

**Release number: 110\_EN\_IS\_R9\_3\_91.0XXX.docx** – The characters of file name in bolt type indicate the software version which the manual refers to; it is visualized at the instrument start up, or by specific function on DIAGNOSTIC menu.



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#### INTRODUCTION

These operating instructions and description of device functions are provided as part of the scope of supply. They could be modified without prior notice. The improper use, possible tampering of the instrument or parts of it and substitutions of any components not original, renders the warranty automatically void.

The converter is to be used only to be coupled with a sensor to realize a measuring device, flow meter, that is to be used for measuring the flow of conductive liquids in closed pipes with conductivity greater than  $5\mu$ S/cm.

The converter could be coupled directly on the sensor (compact version) or coupled to the sensor by cable supplied with it (remote version).



CONVERTER

SENSOR

The reproduction of this manual and any supplied software is strictly forbidden.

#### SAFETY INFORMATIONS

Any use other than described in this manual affects the protection provided by the manufacturer and compromises the safety of people and the entire measuring system and is, therefore, not permitted.

The manufacturer is not liable for damaged caused by improper or non-designated use.

- 1) Transport the measuring device to the measuring point in the original packaging. Do not remove covers or caps until immediately before installation. In case of cartons packaging it is possible to place one above the other but no more than three cartons. In case of wooden packaging do not place one above the other.
- Disposal of this product or parts of it must be carried out according to the local public or private waste collection service regulations.
- 3) The converter must only be installed, connected and maintained by qualified and authorized specialists (e.g. electrical technicians) in full compliance with the instructions in these Operating Instructions, the applicable norms, legal regulations and certificates (depending on the application).
- 4) The specialists must have read and understood these Operating Instructions and must follow the instructions it contains. The Operating Instructions provide detailed

information about the converter. If you are unclear on anything in these Operating Instructions, you must call the ISOIL service department.

- 5) The converter should only be installed after have verified technical data provided in these operating instructions and on the data plate.
- 6) Specialists must take care during installation and use personal protective equipment as provided by any related security plan or risk assessment.
- 7) Never mount or wire the converter while it is connected to the power supply and avoid any liquid contact with the instrument's internal components. To connect remove the terminals from the terminal block.
- 8) Before connecting the power supply check the functionality of the safety equipment.
- 9) Repairs may only be performed if a genuine spare parts kit is available and this repair work is expressly permitted.
- 10) For the cleaning of the device use only a damp cloth, and for the maintenance/repairs contact the service center (for details see the last page).
- 11) To return the product back for service complete and return the meter with form found in the last pages of these operating instructions.

Before starting up the equipment please verify the following:

- Dever supply voltage must correspond to that specified on the data plate
- □ Electric connections must be completed as described
- Ground (earth) connections must be completed as specified

Verify periodically (every 3-4 months):

- □ The power supply cables integrity, wiring and other connected electrical parts
- The converter housing integrity
- □ The suitable tightness of the sealing elements
- □ The front panel integrity (display and keyboard)
- □ The mechanical fixing of the converter to the pipe or wall stand.

#### SAFETY CONVENTIONS

#### DANGER

Warning indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.



#### WARNING

Caution indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.

#### NOTES

Note indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

#### **TECHNICAL CHARACTERISTICS**



#### **ELECTRIC CHARACTERISTICS**

**Converter classification:** class I, IP65 for PA6 housing, IP67 for aluminum housing, installation category (overvoltage) II, rated pollution degree 2.

Power supply versions	Power supply voltage	Power supply frequency	Max power
HV	100-240V~	44-66Hz	
1.V	18-45V		6W
LV	18-45V~	44-66Hz	

- □ Voltage variations must not exceed  $\pm 10\%$  of the nominal one.
- □ All instrument versions can be equipped with all power supply versions.
- □ Input/output insulated up to 500V.
- □ The output 4-20mA (optional) is electrically connected to the ON/OFF outputs and the output power supply (24V----).

#### **ENVIRONMENTAL USE CONDITIONS**

- □ The converter can be installed internally or externally
- □ Altitude: from -200m to 2000m (from -656 to 6560 feet)
- □ Humidity range: 0-98%, 0-85% without condensation for PA6 housing

#### AMBIENT TEMPERATURE

	Min. *	Max
°C	-10	50
°F	14	122

If the converter is supplied in compact version to the sensor, consider the ambient temperatures more restrictive, otherwise refer to the respective manuals.

\* For discontinuous use, a thermostat heat source installation may be necessary.

