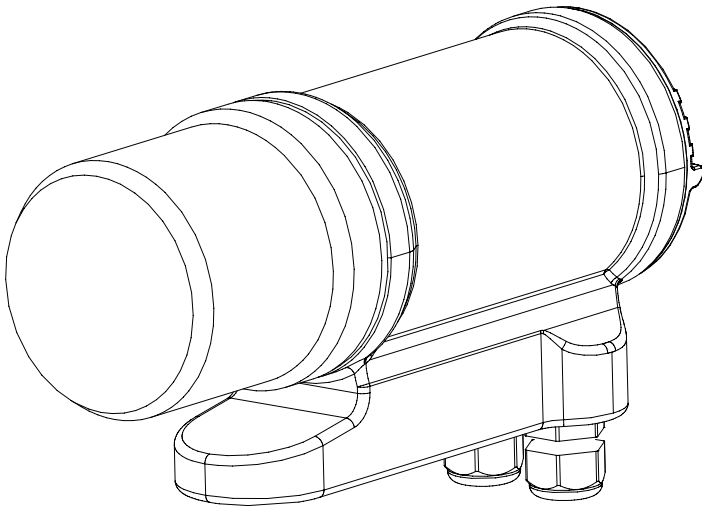


OPERATING AND INSTALLATION MANUAL

CONVERTER

ML4-F1



INDEX

□	Introduction	pag.3
▪	Symbols Used on the manual	pag.4
□	Technical characteristics	pag.5
▪	Electrical characteristics	pag.5
▪	Environmental conditions of use	pag.5
▪	Operative temperature	pag.5
▪	Overall dimensions	pag.6
□	Electrical connections	pag.7
▪	Grounding instructions	pag.7
▪	Power supply converter	pag.7
▪	Electrical connections: input-output cables	pag.8
▪	Electrical connections: sensor cables	pag.9
□	Inputs/outputs	pag.10
▪	Expansion modules	pag.11
▪	Digital Input	pag.12
□	Converter visualisation pages	pag.16
▪	Flags interpretation and led	pag.17
▪	Key board	pag.18
▪	Access codes	pag.19
▪	Programming functions	pag.20
▪	How to access to the configuration menu	pag.23
□	Programming functions	pag.25
▪	Functions description	pag.25
□	Batch	pag.31
▪	Enable batch	pag.31
▪	Programming batch	pag.31
▪	Start / stop batch	pag.32
▪	Important notes	pag.32
□	Alarm messages	pag.33
▪	Causes and actions to be taken	pag.33
▪	Anomalies codes	pag.33

INTRODUCTION

This manual is integral part of the product. Read carefully the instructions contained since they give important indications for the safe 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, make the warranty to decay automatically.

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

Reproduction of the present manual and of any possible software supplied with the instrument is strictly forbidden.

START UP AND MAINTENANCE OF THE INSTRUMENTS

Before starting up the instrument please verify the following:

- Power supply voltage must correspond to that specified in the name plate
- Electric connections must be done as described at page 7-8
- Ground connections must be done

Verify periodically:

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

The mechanical fixing of the instrument on the pipe or on the wall stand

Symbol Used on the manual



ATTENTION



DANGER ELECTRIC SHOCK



WARNING



PRECAUTIONS

TECHNICAL CHARACTERISTICS



ELECTRIC CHARACTERISTICS

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

Power supply versions	Power supply voltage	Pmax	current max
LLV	18÷30 Vdc	10 W	1 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 a 6000 m (from -656 to 19685 feet)
 Humidity range: 0÷100% (IP 67)
 Line voltage range: (see table on technical characteristics)



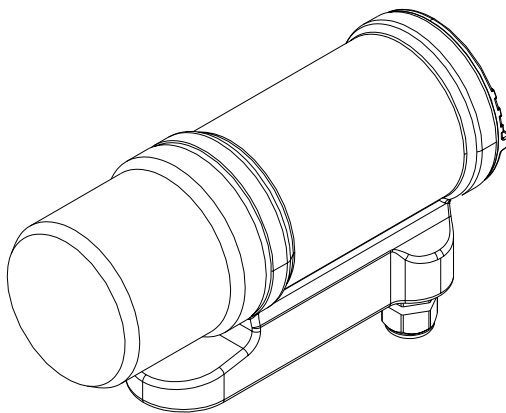
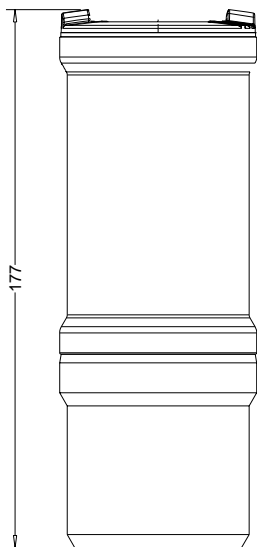
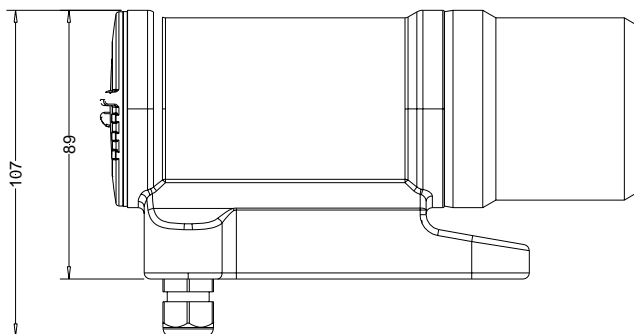
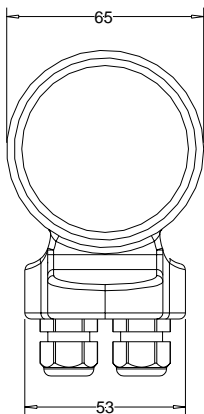
OPERATING TEMPERATURE

TRANSMITTER			
Ambient Temp.			
Min.		Max	
°C	°F	°C	°F
-20*	-4*	60 ¹	140 ¹

- * = For discontinuous use, the installation of a heating resistance it's necessary
- ¹ = For liquid temperature > 60 °C , ambient temperature max 40 °C
 130°C Cip (cleaning in place) is allowed up to 30' (unlimited time if converter switch off)



OVERALL DIMENSIONS



ELECTRICAL CONNECTIONS

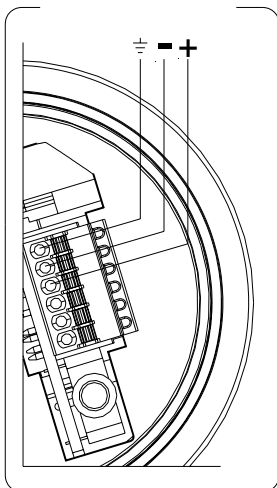


GROUNDING INSTRUCTIONS

For the correct operation of the meter it's **NECESSARY** that sensor and liquid are equipotential, so **ALWAYS** connect sensor and converter to the ground



