

**Battery-powered signal converter for electromagnetic flow meters  
model FLC-406**



**Battery-powered signal converter FLC-406**

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Prior to starting any work, read the operating instructions!  
Keep for later use!

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## 1. Introduction

### 1.1 Conventions

In order to draw the attention of all personnel working with the equipment supplied by Euromisure, the points of particular importance described in this manual are highlighted with graphic signs that will make them easily identifiable.

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#### CAUTION / WARNING!

...indicates vital information and points to be observed. Please refer to the related documents.



#### NOTE

...indicates information and points of particular importance to be observed.

### 1.2 General information



#### WARNING!

It is very important that all personnel working with the equipment have read and understood the instructions and indications provided in this manual, and that they follow them prior to using the equipment itself. The manufacturer assumes no responsibility for the consequences resulting from improper use by the operators.

The operator shall bear responsibility for the suitability of the device for the specific purpose.

The warranty will be considered void in cases of improper installation and use of the devices (systems).

- The manufacturer will not be liable for any kind of damage resulting from the use of its products, including, but not limited to those deemed direct, indirect, incidental, punitive and consequential. The installation, connection, commissioning and maintenance must be performed by staff specifically qualified and authorized for that purpose.
- The personnel in charge of the installation must make sure that the measurement system is properly connected as per the wiring diagram indicated in this document.
- The manufacturer shall bear no responsibility for any damages or injuries resulting from any misunderstanding of this manual. In order to avoid possible accidents to persons or things caused by incorrect interpretation of the instructions, the user must not proceed with operations and/or interventions on the converter if there are uncertainties or doubts regarding the operation(s) to be performed. We recommend contacting Assistance Service for clarifications in this regard for more precise instructions.

For applications that require high working pressures or substances that may be hazardous to people, environment, equipment or anything else if a pipe breakage occurs, Euromisure recommends to take necessary precautions, such as adequate positioning and protection or installation of

a guard or safety valve, before installing the converter.

The device contains live electrical components, thus the installation, monitoring and maintenance must be carried out by qualified and experienced staff fully aware of all the necessary precautions. Before opening any inner part, disconnect the power supply. The flow meter consists of metal and plastic parts, all of which must be in compliance with local rules and requirements concerning waste disposal.

### 1.3 Manufacturer's statement

- Stresses and loads possibly caused by earthquakes, traffic, strong winds, fire damages, vibrations and natural disasters were not taken into account in the phase of designing.
- Do not install the device so that it acts as a focus for pipeline stresses. Take into account any external loads in the device configuration.
- Do not exceed the pressure and/or temperature ratings indicated on the product label or in this Operating Manual during operation.

### 1.4 Packing check

At the moment of purchase and/or upon the receipt of the product, the buyer is strongly advised to check the quality of the packaging, which must be intact without visible dents, and completely and correctly closed.

When opening the packaging, also check that the product complies with the information on the packing list in terms of completeness of components/accessories.

### 1.5 Preliminary notes

The main parts that make up the electromagnetic flow meter are:

- The sensor - installed in the pipes with the use of flanges or threaded connections.
- The converter - installed on the sensor (in the Compact version) or in its proximity (in the Remote version) connected by two cables.

See the following paragraphs for more detailed indications on correct use and installation.

### 1.6 Product identification

Each FLC-406 converter supplied by Euromisure has an adhesive product label, on which the following information are reported.

- **Model:** sensor and converter model;
- **CE conformity mark;**
- **S/N:** serial number that identifies the converter and the sensor;
- **Y:** year of construction;
- **Size:** nominal diameter, standard and nominal pressure flanges;
- **Q3:** nominal flow rate and ratio R (Qnom / Qmin);
- **Power Supply:** supply voltage and/or battery;
- **MAP:** instrument nominal pressure;

# 1. Introduction / 2. Product description

- **Press. loss class:** max pressure drop class in the sensor;
- **Env. class:** environmental class;
- **EMC class:** Electromagnetic Compatibility class;
- **T:** totalizer that cannot be reset;
- **P:** resettable partial totalizer.



## WARNING!

The product label must not be removed, damaged or impaired. It must also be kept clean from dirt and miscellaneous adhesions. The information reported represent the only safe and unambiguous way to recognize the type of converter in your possession.