#### Data plate

On the data plate there is some technical information:

- **MODEL:** Converter Model
- S/N: Serial Number of the converter
- **SUPPLY:** Main power supply
- **Hz:** Supply frequency (AC)
- **POWER:** Maximum power consumption
- **IP:** Protection grade
- **T:** Operating temperature
- COUPLING: Serial number of sensor coupled
- ITEM: free for user

ISOMAG The friendly magmeter MODEL Model S/N Serial n° SUPPLY Power supply Hz Freq POWER Power max ΤP Protect Temperature COUPLING Coupling Œ ITEM Item

#### **DIMENSIONS (PA6 HOUSING)**



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

- cover screws: 0.8Nm
- □ cable glands: 1.8Nm (in reference conditions)
- □ IF2 cap: 2Nm

## ELECTRICAL CONNECTIONS GROUNDING INSTRUCTIONS

ALWAYS ensure that the converter and the sensor are grounded (earthed) correctly. The grounding of the sensor and converter ensures that the equipment and liquid are equipotential.

#### **CONVERTER POWER SUPPLY**





- Before connecting the power supply, verify that the mains voltage is within the limits indicated on data plate.
- □ For the connections use only approved conductors, with fire-proof properties, whose section varies from 0.25mm<sup>2</sup> to 2.50mm<sup>2</sup>, based on distance/power; additionally fix the power supply wires with a additional fastening system located close to the terminal.
- □ The power supply line must be equipped with an external protection for overload current (fuse or automatic line breaker).
- Provide in close proximity the converter a circuit breaker easily accessible for the operator and clearly identified; whose symbols must conform to the electrical safety and local electrical requirements.
- □ Ensure that the component complies with the requirements of the standard for electrical safety distance.
- Check chemical compatibility of materials used in the connection security systems in order to minimize electrochemical corrosion. In the aluminum housing it should avoid direct contact between the ground connection cable and the aluminum housing. It is therefore recommended to connect the safety ground cable, by placing it between the washer and the metal bracket on the related terminal or use an eyelet terminal crimped on the ground protection cable.
- □ The sensor, hardwired inputs and outputs are connected to the converter through terminal blocks located inside the converter.
- □ To locate the terminal block loosen the 4 screws on the front cover. When the front cover is lifted, the terminal block is visible. The terminal block is the hardwire connection of the converter to external equipment, including the sensor.

The following pages give informations on the terminal block numbering, and the respective connecting of the sensor cables, and inputs/outputs.

#### **PA6 CONVERTER INTERNAL VIEW**



#### PA6 CONVERTER TO SENSOR ELECTRICAL CONNECTIONS





#### ALUMINUM CONVERTER TO SENSOR, ELECTRICAL CONNECTIONS



#### DIGITAL INPUT INPUT ON/OFF OPERATION



12

45ms

50Hz

#### **OUTPUT WIRINGS**





**NOTE**: shielded cables are recommended for inputs and outputs wiring.

#### DISPLAY FLAGS AND LED WARNING INTERPRETATION

At 'Power on' of the converter, the user will see the following display screen. In the top right hand corner there may be a range of symbols. The symbols can be interpreted from the table below. Interpretation of the flashing LED can be made from the LED interpretation table at the bottom of this page.



#### **CONVERTER ACCESS**



The keypad is accessible by loosening the 4 cover screws and opening the front cover of the converter. Three KEYS are set aside of the M3 power supply terminal block, allowing the user to change display visualizations and select functions. Ensure that the power supply cover is closed.

#### KEYPAD



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

Increases the numeric figure or the parameter selected by the cursor Accesses to the previous subject in the Quick start or Main menus Batch start/stop (when enabled)

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

Decreases the numeric figure or the parameter selected by the cursor Accesses to the next subject in the Quick start or Main menus

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

Moves the cursor rightwards on the input field Accesses to the following subject in the Quick start or Main menus Changes the display of the process data **LONG PRESSING (> 1 SECOND):** 

Moves the cursor leftwards on the input field Accesses to the previous subject in the Quick start or Main menus

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

Enters/leaves the selected function Enables the main menu for the converter configuration Cancels the selected function under progress

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

Leaves the current function, in the Quick start or Main menus. Enables the 'EXECUTE?' prompt in the Main menu functions, and total reset request (when enabled) from the required function Confirms the selected function



#### **BLIND CONFIGURATION**

For the converters without keyboard (blind configuration), the programming is made through ISOCON (cable and software needed). Being the housing closure dependent by the installer, the IP degree may be compromised, so follow the torques mentioned.



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## FLOW RATE VISUALIZATION



The ML 110 can show a 5 digit character display for flow rate units; this mean the maximum flow rate value that can be represented on the display is **99999** (no matter the positioning of the decimal point). The minimum is **0.0025**.

The representable measure unit depends from sensor flow rate and diameter; the permitted units are those, set the instrument full scale value, allow to be represented with a numerical field which the maximum value do not exceed **999999**.

Example for DN 300:

- Full scale value: 3m/s
- **PERMITTED** measure unit (example): I/s (216.00); m<sup>3</sup>/h (777.60); m<sup>3</sup>/s (0.2160)
- **NOT PERMITTED** measure unit (example): I/h (777600)..