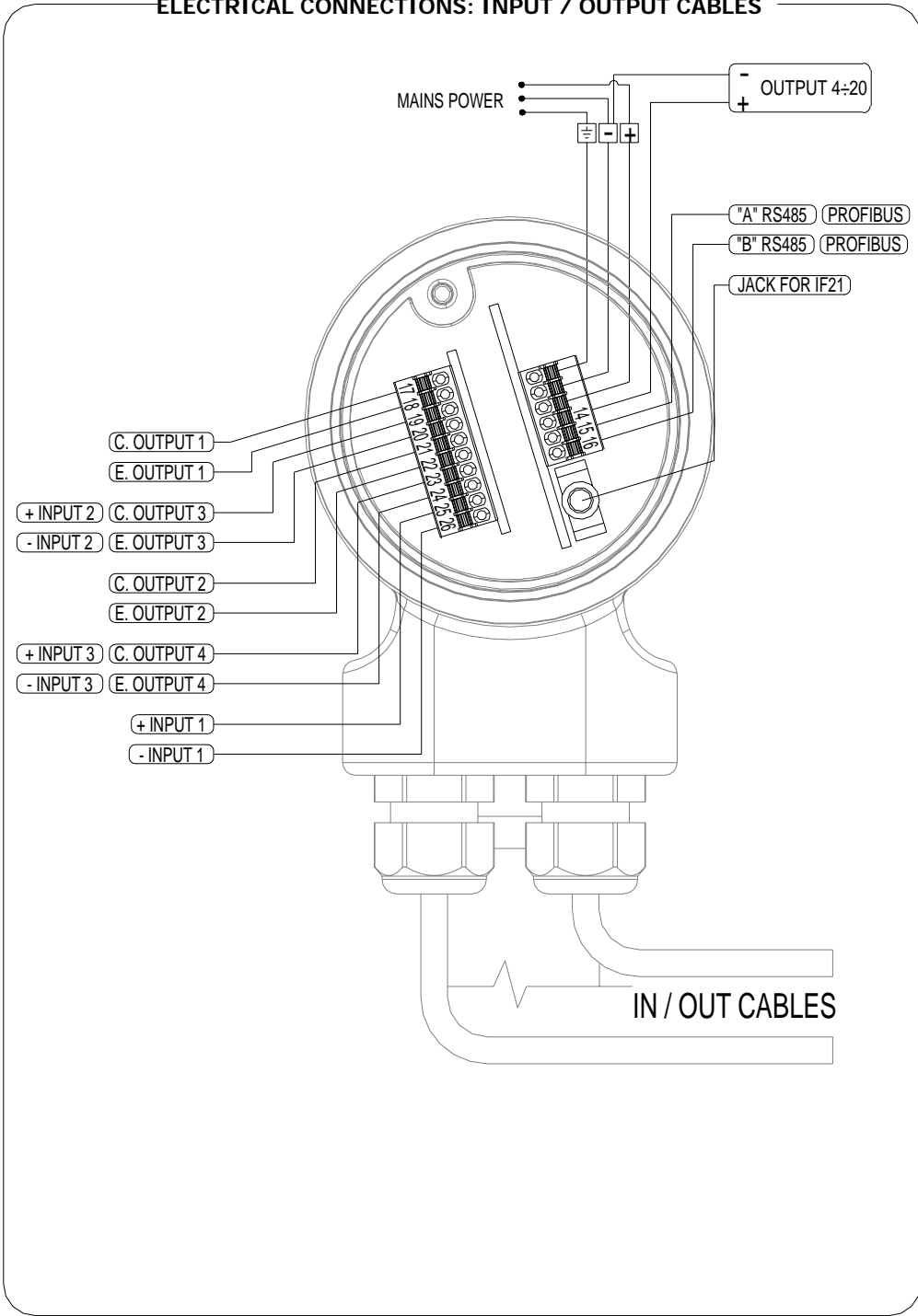
CONVERTER POWER SUPPLY



- 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.
- For the wiring use only approved conductors, with fire-proof 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).
- 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 5

ELECTRICAL CONNECTIONS: INPUT / OUTPUT CABLES



- C. OUTPUT 1
- E. OUTPUT 1
- + INPUT 2
- INPUT 2
- C. OUTPUT 3
- E. OUTPUT 3
- C. OUTPUT 2
- E. OUTPUT 2
- + INPUT 3
- INPUT 3
- C. OUTPUT 4
- E. OUTPUT 4
- + INPUT 1
- INPUT 1

OUTPUT 4+20

MAINS POWER

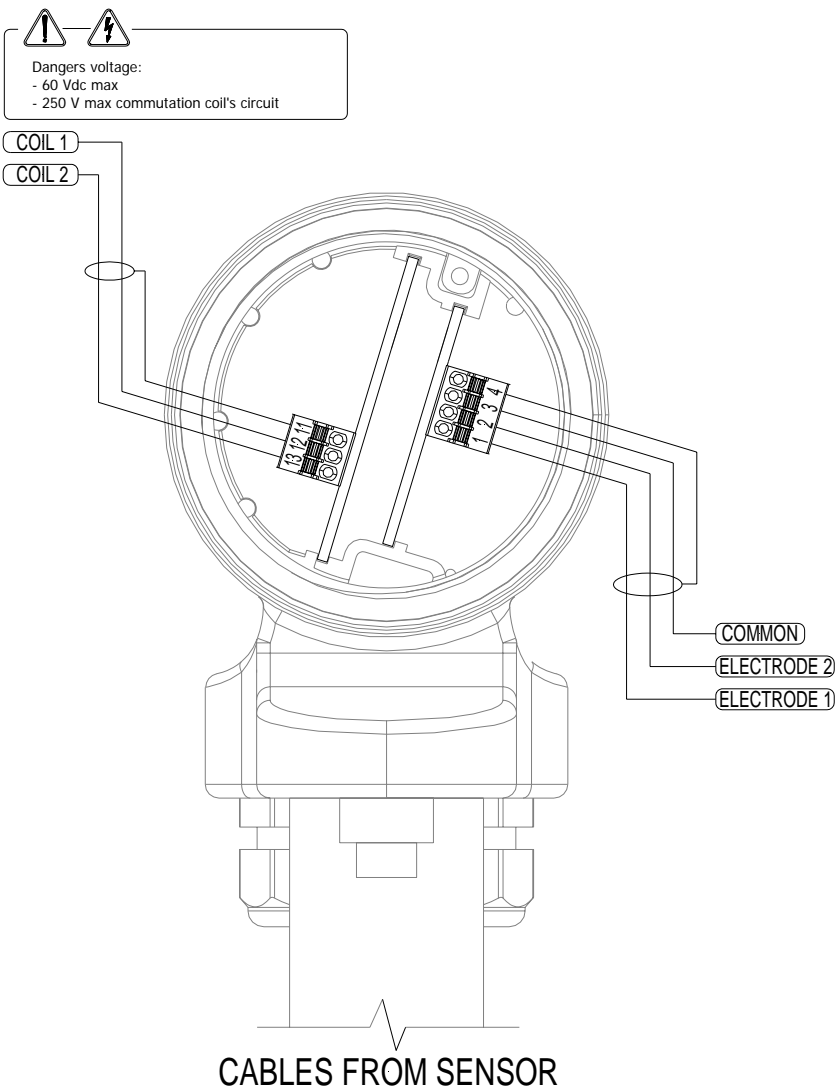
"A" RS485 PROFIBUS

"B" RS485 PROFIBUS

JACK FOR IF21

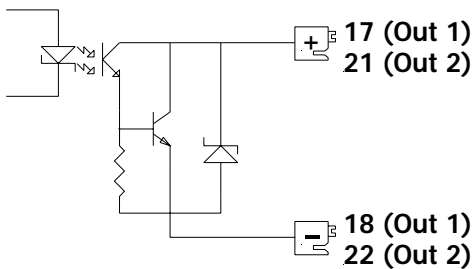
IN / OUT CABLES

ELECTRICAL CONNECTIONS: SENSOR CABLES



INPUTS / OUTPUTS

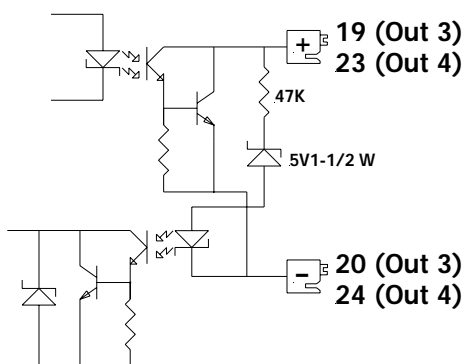
Output 1-2



Technical characteristic of OUTPUTS

- Max voltage **30 Vdc**
- Max load: **100 mA @24Vdc**,
- Max. frequency: 1250 Hz.