<b>WIKAI</b>		Euromisure s.a.s di WIKAI Italia S.r.l. via Borghisani 4 - 26035 Pieve San Giacomo (CR) Made in Italy	
<b>FLC-2200/EL/FLC-406M</b>		<b>CE</b>	<b>M19 0122 T10713</b>
S/N	LAC1073 LMM1140	MAP	16 bar
Y	2019	Press. loss. class	Δp10
Size	DN65 EN1092-1 PN16	Env. Class	M1,0
Q3	63 m3/h R160	EMC class	E1
Power Supply	12-24Vdc Rep. Battery 02/2024	T: non resettable P: partial (resettable)	

Product label

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## 2. Product description

### 2.1 General description

FLC-406 is an electronic converter that, paired with an Euromisure electromagnetic sensor, is able to display measured flow rate on the LCD screen together with one of the 4 totalizers available; other information and some basic settings are directly accessible using the 4-button interface. Two independent positive and negative pulse outputs allow connection with any external meter (max 30 V AC or DC / 100 mA). The required power supply is between 12 and 24 V DC and a battery pack can be connected to attain uninterrupted service even in the event of power failure. A GSM module can also be installed to allow remote transmission of measurements.



## NOTE

The data transmitted remotely are not considered legally relevant and have the sole purpose of providing a remote viewing. The integrity and correctness of the data transmitted are not covered by MID certification.

### 2.2 Coupling

The maximum diameter of the sensor that can be paired with the FLC-406 is 600 mm. Backup battery life is affected by the size of the sensor. The flow meter can be ordered both in a compact and separate version, with a maximum length of 30 mt cable.

### 2.3 Measurement characteristics

- Flow speed range: from 0.015 m/s to 10 m/s.
- Liquid conductivity: > = 20 uS / cm.
- Sampling: 3.125 Hz nominal powered unit (depends on the diameter); battery mode (low power): from 1/5 Hz at 1/60 Hz (default 1/15 Hz).

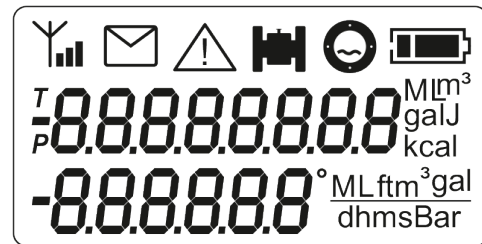
### 2.4 Data storage

All parameters, totalizers and the register are stored in a non-volatile memory.

### 2.5 Display

The LCD screen can display an 8 and a 6-digit number plus different information icons, allowing the user to view different information and set many parameters. The details of what can be shown are:

- Instant flow
- Positive totalizer (T+)
- Negative totalizer (T-)
- Partial Positive (P+)
- Partial negative (N-)
- Date and time
- Converter temperature
- Code and value of the corresponding parameter.



### 2.6 Battery

Lithium batteries are primary energy sources with high energy content, and are designed to satisfy the highest possible safety standards. However, they can represent a potential hazard if subject to improper electrical or mechanical use. In many cases, this is associated with a production of excessive heat, in which the increased internal pressure could damage the cells. The following precautions should therefore be observed when handling and using lithium batteries:

- Do not short circuit, charge, overcharge or connect to incorrect polarity.
- Do not expose the battery to temperatures higher than those specified.
- Do not crush, puncture or open cells or disassemble

## 2. Product description / 3. Converter

battery packs.

- Do not weld or braze on the battery body or battery packs.
- Do not expose the contents to water.

Lithium batteries are regulated under the United Nations Model Regulations on Transport of Dangerous Goods (United Nations model rules on the transport of dangerous goods), UN ST/SGAC document. 10-1, latest edition.

The UN document n. 3091 class 9 covers lithium batteries packed with equipment or within it. The UN document no. 3090 class 9 covers the transport of stand-alone batteries. The following basic precautions should therefore be followed when transporting lithium batteries:

- Transport only in special packages with special shipping

labels and documents.

- Use caution when handling, transporting and packing.
- The gross mass of the package must be limited according to the type of transport. In general, a gross mass of less than 5 kg is acceptable for all forms of transport.
- The batteries comply with the requirements stated in "UN Manual of tests and criteria, Part III, subsection 38.3" for transport by air and in accordance with ADR regulations for transport by truck / ship.