#### ACCESS CODES

Functions in the converter main menu are enabled by the access codes. The information of this manual is related to all the functions available with the 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 = 000000** (only with this code) you can disable the L2 code request

□ \* 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, since there is no way for the user to retrieve or reset it if lost.

#### Factory preset access codes

The converter is delivered with the default L2 (level 2) access code:

#### 111111

#### **QUICK START MENU**

The user has immediate access to the Quick Start menu when the converter is powered up by pressing the  $\boxed{\textcircled{}}$  key. If access to the quick start menu does not occur, then it has been disabled through the function 8.4



#### ACCESS TO THE CONFIGURATION MENU

The converter configuration menu can be accessed in two different ways:

- 1) by **ISOCON** interface
- 2) by **keyboard** of converter

## ACCESS TO THE CONFIGURATION MENU BY ISOCON INTERFACE



Isocon is a Windows<sup>®</sup> software that allows to set all the converter functions and personalize the menu (IF2 is required), see suitable manual for details.



#### ACCESS TO THE CONFIGURATION MENU BY THE KEYBOARD

Functions can be accessed by the keyboard in two different ways:

□ The **Quick start menu** makes direct access possible to a range of principal functions for setting the scale reading and display characteristics of the sensor.



Quick start menu can be enabled by function 8.4 (menu display)

Factory pre-setting: QUICK START MENU=ON

□ Through the **Main menu** it is possible to access functions with the access code level 2. These control the sensor's monitoring, data processing, input/output as well further display options.



The following example shows how to change the Full scale by Quick Start menu; the second illustrates how to change the function by the Main menu.

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#### EXAMPLE: "Quick start menu" function modification. Full scale value 1 (Fs1) from 4dm<sup>3</sup>/s to 5dm<sup>3</sup>/s.



# EXAMPLE: "Main menu" function modification. Full scale value 1 (Fs1) from 4dm<sup>3</sup>/s to 5dm<sup>3</sup>/s. (Quick start menu enabled)



#### **FUNCTIONS MENU**

The main menu is selected from the Quick start menu by pressing the  $\textcircled{\baselinetwise}$  key) and entering the factory code (11111). Functions denoted in grey are displayed only with other active functions, or with optional modules. *(for functions details with the symbol "\*" refer to the next section).* Not all the functions displayed on the converter are shown below are reserved for serving purposes only and not configurable.

MAIN MENU 1-Sensor	
1-SENSOR ND=mm 00025 KA= +01.0000 Sens.type= 00 Ins.position= 0 Ki= 1.0000 Cable len.=m 00 S.rate=Hz 50 Vref= 255 Vref= 040 E.P.detect= 0FF E.cleanin9= 0FF E.p.thr.= 200 Autozero cal.	<ol> <li>Sensor Nominal Diameter (ND), (enter input value 0-3000 mm)</li> <li>Sensor calibration data (Enter value as specified on sensor label)</li> <li>Type of sensor: Enter the first two characters of the sensor serial number</li> <li>Position of insertion sensor: 0=1/8DN, 1=1/2DN, 2=7/8DN</li> <li>Factory parameters automatically calculated (ONLY for insertion sensors)</li> <li>Length of the cable connecting the sensor to the transmitter</li> <li>Sample rate</li> <li>(only for service purpose)</li> <li>(only for service purpose)</li> <li>Enables the empty pipe detection feature</li> <li>11*Electrodes cleaning</li> <li>12*Value of empty pipe sensibility detection</li> <li>1.13* Enables the automatic procedure of zero calibration</li> </ol>

MAIN MENU 2-Scales		
2-SCALES Fs1=dm <sup>3</sup> /s 05.000 Fs2=dm <sup>3</sup> /s 05.000 Tot.MU=dm <sup>3</sup> 1.000 P1s1=dm <sup>3</sup> 01.0000 P1s2=dm <sup>3</sup> 01.0000 Tp1s1=ms 0050.00 Tp1s2=ms 0050.00 Fr91=Hz 01000.00 Fr92=Hz 01000.00 Sg=kg/dm <sup>3</sup> 01.0000	<ul> <li>2.1* Full scale value set for range N.1</li> <li>2.2* Full scale value set for range N.2</li> <li>2.3* Unit of measure and number of decimal place</li> <li>2.4* Pulse value on channel 1</li> <li>2.5* Pulse value on channel 2</li> <li>2.6* Duration of the pulse generated on channel 1</li> <li>2.7* Duration of the pulse generated on channel 2</li> <li>2.8 Full scale frequency for channel 1 (0.1Hz-1000.0Hz)</li> <li>2.9 Full scale frequency for channel 2 (0.1Hz-1000.0Hz)</li> <li>2.10 Volume to mass specific gravity coefficient set in kg/dm<sup>3</sup></li> </ul>	

