCH IN PROGRESS)
 PREBATCH.: PREBATCH OUTPUT (ENERGISED = PREBATCH IN PROGRESS)

(POS. 6.5)Duty cycle value for pulses/frequency output [Out1=XXXXXX]

The duty cycle function defines the time ratio between ON and OFF state when the frequency output is used: 50% means that the ON phase will equal that of the OFF phase, 60% means that the ON phase will be 60 % and the OFF phase will be 40% of the total cycle time. When the pulse outputs are used, the duty cycle defines the OFF phase, this is because the ON phase is already set with the "PULSE DURATION" function (see Main menu "2 - SCALE"). In this case, for example, the duty cycle is set at 50% and the pulse duration at 50ms, the OFF phase will be the same of the ON phase. The formula to calculate the minimum time of the OFF phase and the time of total cycle is the following:

T. total cycle= 100 x (pulse duration in ms)/ (duty cycle)

T. OFF phase = T. total cycle - pulse duration

N.B.: If the value of the function is set to 0 the issue of the pulses happens in synchronous mode with the flow rate therefore when it uses the function in frequency DOESN'T set the duty cycle to 0.

(POS. 6.6-6.7) Function and the range of current output n.1-2 [Out mA1-2=X÷XX±]

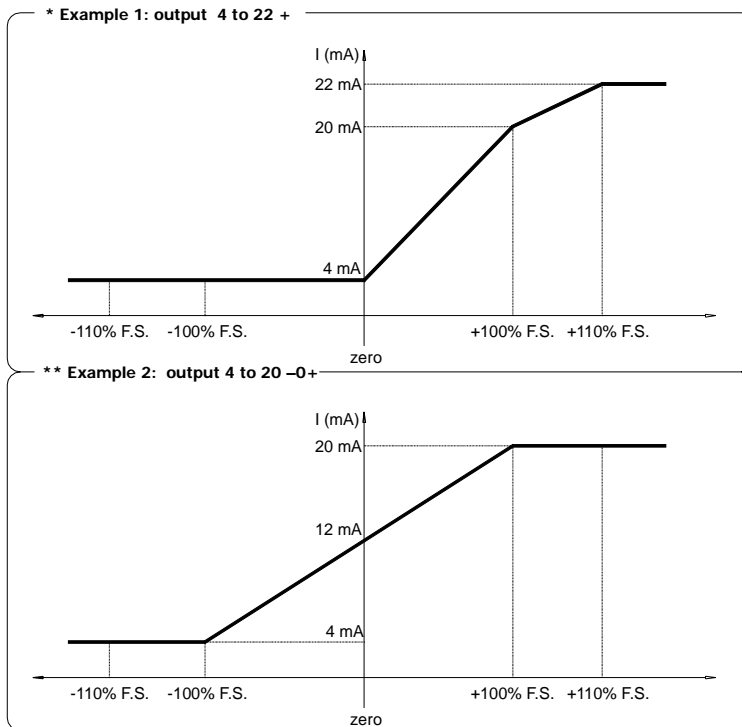
The function associated to the signal current on output N.1-2. The current output N.1 is **optional and it is mounted on the main board**. There are three fields to modify for this function:

- Scale zero: **4** or **0** mA ; 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 chart:

POSSIBLE FIELD	CURRENT VALUES IN mA ASSOCIATE TO THE % VALUE OF FULL SCALE				
	REVERSE FLOW VALUE		ZERO	DIRECT FLOW VALUE	
	≤ -110%	-100%	0%	+100%	≥+110%
OutmA = 0 ÷ 20 +	0	0	0	20	20
OutmA = 0 ÷ 22 +	0	0	0	20	22
OutmA = 4 ÷ 20 +	4	4	4	20	20
* OutmA = 4 ÷ 22 +	4	4	4	20	22
OutmA = 0 ÷ 20 -	20	20	0	0	0
OutmA = 0 ÷ 22 -	22	20	0	0	0
OutmA = 4 ÷ 20 -	20	20	4	4	4
OutmA = 4 ÷ 22 -	22	20	4	4	4
OutmA = 0 ÷ 20 ±	20	20	0	20	20
OutmA = 0 ÷ 22 ±	22	20	0	20	22
OutmA = 4 ÷ 20 ±	20	20	4	20	20
OutmA = 4 ÷ 22 ±	22	20	4	20	22
OutmA = 0 ÷ 20 -0+	0	0	10	20	20
OutmA = 0 ÷ 22 -0+	0	1	11	21	22
** OutmA = 4 ÷ 20 -0+	4	4	12	20	20
OutmA = 4 ÷ 22 -0+	4	4.8	12.8	20.8	22

In hardware alarm conditions "HW ALARM" (interrupted coils, empty pipe, measure error) the current value is programmed by the function "mA v.fault" (pos. 4.7) and it is expressed as percentage of a fixed current range, where: 0% = 0 mA e 110% = 22 mA.