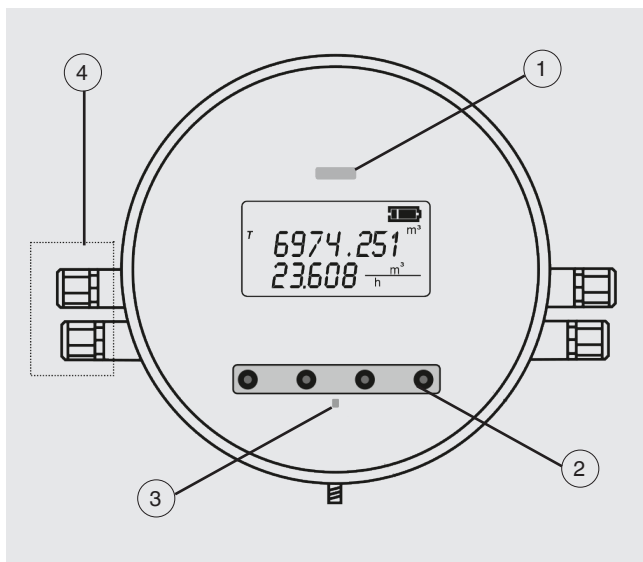


### WARNING!

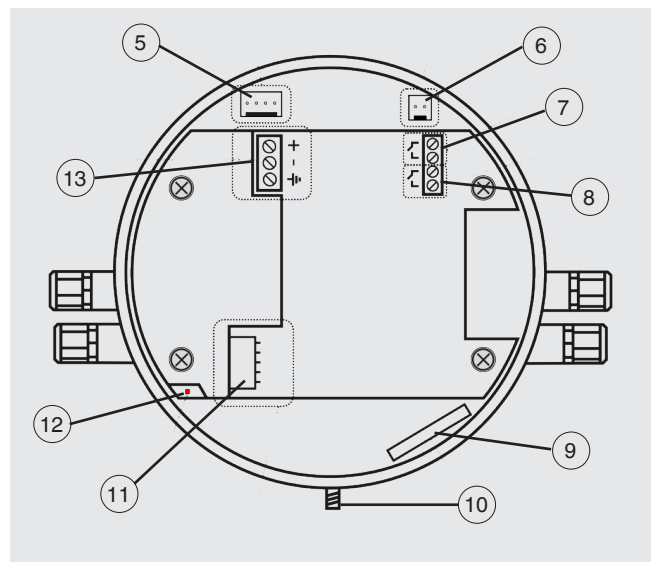
Remove the battery from the transmitter before sending the flow meter to Euromisure in case of maintenance work in warranty.

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## 3. Converter



- ① Infrared port
- ② Push buttons 1-4
- ③ Status LED
- ④ Cable glands for pulse and other I/O



- ⑤ Sensor signal
- ⑥ Sensor coils
- ⑦ Positive pulse output
- ⑧ Negative pulse output
- ⑨ SIM gate
- ⑩ Grounding connection
- ⑪ Battery pack connection
- ⑫ LED Power indicator
- ⑬ 12/24 V input

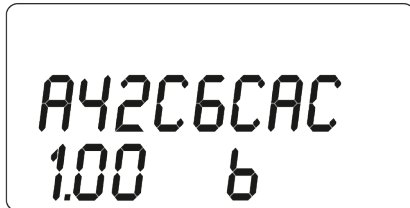
## 3. Converter

### 3.1 System start

Once the physical installation of the instrument is complete, the electronic converter can be switched on by connecting the 12/24 V power supply and/or by connecting the battery pack to the connector. Different information is displayed to the user and a basic configuration is required.

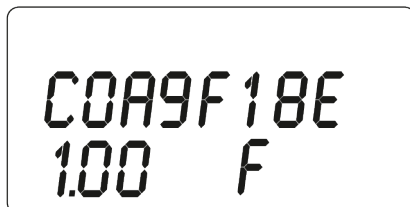
#### 3.1.1 Bootloader version and checksum

The bootloader is a separate software required to download new firmware to the converter.



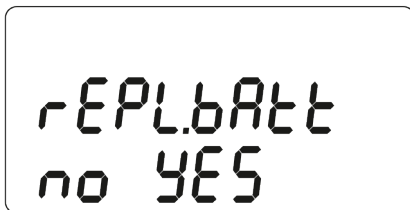
#### 3.1.2 Firmware version and checksum

It refers to the main firmware.