MAIN MENU 3-Measure	
3-MEASURE Damping= Cut-off=% Autocal.= Autorange=	OFF ØØ.Ø OFF OFF

3.1*	Measure	filter
------	---------	--------

- 3.2 Low flow zero threshold: 0-25% of full scale value
- 3.3 Enable automatic hourly internal calibration cycle. Measurement stopped for 8-15s.
- 3.4\* Automatic change of scale

MAIN MENU 4-Alarms	
4-ALARMS Max thr=% Min thr=% Hyst.=% mA v.fault=% Hz v.fault=%	000 000 03 010 125

- 4.1 Maximum flow rate value alarm setting
- 4.2 Minimum flow rate value alarm setting
- 4.3 Hysteresis threshold setting for the minimum and maximum flow rate alarms
- 4.4\* Current output value in case of failure
- 4.5\* Frequency output value in case of failure

#### ISOMAG . MENU <u><u>e</u>in</u> OFF Ξ e s e. 5.1\* Total direct (positive) flow totalizers reset enable OFF 5.2\* Partial direct (positive) flow totalizers reset enable eset= OFF 5.3\* Total reverse (negative) flow totalizers reset enable eset= OFF 5.4\* Partial reverse (negative) flow totalizers reset enable t = 0 F F 5.5 Totalise counting Iocase 0 F F 5.6\* Block measures command 0 F F 5.7\* Autozero calibration external command 0 N 5.8 Range change external command (see function 3.4) s ē 5.5 Totalise counting lock command (see input on/off operation section) ock = 1 m. lock= ratio e a s on= a bra a =



#### 6.1\* Output 1 functions

- 6.2\* Output 2 functions
- 6.3\* Choice of function the range of current output n.1



#### 7.1 Choice of the communication protocol for the IF2 device

- 7.2 Choice of the communication protocol for the RS485 port
- 7.3 Speed of the RS485 output (possible choice: 4800, 9600, 19200, 38400 bps)
- 7.4 RS485 parity
- 7.5 Address value of the converter (range 0 255)
- 7.6 Instrument answer delay



- 8.1 Choice of the language: EN= English, IT=Italian, FR= French, ES= Spanish, DE=German
- 8.2 Display updating frequency: 1-2-5-10 Hz
- 8.3 Display contrast
- 8.4 Quick start menu visualization
- 8.5 Enable the page of net totalizer
- 8.6 Visualizes the values of the partial totalizer in the unit of selected currency
- 8.7 Choice of the numbers of decimals for the visualization currency value: From 0 to 3
- 8.8\* Value of conversion/currency for direct totalizer
- 8.9\* Value of conversion/currency for reverse totalizer
- 8.10\* Total direct (positive) flow totalizer reset
- 8.11\* Partial direct (positive) flow totalizer reset
- 8.12\* Total reverse (negative) flow totalizer reset
- 8.13\* Partial reverse (negative) flow totalizer reset



MAIN MENU 10-Diagnostic 10-DIAGNOSTIC Calibration Self test Simulation= OFF Firmware rev.	10.1* Calibration of the converter         10.2* Autotest converter         10.3* Flow rate simulation enabling         10.4 Firmware revision/version	
MAIN MENU 11-Internal data 11-INTERNAL DATA L2 keycode=00000 Load fact.pres. Load user pres. Save user pres. Ign.cal.err= OFF KR= +01.0237 KS= +1.0000	<ul> <li>11.1 Level 2 access code enter (user choice and setting of access code if required)</li> <li>11.2 Load factory data pre-set</li> <li>11.3 Load user data saved</li> <li>11.4 Save user data</li> <li>11.5 Ignore the calibration error during the switch on test (enable/disable)</li> <li>11.6 KR coefficient (only for service purposes)</li> <li>11.7 KS coefficient (only for service purposes)</li> </ul>	

#### FUNCTIONS DESCRIPTION

(functions description with access code< 3)

$\wedge$				[Identification of the function (not visualized on display)
(POS. 1	.1) Nom	MENU 1 inal diameter of sensor	- SENSOR [ND=	xxxx]
				Converter request Menu visualized on the converter (from 1 to 11)
				Synthetic description of the function

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. 1.11) Electrodes cleaning

Selectable options: OFF, minimum, average and maximum. It is not recommended the use of this function (let OFF) when the liquid has a conductivity less than 100µS/cm.

#### (POS. 1.12) Empty pipe threshold

This value represents the threshold of measure block to zero in empty pipe condition; the span function is 20-250. Since the sensibility of empty pipe detection could be changed by the liquid conductivity, ground connections, type of lining, in case of needed it is possible to adjust manually the preset threshold. It is recommended to check periodically its proper functioning. Value increasing means sensibility decreasing.