Output 3-4 / Input 2-3



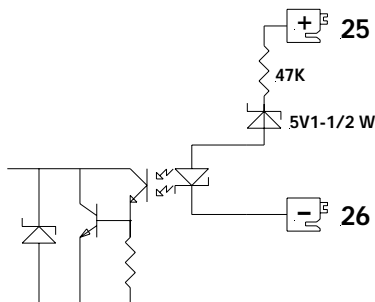
Technical characteristic of OUTPUTS

- Max voltage **30 Vdc**
- Max load: **100 mA @24Vdc**,
- Max. frequency: 1250 Hz.

Technical characteristic of INPUTS

- Max voltage **30 Vdc**
- Min voltage for recognized logical state enables: **18 Vdc**
- Entry resistance of the circuit: **47 kohm**

Input 1



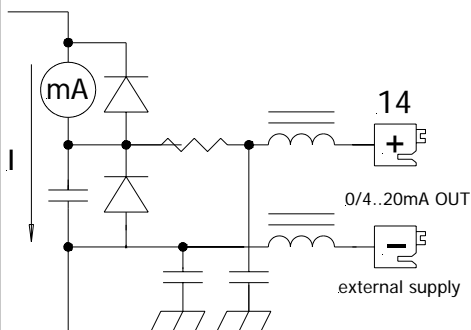
Technical characteristic of INPUTS

- Max voltage **30 Vdc**
- Min voltage for recognized logical state enables: **18 Vdc**
- Entry resistance of the circuit: **47 kohm**



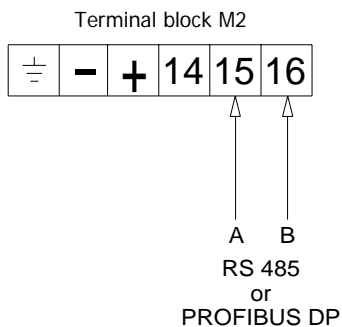
PROTECTIONS

The terminals are protected for the accidental polarity inversion; the output is protected from the extra voltage due to the inductive loads (connections of coils or relay).

(Output 0/4..mA)

- ❑ Power supply **18 ÷ 30 VDC**
- ❑ Max load resistive to the output: **800 ohm** with 24Vdc of power supply
Minimum load recommended 500 Ohm
- ❑ Settling time : **5ms**

ATTENTION: The power supply of 0-4/20 mA is the same of that of entire instruments , therefore is not insulated from it.


**MODULE ME35/36
OPTIONAL**


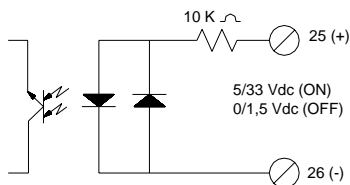
ATTENTION: The power supply of communication module is the same of that of entire instruments, therefore is not insulated from it.



FOR COMMUNICATION MODULE SEE THE SPECIFIC OPERATION MANUALS

HOW WORK THE INPUT

Input electric wiring



Speed rate	Tmin
20 Hz	110 ms
50 Hz	45 ms
60 Hz	40 ms
80 Hz	30 ms
150 Hz	15 ms
300 Hz	10 ms
400 Hz	10 ms

ATTENTION: where not specified the time T must be \geq to Tmin

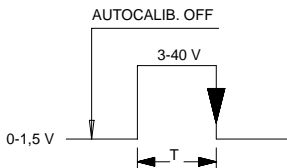
The functions refer to the inputs could be substantially divided in three groups:

1. only assignable functions to the input 1 (page 13)
2. Functions that act directly on the inputs independently from the select input (page 14)
3. only assignable functions to the input 2 and only to the input 3 which they interact between them (any examples to page 15)

remember that the activation of any functions of batch automatically disable the operation of other. The list of such functions is suitable in the tab to page 32.

INPUT OPERATION STAGE (GENERIC FUNCTIONS)

Auto-calibration

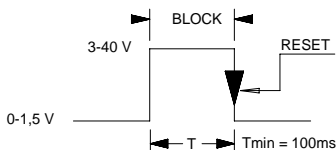


$T_{min} < T < 1 \text{ sec.} = \text{autocalibration}$
 $T > 1 \text{ sec.} = \text{Autozero}$

Necessary conditions for enable the function

- POS. 5.5 ENABLED
- POS. 5.7-5.8-5.9 batch functions assign to input 1-2-3 (optional) DISABLED
- POS. 6.1-6.2-6.3-6.4 batch functions assign to output 1-2-3-4 DISABLED

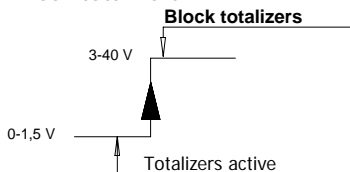
Reset totalizers



Necessary conditions for enable the function

- POS. 5.1 ÷ 5.2 ENABLED at least one

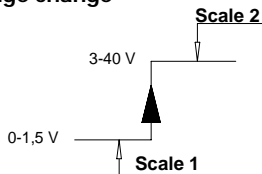
Block totalizers



Necessary conditions for enable the function

- POS. 5.4 ENABLED
- POS. 9.5 (auto-batch) DISABLED
- POS. 9.7 (cons. mode) DISABLED

Range change



Necessary conditions for enable the function

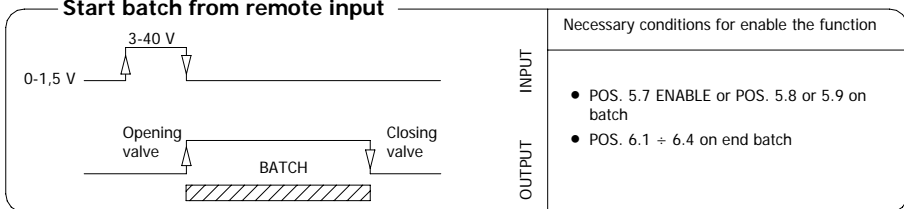
- POS. 5.6 ENABLE
- POS. 5.6 (batch on input 1) DISABLED
- POS. 5.8-5.9 batch functions assign to input 2-3 (optional) DISABLED



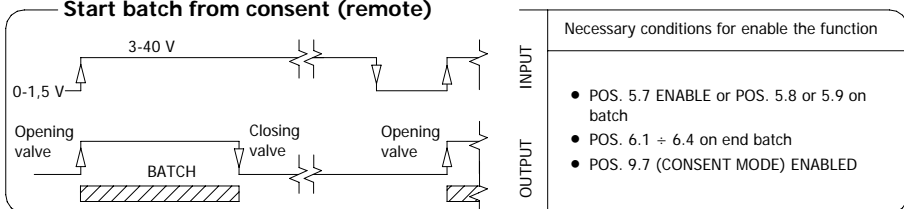
N.B.: THE FUNCTIONS POINT OUT ABOVE ARE ENABLED ONLY ON INPUT 1

OPERATION STAGE ON INPUT 1 OR 2 OR 3 (BATCH FUNCTION)