#### 3.1.3 Battery replacement notification

If the unit is powered by a new battery pack, it is necessary to select «YES» by pressing P4 to reset the battery energy meter. If the unit has just been disconnected and turned back on with the same battery pack, the correct selection is "NO" (P1).



#### 3.1.4 Date and time setting

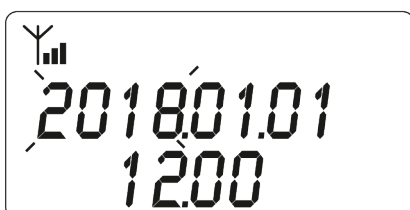
Check and, if necessary, adjust the date and time.

The flashing values can be set using P3 / P4.

P2 selects the next value in the sequence: **year**> **month**> **day**> **hour**> **minute**.

After selecting the last value, a further press of P2 confirms the value and go to the next screen.

P1 confirms the current settings and exits.



### 3.1.5 Main display screen

The converter is now ready.

The positive totalizer appears on the first line and the instantaneous flow rate on the second.

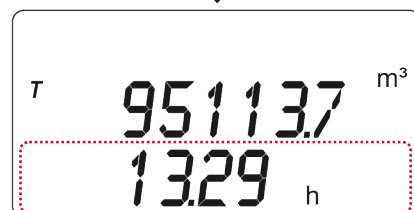
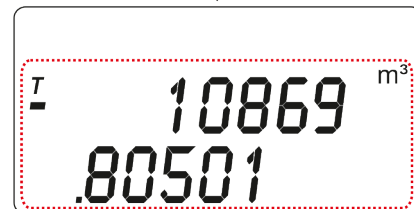
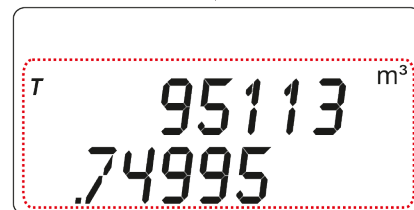
The current technical unit is shown on the right side.



### 3.2 User interface

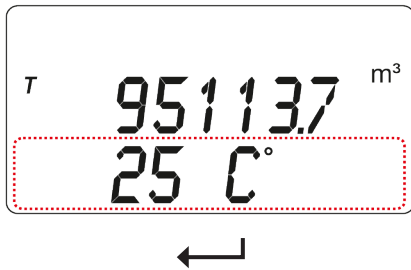
Starting from the main display screen (flow rate and total positive total), the 4 buttons can be used to perform various operations. In detail:

- Scroll through the display options of the first and second lines.
- P3: scrolls the instantaneous flow rate, T+ in maximum resolution, T- in maximum resolution, the time and the board temperature. See the following sequence.