#### (POS. 1.13) Autozero calibration

This function activates the zero calibration automatic system. To perform this operation, it is necessary for the sensor to be full of liquid, and the liquid be perfectly still. Even minimal 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  $\clubsuit$  key and automatically activates the zeroing procedure, after which it is necessary to check that the percentage value showed goes to zero, repeat the operation otherwise. When the value is stable at zero, then press the  $\clubsuit$  key.

#### (POS. 2.1-2) Full scale N.1-2

The full scale is used to indicate to the maximum meter's flow rate; a volume per time is required. The full scale should be chosen carefully as it's parameters are used for several other parameters. There are four fields to fill in order to set this parameter, from left to right: 1) volume measure unit, 2) unit type, 3) time measure unit and 4) numeric value. The selection is made by positioning the cursor on the field to modify. To change the measure unit type (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 measure unit stays at m/sec.

MENU 2 - SCALES

The following tables show the available measure units and the conversion factor by comparison with 1dm<sup>3</sup> and 1kg. The converter accepts any kind of measure units combination satisfying both the following conditions:

- $\square \quad \text{Numeric field value} \leq 99999$
- $\Box$  <sup>1</sup>/<sub>25</sub> fs<sub>max</sub>  $\leq$  numeric field value  $\leq$  fs<sub>max</sub>.

#### [Autozero cal.]

#### [Fs1-2=dm<sup>3</sup>/s X.XXXX]



## [E.P. thr.=XXX]

[El. cleaning=MIN]

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where fs<sub>max</sub> is the maximum full scale value corresponding to the sensor, equal to a 10m/s liquid speed. The measure units are shown as appear on the display. The British and American units are diversified by using capital and small characters.

cm <sup>3</sup>	Cubic centimeter	
ml	Milliliter	
L	Liter	
dm <sup>3</sup>	Cubic decimeter	
dal	Decalitre	
hl	Hectolitre	
m <sup>3</sup>	Cubic meter	

in³	Cubic inch
Gal	American gallon
GAL	British gallon
ft <sup>3</sup>	Cubic foot
Bbl	Standard barrel
BBL	Oil barrel
yd <sup>3</sup>	Cubic yard
kgl	KAmerican gallon
KGL	KBritish gallon

Oz	Ounce
Lb	Pound
Ton	Short tons

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g	Gram
kg	Kilogram
t	Ton

When a mass measure unit is set, the specific gravity function is automatically enabled by the system. Please, note that the mass measure is heavily affected by the temperature. With certain liquids this may cause significant measurement errors. The following time measure units can be selected:  $\mathbf{s} = \text{second}, \mathbf{m} = \text{minute}, \mathbf{h} = \text{hour}, \mathbf{d} = \text{day}.$ 

(POS. 2.3) Measure unit and decimal places number Setting the measure unit and decimals places number displayed for the volumes. To set the measure unit, position the cursor on the measure unit field. To set the unit type, position the cursor on the blank space between the measure unit and the numeric value; the decimal places number can be selected by placing the cursor on numeric field and choosing one of the possible combinations: 1000-01.00-001.0-00001.

(POS. 2.4-5) Pulse value channel 1-2 and total measure unit [Pls1-2=dm<sup>3</sup> X.XXXXX] Setting of a flow volume by which a corresponding pulse will be emitted on channel 1-2. To set the parameter, complete the three fields, from left to right: 1) measure unit, 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. This function is active only if the pulse emission on channel is enabled.

#### (POS. 2.6-7) Pulse duration channel 1-2

Setting of the pulse duration generated on channel 1-2. 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 can not detect which device type 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 electromechanical 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 to the output.

#### [Tpls1-2=ms XXXX.XX]

#### [Tot.MU=dm<sup>3</sup> X.XXX]

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#### (POS. 3.1) Damping

#### MENU 3 - MEASURE -

[Damping=OFF/SMARTX /(time)] This section of the manual is extremely important. The correct filter settings ensures a proper response of the instrument to the measured flow rate. The available dampening filter values range between no damping (damping=OFF) and maximum damping based of 1000 seconds (Damping=1000).

The three diagrams below demonstrate the instrument behavior with different dampening settings with flow rate changes in the range of 1-100%.



#### (POS. 3.4) Automatic scale change enable

Enables/disables the automatic scale change. The meter may have two different working ranges in order to suit variable process conditions. In order to get the best results out of this function it is important that range N.2 is greater than N.1. When the flow rate increases and reaches the 100% of the scale N.1, the meter automatically switches to scale N.2. When the flow rate subsequently decreases to an equivalent value on scale N.2 (equal to the 90% of full scale N.1), scale N.1 will assume the active scale. Allowed values for this parameter: ON/OFF.

Note: the autorange does not allow using the range change external command (pos. 5.8).