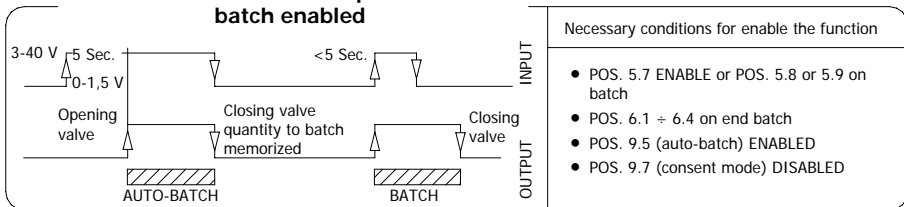
Start batch from remote input



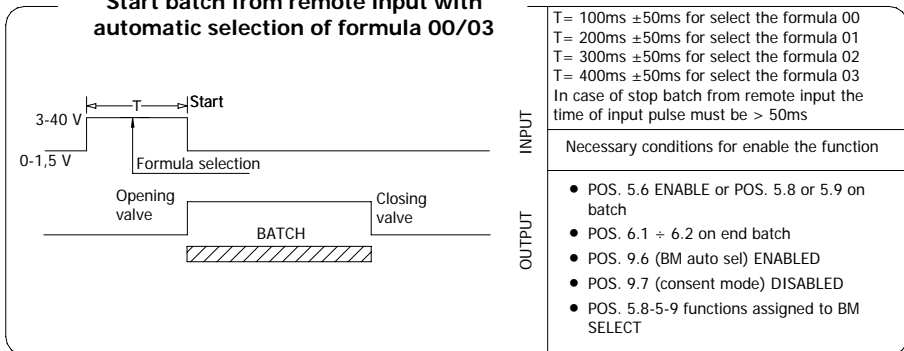
Start batch from consent (remote)



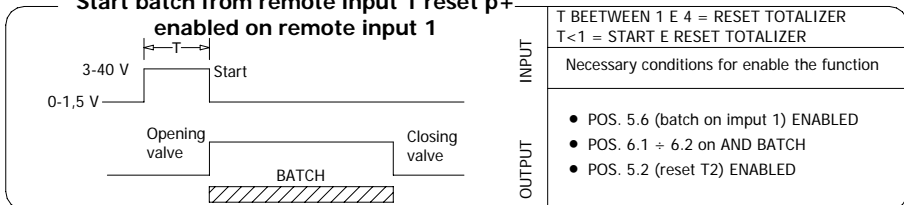
Start batch from remote input with auto-batch enabled



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



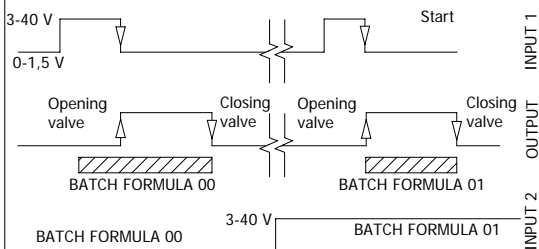
Start batch from remote input 1 reset p+ enabled on remote input 1



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 or 1 and 3 (BATCH FUNCTION)

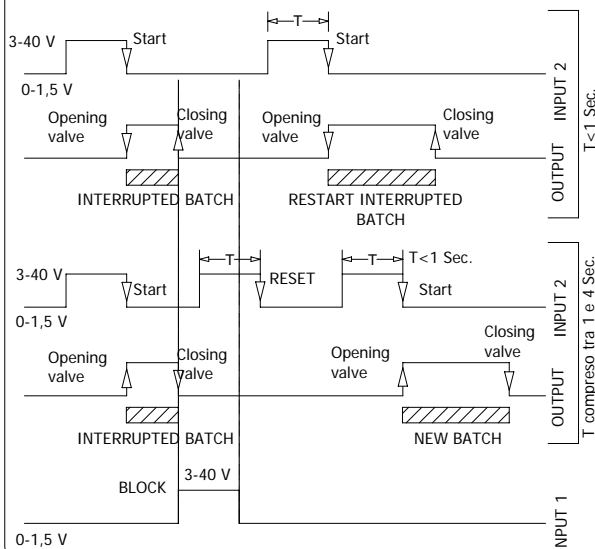
Start batch on remote input 1 stop from output
selection formula 00 o 01 from remote input 2



Necessary conditions for enable the function

- POS. 5.7 ENABLED
- POS. 6.1 or 6.3 on AND BATCH
- POS. 5.8 or/and 5.9 on BM SELECT

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



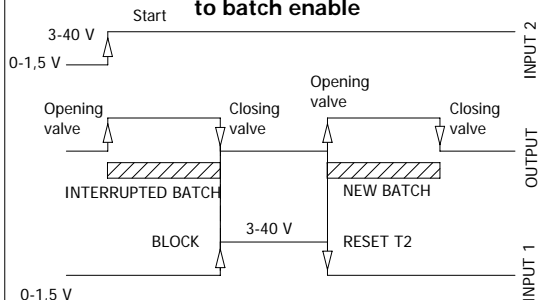
The block of totalizer always determine the interruption of the batch. Exciting again the input 2 or 3 is been able to get 2 results:

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

Necessary conditions for enable the function

- POS. 5.4 (Count lock) ENABLE
- POS. 6.1 OR 6.3 on END BATCH
- POS. 5.8 or 5.9 on BATCH
- POS. 5.2 (T2) ENABLE

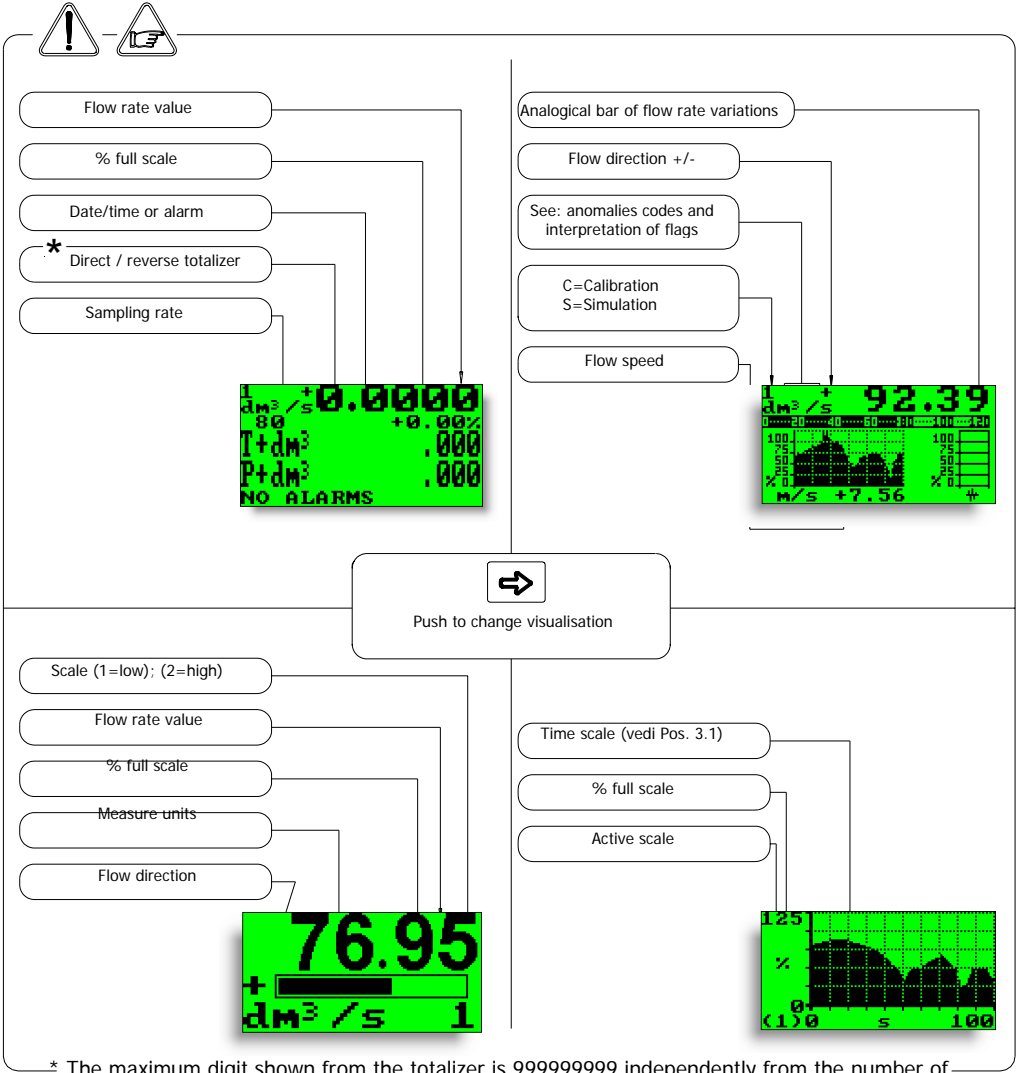
Block and reset totalize from remote input 1
start batch from remote input 2 consent mode
to batch enable