MENU 8.DISPLAY

(POS. 8.3) Display contrast set

[Contrast=X]

Visual display contrast set. The contrast can change according to the room temperature. The set values are from 0 to 15. The entered value has effect only when leaving the function itself.

WARNING >10 is a dark screen and obscures writing on the display

Contrast also can be set from visualization pages (pag. 19) pushing the key  for 8 second or more. In this way the contrast set that will be visualized at release of the key.

(POS. 8.12-8.13) Conversion factor for direct flow rate totalizers [EUR/dm³+/- =X]

Setting of the conversion/currency value for direct flow totalizers (positive). There are three setting fields for this parameter, from left to right: 1) monetary symbol, 2) default/personalized monetary symbol, 3) conversion coefficient. To modify, set the cursor over the required field. Setting the monetary symbol can be achieved in two ways:

1. Choosing one of the 7 predetermined monetary symbols (standard ISO 4217-REV81):EUR=Euro; USD=USA dollar; CAD=Canadian dollar; AUD=Australian dollar; GPB=English pound; CHF=Swissfranc; JPY=Japanese yen.
2. Entering a three character (numbers or letters) personalized currency. To change the characters, the cursor must be set on the symbol "/" (second field)

MENU 9.DATA LOGGER

(POS. 9.1) 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 when the converter power supply is off, otherwise the clock is frozen until the power supply to the converter is resumed. For example, if the power supply has been off for one hour, when switched on the converter will be one hour behind actual time. The calendar is valid till year 2091. **N.B.:** date and time are visualized on display only if the data logger is enabled (Pos 9.2).

MENU 10. DIAGNOSTIC



(POS. 10.1) Meter "calibration"

[Calibration]

Enables the calibration of the meter. The activation of this function happens pressing the  key during the visualization of the function. The following message will be visualised on the screen: "EXECUTE?" press the key  to proceed. Press any other key to delete the operation. The liquid must be absolutely still during the calibration.

(POS. 10.2) "Autotest" function enable






[Self test]


Meter autotest 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 the converter will revert to one of the initial visualization pages. This function is automatically performed when switching on the device.

(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 the key  from one of four visualization pages
- Started: by pushing the key  to set the required % flow rate (Fl.rate=%) and  to set the simulation run. A '*S' will appear in the top right of the screen.
- Finished: by pushing the key  from visualization pages and then by pushing the key .

N.B.: the enable of flow rate simulation disable the contrast regulation with the key  (Pos. 8.3)

The batch functions allow the user to set the converter to measure a defined volume of fluid and control outputs. An example is opening and closing a valve after a predefined volume has passed the sensor. The user sets the volume and the control parameters through the converter through the following functions (Main menu function group 12 'Batch')

MENU 12.BATCH

Menu visualized only with batch active (output on batch and/or pos. 5.9 enable or 5.10 on batch)

(POS. 12.1) Number of batch samples [N.samples=XXX]

Number of batch cycles to be completed to define the value of compensation. This function allows the converter to automatically determine the average value for the automatic compensation of the system delay (POS. 9.3). Set the value to ZERO to manually introduce the compensation value.

(POS. 12.2) % limit of compensation [Diff.thr=%XXX]

This value defines the percentage of maximum difference between the compensation value set (see pos. 12.3) and the average compensation value defined with the function 12.1. Over this threshold the new compensation value will be automatically set (if Number of batch samples is different from zero)

(POS. 12.3) Compensation value [V.com.=XX.XXX]

This value is expressed in the units of measure selected. The compensation value is the difference between the batch value set and the actual system delays due to closing valves, stop pumps, stop motors, etc. To set the compensation value manually, preset to ZERO the number of batch samples (Pos 12.1)

(POS. 12.4) Prebatch value [V.pre=XX.XXX]

This sets the volume of liquid at which the Pre-batch is enabled. When the pre-batch volume (V.pre) is reached the output (if enabled) is de-activated. This value is constant for all quantities to be batched and must be set in current volume unit of measure. The pre-batch function is useful when you need fast and accurate dosages.