#### MENU 4 - ALARMS

#### (POS. 4.4) Current output value in failure case

Setting of the value of the 4-20mA current output in one or more of the following cases; empty pipe, ADC error, and coils interrupted.

The permitted range is from 0% to 120% of the 0-20mA scales, 120% corresponds to 24mA and does not depend on the selected range (0-20/4-20mA).

The NAMUR NE43 recommendations requires alarms signaling value for a current output lower than 3.6 mA (<18%) or greater than 21mA (>105%). It is preferable to set the value of this function at 10%, so that the current value in cases of a.m. would be 2mA, allowing the following diagnostics:

□ current < 2mA - 5%: line interrupted, power supply failure or faulty converter;

 $\hfill\square$  2mA -5%  $\leq$  current  $\leq$  2mA + 5%: hardware alarm;

 $\label{eq:main_state} \Box \quad 4mA \leq current \leq 20mA: normal working range;$ 

□ 20mA < current  $\leq$  22mA: out of range, measure above 100% full scale (f.s.).

#### (POS. 4.5) Frequency output value in failure case

To set the frequency value assigned to the on/off output in one or more of the following cases: Empty pipe; coils interrupted; ADC error

Allowable range 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:

 $\hfill 0\%$  Hz  $\leq$  frequency  $\leq$  100% f.s.: normal working range;

 $\hfill\square$  100% f.s. < frequency  $\leq$  110% f.s.: overflow, measure above the 100% of the f.s.;

 $\hfill 115\%~f.s. \le$  frequency  $\le 125\%~f.s.:$  hardware alarm condition.

#### MENU 5 - INPUTS

# (POS. 5.1-2-3-4) Enable reset partial/total totalizers[T+-/P+- reset= ON/OFF]When one of this function is enabled, the related totalizer may be reset through the on/off input.(POS. 5.6) "Block measures" command block measures enable[Meas. lock=ON/OFF]When this function is active (ON), applying a voltage on the on input terminals, the measurement is stopped, the meter will display zero flow.[Meas. lock=ON/OFF]

(POS. 5.7) Autozero calibration external command enable [Calibration=ON/OFF] This function enables/disables the automatic zero calibration system. When this function is active, applying a voltage on the meter's on/off input terminals performs an autozero calibration cycle. ATTENTION: if the voltage pulse is less 1 sec., the meter performs an Auto calibration cycle to compensate possible thermal drifts. If the voltage pulse is more 1 sec, the meter performs an Autozero measure calibration.

#### [Autorange=ON/OFF]

[mA v.fault =% XXX]

[Hz v.fault=% XXX]

Inclusion of controls         Inclusion of controls on the intervention of the interventinter of the intervention of the intervention of the inte			
	POS. 6.	5.1) Function choice corresponding to on/off output 1	[Out1=XXXXXX]
PUNCTIONS FOR OUTPUTS 1 AND 2  OFF: DISABLED  PUNCTIONS FOR OUTPUTS 1 AND 2  PUNCTIONS FOR OUTPUT (ENERGIZED = -)  PUNCTIONS FOR OUTPUT (ENERGIZED = SCALE 2)  PUNCTIONS FOR OUTPUT (ENERGIZED = SCALE 2) PUNCTION OUTPUT (ENERGIZED = SCALE 2) PUNCTION FOR FOURTH FUNCTION FOUTPUT (ENERGIZED = SCALE 2) PUNCTION FOUTPUT (ENERGIZED = SCAL	inction	choice corresponding to digital Output 1. The functions are listed in	the table below
Function choice corresponding to digital Output 2. The functions are listed in the table below.         FUNCTIONS FOR OUTPUTS 1 AND 2 <ul> <li>OFF: DISABLED</li> <li>#1 IMP+: PULSE ON CHANNEL 1 FOR POSITIVE FLOW RATE</li> <li>#1 IMP: PULSE ON CHANNEL 1 FOR NEGATIVE FLOW RATE</li> <li>#1 IMP: PULSE ON CHANNEL 1 FOR NEGATIVE FLOW RATE</li> <li>#2 IMP+: PULSE ON CHANNEL 2 FOR POSITIVE AND NEGATIVE FLOW RATE</li> <li>#2 IMP-: PULSE ON CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#1 FREQ+: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#1 FREQ+: FREQUENCY CHANNEL 1 FOR NEGATIVE FLOW RATE</li> <li>#1 FREQ+: FREQUENCY CHANNEL 1 FOR POSITIVE FLOW RATE</li> <li>#1 FREQ: FREQUENCY CHANNEL 1 FOR POSITIVE FLOW RATE</li> <li>#1 FREQ: FREQUENCY CHANNEL 1 FOR POSITIVE FLOW RATE</li> <li>#1 FREQ: FREQUENCY CHANNEL 1 FOR POSITIVE FLOW RATE</li> <li>#1 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE FLOW RATE</li> <li>#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE AND NEGATIVE FLOW RATE<th></th><th>2) Function choice corresponding to on (off output 2</th><th></th></li></ul>		2) Function choice corresponding to on (off output 2	
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<ul> <li>SIGN: FLOW DIRECTION OUTPUT (ENERGIZED = -)</li> <li>RANGE: RANGE INDICATION OUTPUT (ENERGIZED = SCALE 2)</li> </ul>		#2 FREQ: FREQUENCY CHANNEL 2 FOR POSITIVE AND NEGATIVE FLOW RATE	
□ RANGE: RANGE INDICATION OUTPUT (ENERGIZED = SCALE 2)		SIGN: FLOW DIRECTION OUTPUT (ENERGIZED = -)	
		RANGE: RANGE INDICATION OUTPUT (ENERGIZED = SCALE 2)	
MAX AL.: MAX FLOW RATE OUTPUT(ENERGIZED = AL. OFF)		MAX AL.: MAX FLOW RATE OUTPUT(ENERGIZED = AL. OFF)	
MIN AL.: MIN FLOW RATE OUTPUT (ENERGIZED = AL. OFF)		MIN AL.: MIN FLOW RATE OUTPUT (ENERGIZED = AL. OFF)	
D MAATMIN: MAAAND MIN FLOW KATE ALAKM OUTPUT (ENERGIZED = AL. OFF)		MAX+MIN: MAX AND MIN FLOW KATE ALARM OUTPUT (ENERGIZED = AL. OFF)	
$\Box$ P. EMPTT: EMPTT PIPE ALAKIM OUTPUT (ENERGIZED = FULL PIPE) $\Box$ OVERED UN OUT OF DANCE ALAMM OUTPUT (ENERGIZED = FULL PIPE)		P. EMPTT: EMPTT PIPE ALAKM OUTPUT (ENERGIZED = FULL PIPE) OVERELOW: OUT OF DANCE ALARM OUTPUT (ENERGIZED = FLOW DATE OK)	