The block of the totalize always determines the stop of batch. With the function of reset T2 enable on descent front of input 1 comes reset the totalize of the batch in course. therefore the presence of the consent or a new pulse on the input 2 or 3 they will determine the start of a new batch

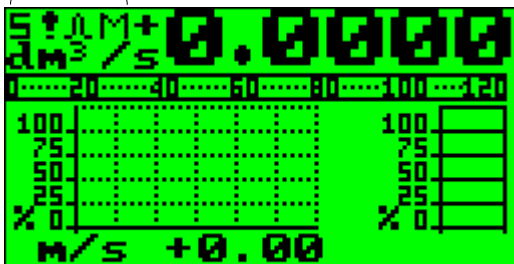
Necessary conditions for enable the function


- POS. 5.4 (Cout lock) ENABLE
- POS. 5.8 or 5.9 on BATCH
- POS. 9.7 (consent mode) ENABLE
- POS. 5.2 (T2) ENABLE



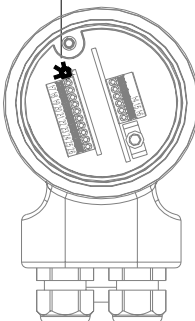
Flags interpretation and LED

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 16

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

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

It moves the cursor rightward on the input field
It goes to the following subject of the menu
It changes 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):**

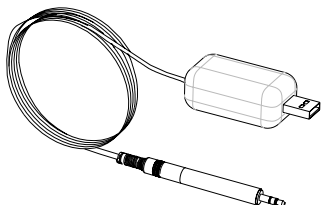
It enters /leaves the selected function
It enables the main menu for the instrument configuration
It cancels the selected function under progress

LONG PRESSING (> 1 SECOND):

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



BLIND VERSION



The converter it's without keyboard, the programming of functions is made up by the IF21 serial device

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 = 00000** you disable the request of code
- * **with L2 customised** (freely chosen by the user) you can proceed programming all the functions up to L2 security level, entering the code itself whenever you need enter the Main menu

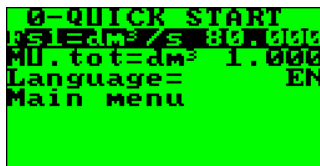
***ATTENTION:** take note very carefully of the customised code you have chosen, since there is no way for the user to retrieve it if it is forgotten

FACTORY PRE-SETTINGS ACCESS CODES

The converter is delivered with access code L2:

11111

With this code, it is possible to access to the "Quick start menu" pressing the key  from one of the visualization pages



The "Quick start menu" may be set without entering any access code (see example 1 on page 21).

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

ML4F1 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      00032
KA=      +01.0080
Sens.type= 000
Ins.position= 0
KL=+[01] +02.1500
KL=-[01] +02.1500
E.P.detect= OFF
Autozero cal.
E.P.calibr.
  
```

- 1.1 Insert ND of sensor (0-3000)
- 1.2 Calibration data of sensor 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 parameter
- 1.6 Enables the empty pipe detection feature
- 1.7* Enables the automatic zero calibration system
- 1.8* Enables the automatic calibration procedure of the empty pipe detection

MAIN MENU

1-Sensor

2-Scales

```

2-SCALES
Fs1=dm³/s 5.0000
Fs2=dm³/s 8.1920
MU Tot.=dm³ 1.000
Imp1=dm³ 1.00000
Tpul1=ms 0050.00
Imp2=dm³ 1.00000
Tpul2=ms 0050.00
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 output 1
- 2.5* Duration of the pulse generated on output 1
- 2.6* Pulse value on output 2
- 2.7* Duration of the pulse generated on output 2
- 2.8 Specific gravity set in kg/dm³ (enable only if FS1 or FS2 are weigh/time)

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
Autocal.= OFF
Autorange= 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. The measure it's stopped for 8-15 sec.
- 3.7* Automatic change of scale

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
M0 v.fault=% 000
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 1.6
- 4.7* Current output value in case of failure
- 4.8* Batch safety timer

```

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

```

5-INPUTS
T1 reset= OFF
T2 reset= ON
Puls.reset= OFF
Count lock= ON
Calibration= OFF
Range change=OFF
Batch= OFF
Inp. 2= OFF
Inp. 3= OFF
    
```

- 1* Total direct (positive) flow totalise reset enable
- 5.2* Partial direct (positive) flow totalise reset enable
- 5.3 Reset totalise of pulse from digital input (see page 13)
- 5.4 Totalise counting lock command (see page 13)
- 5.5* Autozero calibration external command
- 5.6 Range change external command (se pos. 3.7)
- 5.7 Batch start/stop external command (see batch functions)
- 5.8* Functions assigned to input 2 (automatically disabled if OUT3 it's enabled)
- 5.9* Functions assigned to input 3 (automatically disabled if OUT4 it's enabled)

Functions assigned
On input 1

```

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

```

6-OUTPUTS
Out1= #1 IMP+
Out2= SIGN
Out3= OFF
Out4= #2 IMP+
Duty cy.1=% 00
Duty cy.2=% 00
Out1 mA=4÷22
    
```

- 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 output 1
- 6.6* Duty cycle value for pulses output 2
- 6.7* Choice of the function and the range of current output n.1

```

6-Outputs
7-Communication
    
```

```

7-COMMUNICATION
IF2 prot.= DPP
RS232 prot.= DPP
Address= 000
RS485 bps= 19200
    
```

- 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)

```

8-DISPLAY
Language= EN
Totaliz.= T+/T-
D.rate=Hz 10
Quick start= OFF
    
```

- 8.1 Choice of the language: E= English, I=italian, F= French, S= Spanish
- 8.2 Partial totalizer visualization (with batch enable the function is always on)
- 8.3 Updating frequency on the display: 1-2-5-10 Hz
- 8.4 Quick start menu visualization

```

7-Communication
8-Display
9-Batch
10-Diagnostic
11-Internal data
    
```

Menu 9: Menu visualized only IF batch is active (see from pag. 31)

```

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

```

- 9.1* Number of batch cycles to be done to define the value of compensation.
- 9.2* % limit of compensation threshold
- 9.3* Compensation value
- 9.4* Prebatch value
- 9.5* Auto-batch
- 9.6* Automatic selection of batch formula
- 9.7* Static consent of batch

```

8-Display
9-Batch
10-Diagnostic
11-Internal data

```

```

10-DIAGNOSTIC
Calibration
Self test
Simulation= OFF
STAND-BY

```

- 10.1* Enable the calibration of the converter
- 10.2* Converter autotest
- 10.3* Flow rate simulation enabling
- 10.4 Stand-by of converter to reduce the consumption during service operation

```

8-Display
9-Batch
10-Diagnostic
11-Internal data

```

```

11-INTERNAL DATA
L2 keycode=00000
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
- 11.3 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