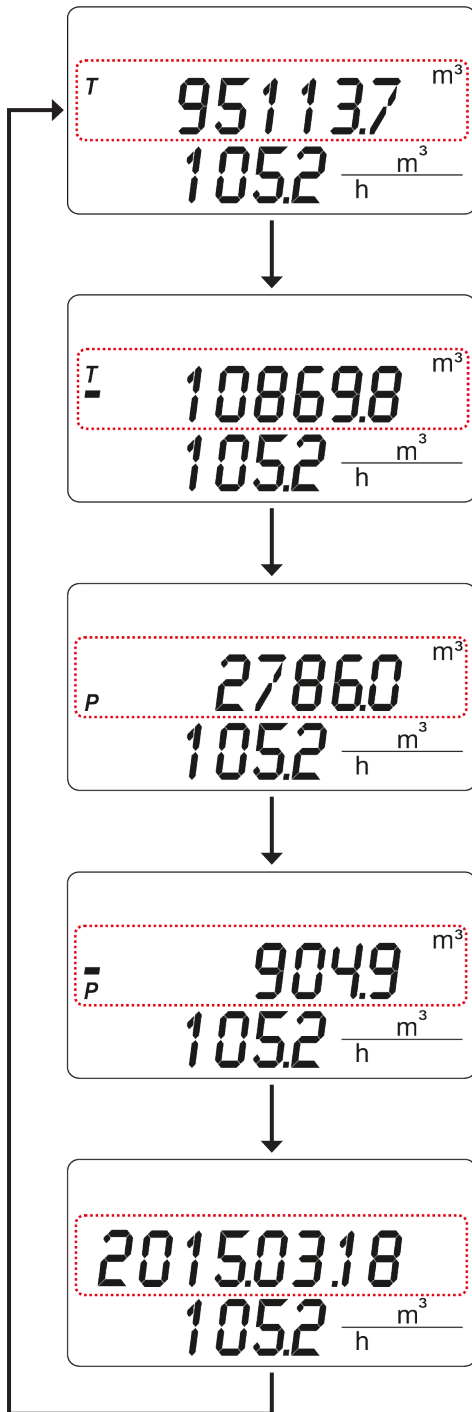


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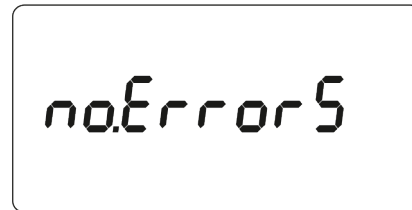
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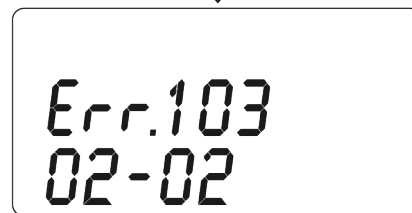
- **P4**: scrolls the totalizers (reduced resolution) and the date in this order: **T** +> **T**-> **P** +> **P**-> **date**.



- **P2**: scrolls the number of active alarms (first row) / total alarms (second row) In a normal working condition no alarms will be signaled.



If one (or more) alarm condition is registered, it will be scrolled.



- **P1**: entering the password to access the function selection (the preset value is 000000).



Use **P4/P3** to increase/decrease the current value of the digit. Go to the next digit with **P2**. When the last digit is entered, a further press of **P2** will unlock access to the function selection if the entered password is correct, otherwise the figure will return to the first one.



- Function selection code: each value corresponds to a menu or a parameter set function (see Par. 3.7 'Functions'). For selecting the function code use **P4/P3**; use **P2** to enter the selected code. Pressing **P1** returns to the main screen.



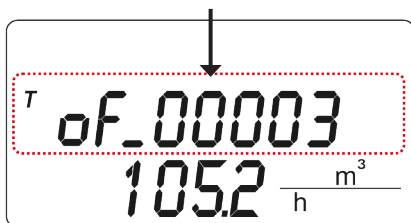
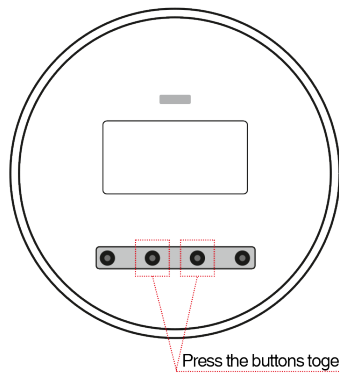
### 3. Converter



Within a specific function, the functionality of the buttons may be different; in this example, **P4/P3** increases and decreases the value of the parameter shown on the first line, **P2** confirms the value and returns when the function is selected. **P1** stops the operation and returns to the main screen.

#### 3.3 Display of the totalizer overflow counter

If the totalizers reach the display saturation value, they perform the rollover and continue to count; while one of the four totalizers is displayed, pressing **P2** and **P3** together will show its overflow counter.



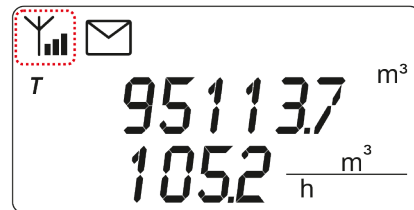
#### 3.4 Cellular communication



##### NOTE

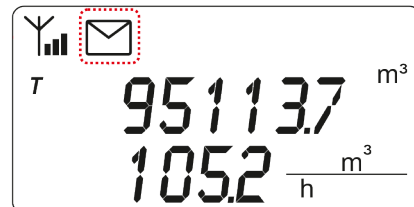
This function is available only if optional cellular hardware is installed.

Some basic information on cellular activity is shown directly on the FLC-406 display. See the following details:

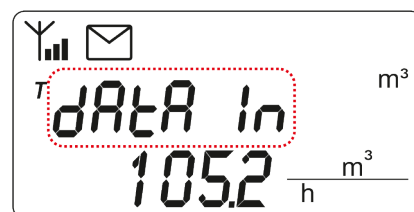


##### Cellular signal level

	None / Insufficielt
	Low
	Ok
	Optimal



- new parameter/command received. Press **P2** to confirm.