HARDW AL.: CUMULATIVE ALARM OUT interrupt coils, empty pipe, measure error (ENERGIZED=NO ALARM)

#### (POS. 6.3) Current output option and range

#### [Out mA=X\_XX XXX]

This function sets the current output N.1. This function is optional and will not appear unless the option has been requested. There are three fields to modify for this function:

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

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

	CURRENT VALUES IN mA	ASSOCIATE TO THE %	FULL SCALE VALU	E		
	REVERS	REVERSE FLOW VALUE		DIR	DIRECT FLOW VALUE	
POSSIBLE FIELD	≤ <b>-110%</b>	-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 "HARDW AL." (interrupted coils, empty pipe, measure error) the current value is programmed by the function "mA v.fault" (pos. 4.4) and it is expressed as percentage of a fixed current range, where: 0% = 0mA and 110% = 22mA.



#### **MENU 8 - DISPLAY**

#### (POS. 8.8-9) Conversion factor for flow rate totalizers

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

- 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)

#### (POS. 8.10-11-12-13) Total/Partial totalizer reset

Activates the reset of total and partial flow totalizer. These functions are activated by pressing the key to during the visualization of the function itself. When "EXECUTE?" is required, press to proceed. Press any other key to delete the operation.

#### **MENU 10 - DIAGNOSTIC**

#### (POS. 10.1) Meter calibration

Enables the meter calibration function. The activation of this function happens by pressing the key  $\clubsuit$  during the function visualization, at the following question will be visualized: "EXECUTE?", so press the  $\clubsuit$  key to proceed. Press any other key to delete the operation.

#### (POS. 10.2) Self test function

Meter auto test function. This function stops the meter normal functions and performs a complete test cycle on the measuring input circuits and the excitation generator. To activate this function, selecting it, by pressing the key  $\textcircled{\below}$  at the prompt: "EXECUTE?" press the key  $\textcircled{\below}$  to start the test, any other key will delete the operation. The test result is shown on the display, the display will return to one of the visualization pages at the test end. The function is automatically performed when the device is switched on. For any errors see the next page for corrective actions.

#### (POS. 10.3) Flow rate simulation

Flow rate simulation enabling. This function allows for the possible generation of an internal signal that simulates the flow rate, allowing the outputs and all the connected instruments to be tested. After enabling it, a 'S' appears in the top right of the screen and the flow rate simulation can be:

- □ set: by pushing the key | ♦ from one of visualization pages, to set the required % flow rate (Fl.rate=%) and the same key to confirm the value;
- $\Box$  finished: by pushing the key |  $\Rightarrow$  from visualization pages and then by pushing the key |  $\Leftrightarrow$ .