(POS. 12.5) Enable/disable auto-batch function [Auto batch=ON/OFF]

By applying a voltage to the on/off input terminals for more than 5 second opens the value controlled by the converter. When the required flow volume has passed, the input voltage is removed, closing the value. The converter memorizes the volume supplied in the current batch memory. (see "Batch Functions") ; The volume set in this procedure will be the batch volume supplied in every following activation of the batch function. In order to modify this value, repeat the operations described above. This procedure set the safety timer at a value 1.25 times greater than the time used to reach the batched quantity; after that the counter will be reset.

(POS. 12.6) Automatic selection of batch formula [BM auto sel=ON/OFF]

The function allows the automatic selection of the first 4 formulas depending on the duration of the pulse of the batch start (see page 15 "Operation stage on input 1 or 2"). This function is active only if the function Cons. mode (POS. 12.7) has not enabled (OFF). With the 'Static consent of batch', the automatic compensation of the batch volume is excluded (additionally the value of the parameter "N.samples" (POS. 12.1) will be automatically be set to zero). However the manual compensation is possible by inserting an appropriate value on the parameter "V.com" (POS. 12.3)

(POS. 12.7) Static consent of batch [Cons. mode=ON/OFF]

This function enables the start and stop of the batch dosing using a static signal, instead of an impulse, applied to the input (see page 13 "Digital input), this signal has to be constantly applied throughout the batch. This function automatically disables the functions 'BM auto sel' (POS 12.6) and 'Auto batch' (POS 12.5).

BATCH FUNCTION CONFIGURATION.

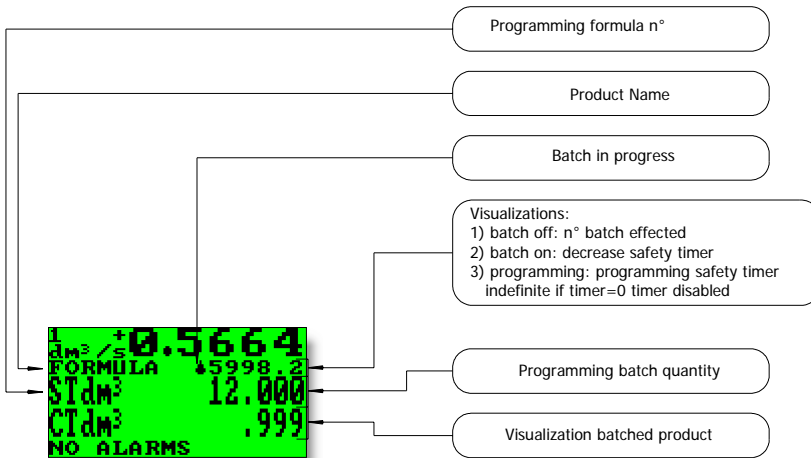
ENABLE BATCH

Select one of the following functions to enable and program the batch on the converter:

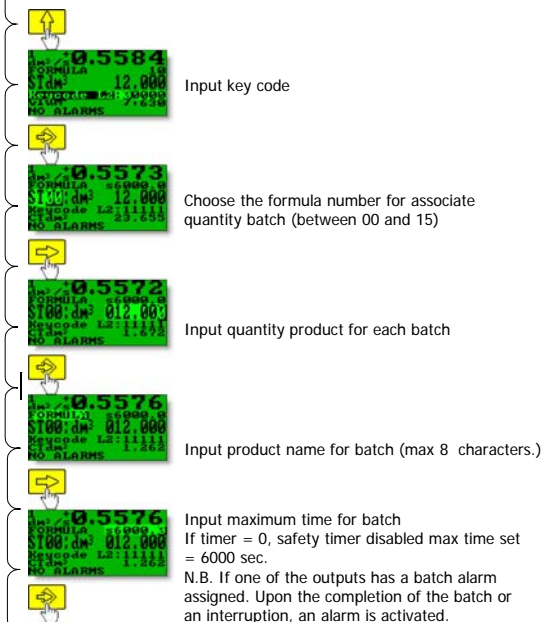
- POS. 5.9-5.10: START/STOP batch from input
- POS. 6.1-6.2: assign one of the functions outputs one and/or two

Some examples of operation of such functions are visualized from page 15.