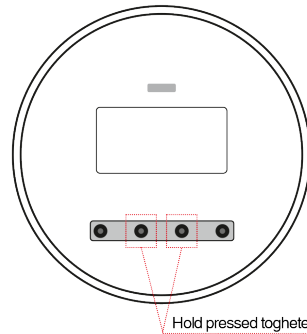
## 3. Converter

### 3.5 First activation

Depending on the instrument configuration, the converter can be shipped with the battery pack disconnected or already connected.

- If disconnected: the unit is automatically operational once connected (see page 11).
- If already connected: the unit is hibernated and must be activated.

To activate a hibernated unit, the **P2** and **P3** keys must be kept pressed for 5 seconds.



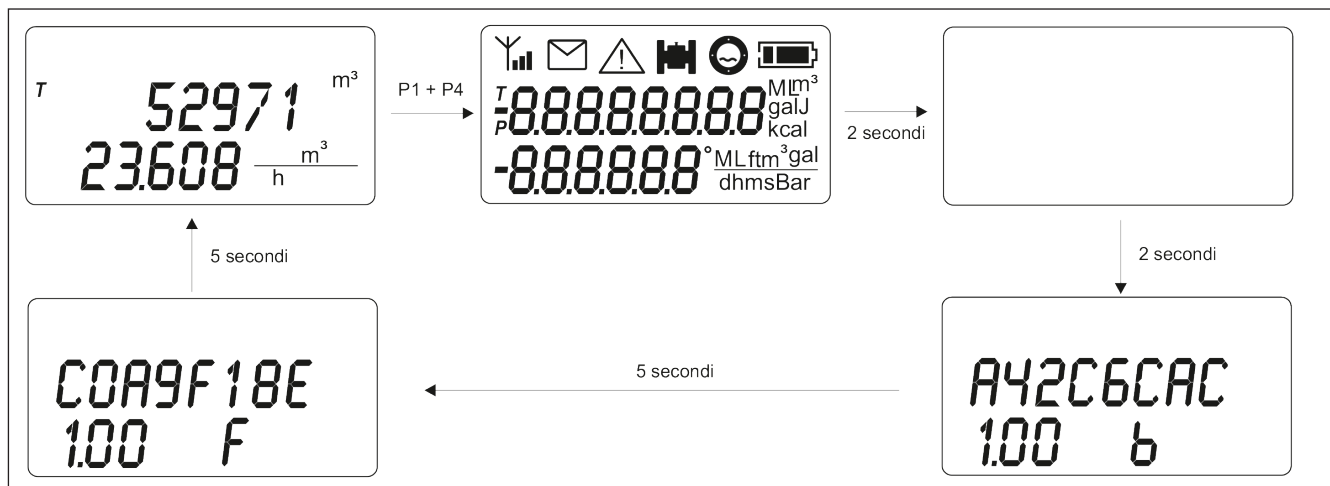
#### First activation

### 3.6 Display test

The integrity of the LCD display can be checked by pressing **P1** and **P4** together from the current measurement screen; all segments of the display will be activated and deleted in sequence. In addition the version and revision, bootloader

revision (VV.RR b) / firmware version and revision (VV.RR f) and the corresponding checksum are displayed.

The previous measurement screen will be restored at the end of this operation.



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### 3.7 Functions

A list of all the functions available by the user interface is shown below.