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#### [Self test]

[Simulation = ON/OFF]

[Calibration]

#### [EUR/dm<sup>3</sup>+/- =X]

[T/P/-/+ reset]

#### ALARMS

#### Messages, causes and corrective actions

MESSAGE	CAUSE	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 can not generate the sufficient number of pulses         Set a bigger volume unit or, if the counting device allows it, reduce duration value		Set a bigger volume unit or, if the connected counting device allows it, reduce the pulse duration value	
EMPTY PIPE	<b>EMPTY PIPE</b> The measuring pipe is empty or the detection system has not been properly calibrated Check whether the pipe is empty, empty pipe calibration procedure		
INPUT NOISY	The measure is strongly effected by external noise or the connecting cable from converter to the sensor may be broken	Check the status cables connecting the converter to the sensor, the devices grounding connections 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 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 $\Omega$ ). To disable the alarm, set the "mA VAL.FAULT" value (menu alarm) to 0.	
P.SUPPLY FAIL	Power supply different from that indicated on the label	Verify that the power supply is as indicated on the label	

#### Anomalies, codes and remedies

CODE	ANOMALIE DESCRIPTION	ACTION TO TAKE
0001	problem with watch-dog circuit	
0002	Wrong work data configuration in eeprom	
0004	Wrong safety data configuration in eeprom	
0008	Defective eeprom	
0010	Defective keyboard (one or more keys are pushed during the test)	ADDRESS TO SERVICE
0020	Power supply voltage (+3.3) is out of range	
0040	Power supply voltage (+13) is too low (<10V)	
0080	Power supply voltage (+13) is too high (>14V)	
0200	Timeout calibration input (broken input circuit)	
0400	Input stage gaining is out of range	Check the status cables connecting the converter to the sensor, the grounding connections or the possible presence of strong and anomalous noise sources
0800	Interruption on the coils circuit	Check the status cables connecting the converter to the sensor
0C00	Cumulative alarm 0800 + 0400	See single code

#### SERVICE: return form for instrument repair or calibration

# ISOMAG RETURN MATERIAL FORM AND CLEANING UP CERTIFICATE RMA n°\_\_\_\_\_

#### Shipping Address:

ISOIL INDUSTRIA S.p.A. Via Piemonte, 1 35044 MONTAGNANA (Padova) Italy

Dear Friend,

to improve the SERVICE QUALITY and the SAFETY, please read, complete and attach this document (RMA) to the material you intend to send. Failure in RMA compilation will not allow us to be able to take charge of the materials.

Sender:	Ref. D.D.T. n.	of	//	/

- A detailed set of instructions for testing the sensor isolation and continuity is given in the service manual. If you are experiencing problems that are not related to the physical integrity of the sensor (water ingress, body, liner, connector or electrodes damage for example) we kindly ask you to test the sensors isolation and continuity. If the sensor passes these tests then we ask you to consider not returning this sensor without first consulting isomagservice@isoil.it
- In the case that the converter or sensor is returned and it is not repairable inside the warranty agreement terms or the inspection report is not accepted a cost for any converter testing and sensor dry testing and inspection will be mandatorily debited.
- Please send the sensor clean from medium. Additionally please inform about eventual medium wastes remaining in the sensor. For this purpose please use this form.
- A safety specification sheet of the medium must accompany this repair note in the following cases: toxic, otherwise dangerous or objectionable medium, or medium belonging to any dangerous material class.
- Please note that the instruments sender will be charged for any necessary cleaning costs. Additionally, we reserve the right to send the instruments back to the sender for cleaning!
- Please kindly state the observed failure and, eventual causes.

For the return photocopy these pages in A4 format

Sensor: MS	Serial n	umber:
Failure descript	ion:	
Converter: ML_	Seria	I number:
Failure descript	ion:	
We herewith con therefore free of cleaning medium.	firm that above men any liquid and/or soli Any eventually remain	tioned sensor has been cleaned and it is d wastes of the measuring medium and/or ning wastes are:
Measuring med	ium:	
harmful/ injurious Sensor cleaned	no with:	yes; in this case, safety specification sheet must be attached!
Further notes:		
Date	Company stamp	e-mail address (for questions)

Signature of person in charge

#### CONFORMITY DECLARATION

#### Isoil Industria spa

declares that the product line:



converter model:

#### ML 110

and sensor models:

# MS 501 – MS 600 – MS 1000 – MS 2410 – MS 2500 – MS 3770 – MS 3800 – MS 5000

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

- EN 61010-1:2001
- EN 61326-1:2006

and therefore comply to the following CE requirement directives:

- 2006/95/CE (Low voltage directive LVD)
- 2004/108/CE (Electromagnetic Compatibility Directive EMC)

25/03/2011



via f.lli Gracchi, 27 20092 Cinisello Balsamo (MI) Tel. +39-02-660271 Fax +39-02-6123202

#### ADDRESSES

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