VISUALIZATION PAGE WITH BATCH FUNCTION ENABLED



From the visualization pages



PROGRAMMING A BATCH


For each formula you can associate:

- Product quantity
- Product name
- Maximum time for batch (safety time for each formula)

After activating the batch function from visualization page at pages 47, proceed as illustrated and described in the aside example.

START STOP BATCH

START: it is possible activate the start of batch in two different ways:



1. **From remote input:** assigning the functions of start/stop batch to the input 1 (POS. 5.9) or input 2 (POS. 5.10) and using the input/s like visualized from page 14.
2. **From keyboard:** short pressing of the key 

N.B.: The start of batch from keyboard is always initiated on the release of the key. The function is not available with the batch consent (POS. 12.7) function enabled.

STOP: A batch may stop (be stopped) due to three events:

1. **Keyboard or remote input** (manual stop): short pressing of the key
2. **End of batch:** In this case the batch will be stopped once the batch quantity has been achieved and a signal given
3. **Maximum time of batch:** If a maximum batch time has been set, and is exceeded, the batch in progress is stopped independently from the batched quantity.

Notes:

- during the batch the symbol of the active batch  and the name of the formula are visualized on display.
- When the batch outputs are enabled, pushing the  key for more than 5 seconds will energise the outputs until the key is released. On the display, In place of the CT and ST totalisers the following message will appear:

!! VALVE !!
!! OPENED !!

IMPORTANT NOTES

The start of the batch disables any function listed in the table below:

		POS 12.5	POS 12.6	POS 5.6	POS 12.1	POS 5.9	POS 3.7-5.8	POS 3.8	POS 5.7
		AUTO BATCH	BM AUTO SEL	BLOCK TOTALIZER	N. SAMPLES	INPUT 1 ON START/STOP BATCH	AUTO RANGE CHANGE OR FROM INPUT	ENERGY SAVING	CALIBRATION
* If using Input 1				*DISABLE					
** Value set to zero					** DISABLE				
POS 12.5	AUTO BATCH			*DISABLE					
POS 12.6	BM AUTO SEL				** DISABLE				
POS 12.7	CONS. MODE	DISABLE	DISABLE	* DISABLE					
POS 5.9	INPUT 1 ON START/STOP BATCH						DISABLE	DISABLE	DISABLE
POS 5.10	INPUT 2 ON START/STOP BATCH					DISABLE	DISABLE	DISABLE	DISABLE
POS 5.10	BM SELECT		DISABLE		** DISABLE				
POS 6.1+6.4	OUTPUT ON END BATCH							DISABLE	

ACTS ON

To optimize the performances of the meter used as a batch instrument, it is recommended to set it as prompt as possible according to the plant requirements, choosing the opportune values of time constant (pos. 3.1) and acceleration threshold (pos. 3.2).

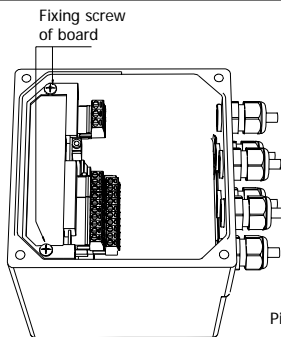
ALARM MESSAGES, CAUSES AND ACTIONS TO BE TAKEN

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 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 repeat the empty pipe calibration procedure
BATCH ALARM	Batch interrupted for the followings condition: <input type="checkbox"/> Timer batch expired before the end of the batch <input type="checkbox"/> Batch valve open and flow rate to zero for a time longer to the safety timer set <input type="checkbox"/> Batch valve closed and flow rate different from zero for a time longer than the safety timer set	Verify: <input type="checkbox"/> Presetting <input type="checkbox"/> System conditions
INPUT NOISY	The measure is strongly effected by external noise or the cable connecting the converter to the sensor is broken	Check the status of the cables connecting the sensor, the grounding connections of the devices and the possible presence of noise sources
EXCITATION FAIL	The coils or the cable connecting the sensor are interrupted	Check the connecting cables to the sensor
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 V.fault" value (menu alarm) to 0.
P.SUPPLY FAIL	Power supply different from that indicated on the label.	Verify that the power supply is with in the specifications indicated on the label