FUNC	DESCRIPTION	ACTION P1	ACTION P2	ACTION P3	ACTION P4	MIN VALUE	MAX VALUE	NOTES
01	Instant flowrate unit	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	1	6	1=m; 2=m <sup>3</sup> ; 3=L; 4=ML; 5=ft <sup>3</sup> ; 6=gal; 7=BBL. Setting 1 (meters) the time base is automatically set to 1 s.
02	Time base unit	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	1	4	1=s; 2=m; 3=h; 4=d
03	Counter unit	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	1	4	1=m <sup>3</sup> ; 2=L; 3=ML; 4=gal; 5=BBL; 6=Aft; 7=Ain
04	Zero calibration	Back to main screen	Cancel operation + return to function selection	No action	Start calibration	-	-	The display shows the time left to complete the operation. At the end of the operation, the main screen is displayed.
05	Ka factor	Back to main screen	Return to function selection	Back to main screen	Back to main screen	-10.0	10.0	
06	Sensor diameter	Back to main screen	Return to function selection	Back to main screen	Back to main screen	1	4000	The parameter is electrically blocked; read only.
07	Pulse volume	Back to main screen	Return to function selection	Back to main screen	Back to main screen	1	10000	The parameter is electrically blocked; read only.
08	Pulse technical unit	Back to main screen	Return to function selection	Back to main screen	Back to main screen	1	4	1=mL; 2=L; 3=m <sup>3</sup> ; 4=gal
09	Pulse duration	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	5	500	Expressed in ms (seconds/1000).
10	Measurement frequency	Back to main screen	Confirm + return to function selection.	Decrease value	Increase value	5	60	Interval between two measurements [s].
11	Date and time	Back to the previous field; if in years setting field, back to main screen.	Forward to the next field; if in minutes setting field, back to main screen.	Decrease value	Increase value	2015/01/01 00:00	2099/31/12 23:59	
12	Damping	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	2	100	Number of samples averaged.
13	Bypass	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	2	95	Bypass filter threshold, % of full scale.

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FUNC	DESCRIPTION	ACTION P1	ACTION P2	ACTION P3	ACTION P4	MIN VALUE	MAX VALUE	NOTES
14	Peak cut	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	1	90	Pulse suppression filter threshold,% of full scale.
15	Cut off	Back to main screen	Confirm + return to function selection	Back to main screen	Back to main screen	0.00	10.00	[m/s] - the parameter is electrically locked.
16	Flowrate display digits	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	0	4	Number of decimal digits of the instant flow shown on the display.
17	Totalizers display digits	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	0	4	Number of decimal places of the totalizers
18	Empty pipe threshold	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	200	5000	
19	Full scale	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	1.0	10.0	Full scale expressed in m/s (not connected to the diameter value).
20	Partial positive totalizer reset	Back to main screen	Return to function selection	No action	Partial positive tot. reset (must be hold pressed for 5 s).	No action	No action	The display shows the positive partial totalizer.
21	Partial negative totalizer reset	Back to main screen	Return to function selection	No action	Partial negative tot. reset (Must be hold pressed for 5 s)	No action	No action	The display shows the negative partial totalizer.
22	Firmware version	Back to main screen	Return to function selection	No action	No action	-	-	Show the current version. Firmware revision.
23	Firmware checksum	Back to main screen	Return to function selection	No action	No action	-	-	Shows the installed firmware CRC32.
24	Empty pipe detection mode	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	0	3	0: Disabled; 1: Enabled on the fourth electrode; 2: Enabled on the measuring electrodes; 3: Enabled on both
25	Password setup	Back to main screen	Forward to the next digit, confirm and return	Decrease value	Increase value	000000	999999	
26	Bootloader version	Back to main screen	Return to function selection	No action	No action	-	-	Shows the current version. Revision of the bootloader.
27	Bootloader checksum	Back to main screen	Return to function selection	No action	No action	-	-	Show the current bootloader CRC32
28	Line frequency	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	0	1	Set the frequency of the power supply ■ 0: 50 Hz ■ 1: 60 Hz
29	Load user parameters	Back to main screen	Return to function selection	Decrease value	(Long press) load user parameters	-	-	Replaces the parameters of the instrument with those saved as user copy.
30	Save user parameters	Back to main screen	Return to function selection	Decrease value	(Long press) save user parameters	-	-	Save the instrument parameters as a user copy.