```

8-Display
9-Batch
10-Diagnostic
11-Internal data

```

ACCESS TO THE CONFIGURATION MENUES

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

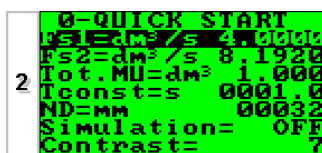
- ❑ Through the “**Quick start menu**” where it is possible to access directly to some of the principal functions
- ❑ Through the “**Main menu**” where it is possible to access to all function with access code ≤ 2

We show below some examples relating to the change of the value in the “Fs1” function

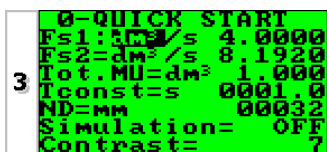
EXAMPLE: modifying the full scale value from $4\text{dm}^3/\text{s}$ to $5\text{dm}^3/\text{s}$. from “Quick start menu”



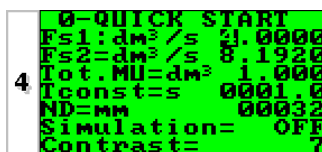
Enter in the “Quick start menu”



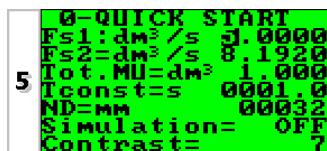
Access to the function “Fs1”



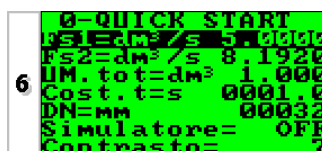
Push repeatedly



Change the value

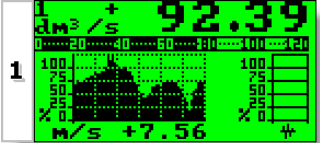



Confirm the new value



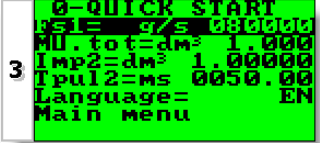
Main page

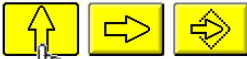
**EXAMPLE: modifying the full scale value from 4dm³/s to 5dm³/s.
from "Main Menu" (quick start menu enable)**


1 




Enter in the "Quick start menu"

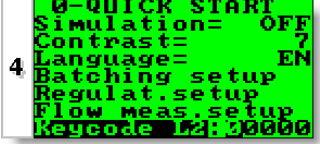
3 




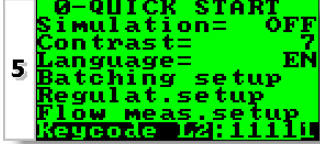
2 





Access to the "Main Menu"


4 





5 



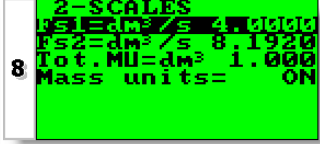
6 




7 

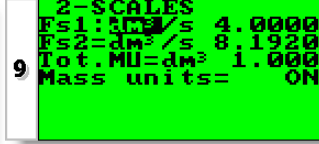



Access to the "Scale" menu

8 

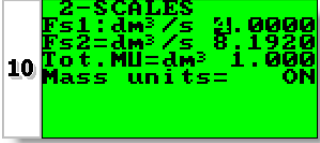


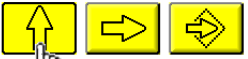
Access to the function "Fs1"

9 

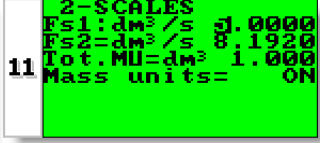



Push repeatedly

10 

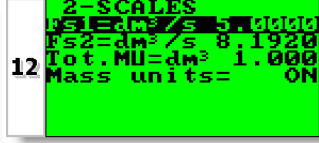



Change the value

11 





Confirm the new value

12 




Long push

13 



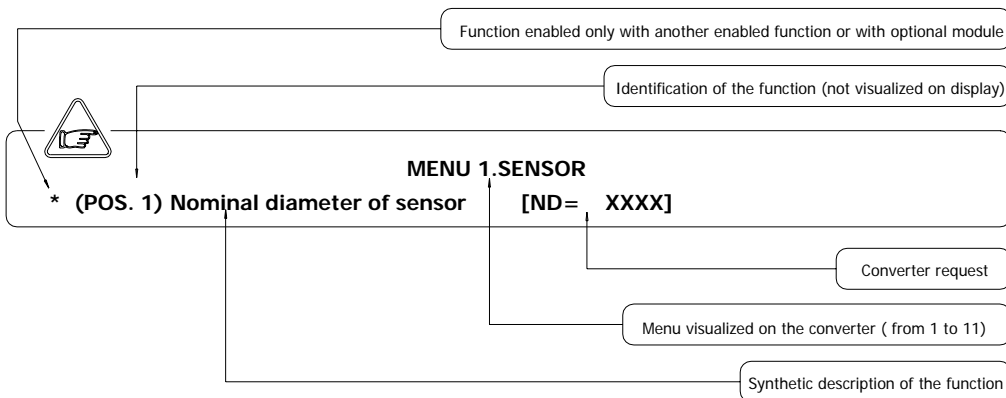
Long push

14 

Main page

FUNCTIONS DESCRIPTION

(description of the functions with access code < 3)



N.B.: follow are detailed description only some functions of the converter
(see note to page 20)

MENU 1.SENSOR

(POS. 1.7) "Autozero" calibration

[AUTOZERO CAL.]

Enables the automatic zero calibration system. 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. When the percentage flow rate value is stable press the key . Check the percentage flow rate value goes to zero, otherwise repeat the operation again. When the value is stable at zero, then press .

(POS. 1.8) "Empty pipe" calibration

[E.P. CALIBR.]

This function enables the automatic calibration procedure of the empty pipe detection function. Before performing this function, the sensor has to be completely filled with the liquid. 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 any other key annul the operation. By this function the system sets the value of a parameter, which could also be manually changed (see function "E.P.thr" menu 4-ALARMS).

MENU 2.SCALES

(POS. 2.1-2.2) Full scale n° 1-2

[FS1-2= dm³/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 dm³ and 1 kg. The converter accepts any kind of combination of units of measure satisfying both the following conditions:

1. Numeric field value ≤ 99999
2. $^{1/25} f_{S_{max}} \leq \text{numeric field value} \leq f_{S_{max}}$.

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:

cm ³	Cubic centimetre
ml	Millilitre
l	Liter
dm ³	Cubic decimeter
dal	Decalitre
hl	Hectolitre
m ³	Cubic metre

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

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. The units of measure of time may be chosen among the values: s=second, m=minute, h=hour, d= day.

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

Setting the unit of measure and number of decimals for visualized the totalizes or the volumes to batch. 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 totalizes position the cursor on numeric field and choose one of the possible combinations: 1000-01.00-001.0-00001.

***(POS.2.4-2.6) Pulse value output 1-2 and unit of measure of tot.** [IMP1-2= dm³X.XXXXX]

Setting of the pulse volume corresponding to output 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.2.5-2-7) Pulse duration on output 1-2 [TPLS1-2=msXXXX.XX]

Setting of the duration of the pulse generated on output 1-2. Its 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 go down to 0.04 milliseconds.

ATTENTION: since the instrument cannot detect which type of device it is connected to, it is up to the user to verify the set pulse duration is compatible with the external device processing such pulses. If, for example, an electro-mechanical pulse counter is connected, then two kind of problems may occur: if the pulse is too long than the coil may burn or, if it is too short, the counter may not be able to count and eventually even cause the damaging of the output itself.

MENU 3.MEASURE

(POS. 3.1) Time constant

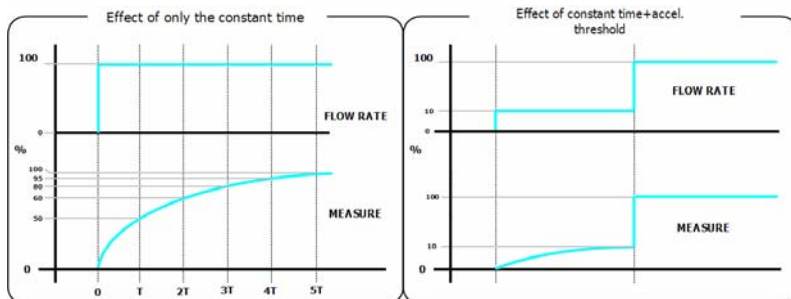
[TCONST=s XXXX.X]

This parameter affects the integrating filter making the instrument response quicker or slower, according 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 valid range of value it's 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

Acceleration threshold set. The acceleration threshold stands for the limit beyond which a flow rate variation determines an immediate response at the output, without being filtered by the time constant. This system allows the instrument to have an immediate response in case of big variations of the flow rate, filtering (and delaying) the response to small variations. The result of that is a very stable measure, ready to follow the process. The value is set as percentage of the full scale value from 0 to 125%. If such a value is set to zero any flow rate variation bigger than 0.5% of the full scale value will immediately 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 pick cut off threshold set. This parameter allows setting the maximum value of deviation of the actual measure sample by comparison with the average one. If the new value is higher than the set limit, than such a value is "cut" to the limit value. This function is used to make the meter less sensitive to big perturbations on the flow rate measure, as it may happen when there are solids in suspension in the liquid hitting against the electrodes determining a high electrical noise. The permitted values of this function **range** from 0 to 125 % and are referred to the full scale value. If this parameter is set to zero the peak detection function is disabled and any new measure ample will be accepted and processed as it is 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 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. 5.6)