ANOMOLIES CODES

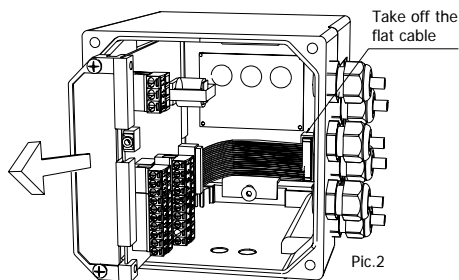
CODES	ANOMALIE DESCRIPTIONS	ACTION TO TAKE
0001	Problem with watch-dog circuit	ADDRESSING TO SERVICE
0002	Wrong configuration work data in eeprom	
0004	Wrong configuration safety data in eeprom	
0008	Defective eeprom	
0010	Defective keyboard (one or more key are pushed during the test)	
0020	Power supply 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	Gain input stage 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 codes 0800 and 0400 above.

APPENDIX 1 DISPLAY ROTATION PROCEDURE



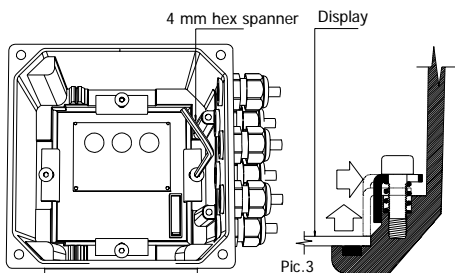
Pic.1

- ❑ Unscrew the screws suitable in pic. 1



Pic.2

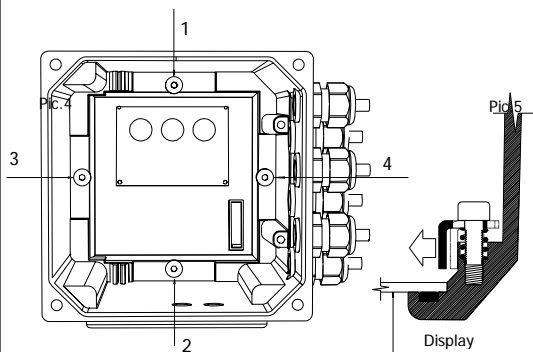
- ❑ Lift the board, remove the flat cable from the display pic. 2 and extract completely the board from the box



Pic.3

- ❑ Partially unscrew the screw fixing the display to allow the angular shift and extraction of the display

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

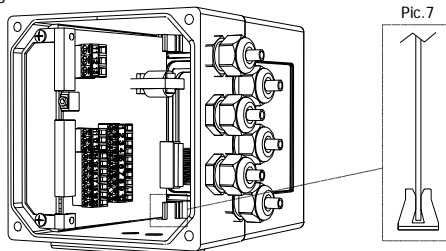


Pic.5

- ❑ Rotate the display to the desired location, verify it's correct set of the seal, the cleaning of the contact surfaces it set the display housing.
- ❑ Place the fixing angles in the suitable positions (pic. 5) and screw down firmly until they make contact with the display housing.

Screw up tightly the 4 screws (1,2,3,4) indicated in pic. 4

Pic.6



Pic.7

- ❑ Restore the flat cable connection to the display
- ❑ Verify the board is set correctly in the fixing clip (Pic.7)
- ❑ Fix the board to the box to complete the assembly process.

DECLARATION OF CONFORMITY**Isoil Industria spa**

Declares that the product:

ISOMAG ™

Converter model:

ML210

And sensor models

MS 500 – MS 501 – MS 600 – MS 1000 – MS 2410 – MS 2500 – MS 3700 – MS 3770 – MS3800 – MS 5000

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

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

and therefore comply to the following CE requirement directives:

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

25/11/2007

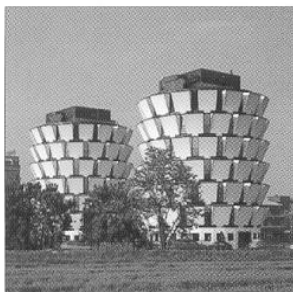

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FILE NAME: 210_EN_IS_6_3_8X.doc

The version number of this manual is indicated by the fourth number from the right. The last three characters of the file name identify the software version to which this manual refers. The software version of the converter is visualized during it's power up.

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The solutions that count



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