MENU 4.ALARMS

(POS. 4.7) Current output value in case of failure

[mA VAL.FAULT =% XXX]

Setting of the value the 0/4...20 mA current output has to be in one of the following cases: empty pipe; coils interrupted; ADC error

The allowed range is from 0 to 120% of the 0...20 mA scale, 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:

1. current < 2 mA - 5%: line interrupted, power supply failure or faulty converter;
2. 2 mA -5% ≤ current ≤ 2 mA + 5%: hardware alarm;
3. 4 mA ≤ current ≤ 20 mA: normal working range;
4. 20 mA < current ≤ 22 mA: out of range, measure above 100% f.s.

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

(POS. 4.9) Batch safety timer

This function is useful when you need control one or both of the followings condition:





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

When this alarm is activates, they are aborted the batch operation and the power supply of the valve. The values of function are from 0 to 25.5 seconds and is active only if one or more of the batch functions are enable.

MENU 5.INPUTS

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

From visualisation pages, proceed in the following mode:

Push the key , Set the L2 CODE if required and then push the key  from visualization page, at the required "RESET TOTALIZ.?" Push the key  and then the key  to confirm or any other key to cancel this operation

(POS.5.5) "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 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. 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.

(POS.5.8-5.9)Functions assigned to input 2-3**[ING.2-3=XXXXXX]**

Choice of the function to associate the input 2 The functions are listed in the table below.

FUNCTION FOR INPUT 2-3

OFF: DISABLE

BATCH: START/STOP BATCH

BM SELECT: STATIC SELECTION OF FORMULA

VALV. OPEN: OPEN VALVE COMMAND

STAND-BY: STAND-BY COMMAND (see function 10.4)

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 table below:

FUNCTION FOR OUTPUT 1,2,3,4

OFF: DISABLED

PLS+: PULSE FOR POSITIVE FLOW RATE (ONLY OUTPUT 1-2)

PLS-: PULSE FOR NEGATIVE FLOW RATE (ONLY OUTPUT 1-2)

PLS: PULSE FOR POSITIVE AND NEGATIVE FLOW RATE (ONLY OUTPUT 1-2)

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)

P.EMPTY: EMPTY PIPE ALARM OUTPUT (ENERGISED = FULL PIPE)

OVERFLOW.: OUT OF RANGE ALARM OUTPUT (ENERGISED = FLOW RATE OK)

HARDW AL.: CUMULATIVE ALARM OUTPUT interrupt coils, empty pipe, measure error (ENERGISED = NO ALARMS)

EXT. COMM.: ONLY AVAILABLE WITH DATA LOGGER MODULE

BATCH AL: BATCH ALARM

BATCH SYN.: 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. 6.5-6.6)duty cycle value for pulses output**[OUT.1-2=XXXXXX]**

When pulse outputs are used, the duty cycle defines the OFF phase because the ON phase is already set with the function "PULSE DURATION" (see menu "SCALE"). If for example, the duty cycle is set to 50% the minimum OFF phase will be equal to the ON phase. The formula to calculate the minimum time of OFF phase and total cycle duration 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 duty cycle value is set to 0, the pulses emissions is synchronized with the flow rate ; set this value in case you need the pulses like "frequency out"

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

Choice of the function and the range of current output N.1. There are three fields to modify for this function:

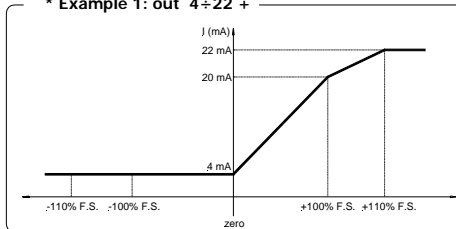
- Scale zero: **4** or **0** mA ; Full scale: **20** or **22** mA
- Field: **+** = positive, **-** = negative, **±** = both, **-0+** = central zero scale

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

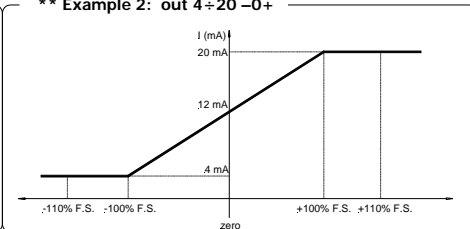
POSSIBLE FIELD	CURRENT VALUES IN mA ASSOCIATE TO THE % VALUE OF FULL SCALE				
	REVERSE FLOW VALUE		ZERO	DIRECT FLOW VALUE	
	≤ -110%	-100%	0%	+100%	≥ +110%
OutmA = 0 + 20 +	0	0	0	20	20
OutmA = 0 + 22 +	0	0	0	20	22
OutmA = 4 + 20 +	4	4	4	20	20
* OutmA = 4 + 22 +	4	4	4	20	22
OutmA = 0 + 20 -	20	20	0	0	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 VALL. FAULT" (pos. 4.7) and it is expressed as percentage of a fixed current range, where: 0% = 0 mA e 110% = 22 mA.

* Example 1: out 4+22 +



** Example 2: out 4+20 -0+



MENU 9 BATCH

Menu visualized only with batch active (output on batch and/or pos. 5.8 enable or 5.9 on batch)

(POS. 9.1) Number of batch samples [N.SAMPLES=XXX]

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

(POS. 9.2) % limit of compensation [HYST.=%XXX]

This value defines the percentage of maximum difference between the compensation value set (see pos. 9.3) 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. 9.3) Compensation value**[V.COM.=XX.XXX]**

This value, expressed in the same selected volume unit of measure, is the result of the difference between the batch value set and the quantity of product really supplied due to the system delays: closing valves, stop pumps, stop motors, etc. Attention: if you need to set manually the value of compensation, preset to ZERO the Number of batch samples (POS. 9.1)

(POS. 9.4) Prebatch value**[V.PRE.=XX.XXX]**

set the volume of liquid at which you want to enable the pre-batch. 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 fillings.

(POS. 9.5) Enable/disable auto-batch function**[AUTO BATCH=ON/OFF]**

Applying a voltage on the on/off input terminals for more than 5 second the valve controlled by the meter stands open while the voltage is applied on the input. When the product has reached the desired volume/level, removing the voltage from the input, the meter closes the valve and memorizes the supplied product volume in the current memory batch (see "BATCH FUNTIONS"); the value obtained with this procedure will be the volume supplied in every following batch. In order to modify this value, repeat the operations 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. 9.6) 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 11 "Input operation stage"). This function is active only if the function cons. mode (POS. 9.7) has not enabled. Besides, activating this function, the automatic compensation of the batch volume is also excluded (the value of the parameter "N.medie" (POS. 9.1) will be automatically set to zero). However the manual compensation is possible introducing the opportune value on the parameter "V.com" (POS. 9.3)



(POS. 9.7) Static consent of batch**[Cons. mode=ON/OFF]**

The function enable the start and the stop of the dosing using a static signal, instead of an impulsive, applied to the input (see pag. 11 "Digital input), this signal will have to stand applied all through the batch. This function automatically disables the functions "BM AUTO SEL" (POS. 9.6) and " AUTO BATCH" (POS. 9.5).

MENU 10. DIAGNOSTIC**(POS. 10.1) Meter "calibration"****[CALIBRATION]**





Enable the calibration of the meter. The activation of this function happens pressing the key  during the visualization of the function. Will be visualized the following question: " EXECUTE?" press for more of two second the key  to proceed . Press any other key to delete the operation

(POS. 10.2) "Autotest" function enable**[SELF TEST]**

Meter 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 will have visualized one of visualization page. 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  after set it
- finished: by pushing the key  from visualization pages and then by pushing the key .

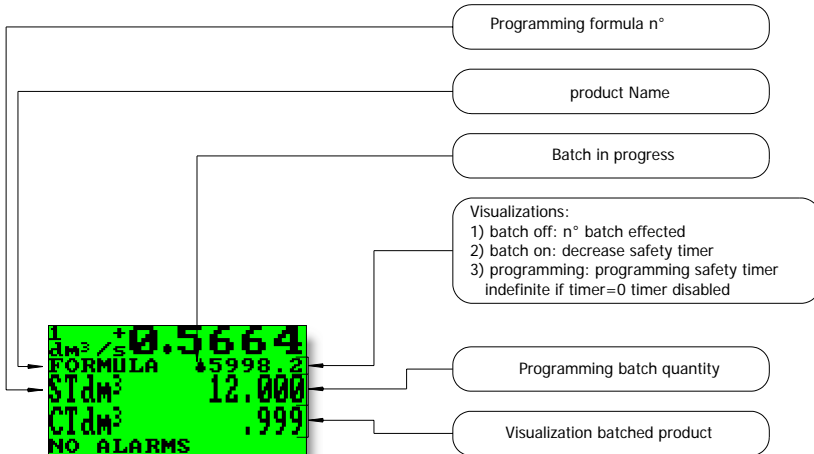
BATCH FUNCTION.

ENABLE BATCH

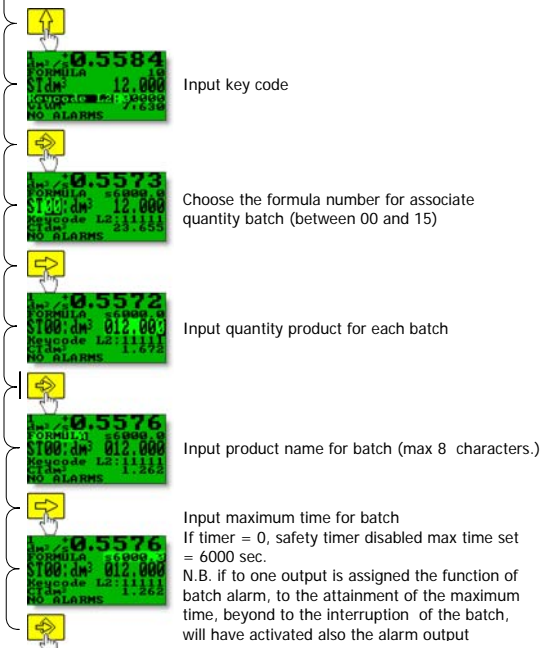
Enable one of the following functions to enable and program the batch on the converter:

- POS. 5.7-5.8-5.9: START/STOP batch from input
 - POS. 6.1-6.2-6.3-6.4: assign one of the functions to one of two output
- Some examples of operation of such functions are visualized from page 14

VISUALIZATION PAGE WITH BATCH FUNCTION ENABLE



From the visualization pages



PROGRAMMING 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 in the aside example.

START STOP BATCH



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

1. **from remote input:** assigning the functions of start/stop batch to the input 1 (POS. 5.7) or input 2-3 (POS. 5.8-5.9) 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 on the descent front (release of the key) and is not available with the function of batch consent (POS. 9.7)

STOP: the stop of batch can be due to three events:

1. **keyboard or remote input** (manual stop): short pressing of the key
2. **end of batch:** in this case the stop of batch will have activated from a output signal to the attainment of the batch quantity
3. **maximum time of batch:** if a maximum batch time has been set and this 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 video.**
- When the batch outputs are enable, pushing for more of 5 sec. the key , the outputs will remain energized till the key is released. On the display, in place of the CT and ST totalises the following messages will appear:

!! VALVE !!
!! OPENED !!

IMPORTANT NOTES

Cross of relation between functions assigned to the input and automatic settings of IN/OUT :

		POS 9.5	POS 9.6	POS 5.4	POS 9.1	POS 3.7-5.6	POS 5.5	POS 5.7	POS 5.8	POS 5.9
		AUTO BATCH	BM AUTO SEL	COUNT LOCK	N. SAMPLES	AUTO RANGE CHANGE OR FROM INPUT	CALIBRATION	INPUT 1 (BATCH)	INPUT 2	INPUT 3
POS 9.5	AUTO BATCH			* DISABLE						
POS 9.6	BM AUTO SEL				** DISABLE					
POS 9.7	CONS. MODE	DISABLE	DISABLE	* DISABLE						
POS 5.7	INPUT 1 ON BATCH					DISABLE	DISABLE			
POS 5.8	INPUT 2 ON BATCH					DISABLE	DISABLE	DISABLE		
POS 5.9	INPUT 3 ON BATCH					DISABLE	DISABLE	DISABLE	DISABLE	
POS 6.1-6.2-6.3-6.4	OUTPUT 1-2-3-4 ON BATCH FUNCTIONS			DISABLE		DISABLE	DISABLE			
POS 6.3-6.4	OUTPUT 3-4 ON ANY FUNCTION								DISABLE	DISABLE
POS 5.10	BM SELECT		DISABLE		** DISABLE					

* IF INPUT 1 USED
 ** SET VALUE TO ZERO

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 perform again the empty pipe fcalibration procedure
BATCH ALARM	Batch interrupted for the followings condition: <ul style="list-style-type: none"> <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 to the safety timer set 	Verify: presetting system condition
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, the grounding connections of the devices or 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 VAL.FAULT" value (menu alarm) to 0.
P.SUPPLY FAIL	Power supply different from that suitable in the label.	Verify that the power supply is that suitable on label

Anomalies codes

CODES	ANOMALIE DESCRIPTIONS	ACTION TO TAKE
0001	problem with watch-dog circuit	ADDRESS 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	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

DECLARATION OF CONFORMITY**Isoil Industria SpA**

it declares under the own responsibility that the product:

ISOMAG™

Model converters

ML4F-1

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

[Handwritten Signature]
 THE LEGAL REPRESENTATIVE

ISOIL
 I N D U S T R I A

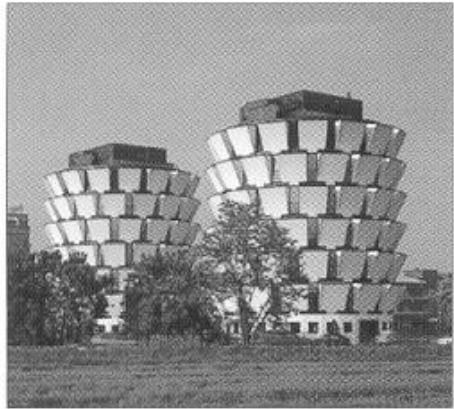
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The last three character of file name , identify the sw version , which the manual is refer . the sw version is visualized during switch on of converter

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