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FUNC	DESCRIPTION	ACTION P1	ACTION P2	ACTION P3	ACTION P4	MIN VALUE	MAX VALUE	NOTES
31	Load factory parameters	Back to main screen	Return to function selection	Decrease value	(Long press) load factory parameters	-	-	It replaces the parameters of the instrument with the factory ones.
32	Damping in low power mode	Back to main screen	Confirm + return to function selection	Decrease value	Increase value	1	100	Number of samples to be averaged over.
33	Auto power off	Back to main screen	Return to function selection	Decrease value	Increase value	0	7	Shutdown time <ul style="list-style-type: none"> <li>■ 0=20 s;</li> <li>■ 1=1 min;</li> <li>■ 2=3.</li> </ul>
34	Sensor offset	Back to main screen	Return to function selection	No action	No action	-99999999	99999999	It shows the offset of the paired sensor.
35	Log of firmware download attempts	Back to main screen	Return to function selection	Show previous record	Show next record	Oldest registry (0)	Last registry available	It shows log of firmware download attempts.
36	Service code	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	Function not accessible; an attempt to access will show "denied" on the screen.
37	Negative pulse output configuration	Back to main screen	Return to function selection	Decrease value	Increase value	0	3	0: Negative flow; 1: Positive Flow; 2: Net Positive flow; 3: Error report.
38	Selection of the measurement to map on 4-20 mA output	Back to main screen	Return to function selection	Decrease value	Increase value	0	4	0: Flow; 1: Full scale percent; 2: Pressure; 3: Temperature T1 4: Temperature T2
39	Measurement value to be mapped on 4 mA output	Back to main screen	Return to function selection	Decrease value	Increase value	0	1000	Measurement value to be mapped on 4mA output (enabled only with 4-20 mA card).
40	Measurement value to be mapped on 20mA output	Back to main screen	Return to function selection	Decrease value	Increase value	0	1000	Measurement value to be mapped on 20 mA output (enabled only with 4-20 mA card)
41	Flow send	Back to main screen	Return to function selection	Decrease value	Increase value	0	1	0: signals error in case of reverse flow
42	Flow simulation	Back to main screen	Return to function selection	Decrease value	Increase value	0	1	0: flow simulation disabled 1: flow simulation enabled (enabled only with 4-20 mA card)..
43	Flow simulation value	Back to main screen	Return to function selection	Decrease value	Increase value	0	1000	Value of the flow to be simulated (enabled only with 4-20 mA card).
44	Bluetooth access interval	Back to main screen	Return to function selection	Decrease value	Increase value	0	9	0: Always off; 1: On every 30 s; 2: On every 60 s; 3: On every 2 min; 4: On every 5 min; 5: On every 10 min; 6: On every 15 min; 7: On every 30 min; 8: On every 60 min; 9: Always on  (Enabled only with Bluetooth-Modbus card).

### 3. Converter

EN

FUNC	DESCRIPTION	ACTION P1	ACTION P2	ACTION P3	ACTION P4	MIN VALUE	MAX VALUE	NOTES
45	Bluetooth access duration	Back to main screen	Return to function selection	Decrease value	Increase value	3	30	Duration in seconds of the Bluetooth access  (enabled only with Bluetooth-Modbus card installed).
46	MODBUS access interval	Back to main screen	Return to function selection	Decrease value	Increase value	0	12	0: Always off; 1: On every 5 s; 2: On every 10 s; 3: On every 15 s; 4: On every 30 s; 5: On every 1 min; 6: On every 2 min; 7: On every 5 min; 8: On every 10 min; 9: On every 15 min; 10: On every 30 min; 11: On every 60 min; 12: Always on  (enabled only with Bluetooth-Modbus card installed).
47	MODBUS access duration	Back to main screen	Return to function selection	Decrease value	Increase value	1	30	Duration in seconds of the Modbus access  (enabled only with Bluetooth-Modbus card installed).
48	MODBUS baud rate	Back to main screen	Return to function selection	Decrease value	Increase value	0	6	Baud rate Modbus 0: 2400; 1: 4800; 2: 9600; 3: 19200; 4: 38400; 5: 57600; 6: 115200 (default)  (enabled only with Bluetooth-Modbus card installed).
49	Number of MODBUS bits	Back to main screen	Return to function selection	Decrease value	Increase value	0	1	Number of modbus bits 0: 8 data bits 1: 7 data bits
50	MODBUS parity	Back to main screen	Return to function selection	Decrease value	Increase value	0	2	MODBUS parity 0: None 1: Odd
51	MODBUS stop bit	Back to main screen	Return to function selection	Decrease value	Increase value	0	1	MODBUS stopbit 0: 1 bit stop 1: 2 bit stop  (enabled only with Bluetooth-Modbus card installed).
52	MODBUS address	Back to main screen	Return to function selection	Decrease value	Increase value	0	255	MODBUS address  (enabled only with Bluetooth-Modbus card installed).
53	MODBUS byte-order	Back to main screen	Return to function selection	Decrease value	Increase value	1	5	MODBUS byte order  0: little endian 1: big endian 2: little endian byte swap.

- = editable
- = read only

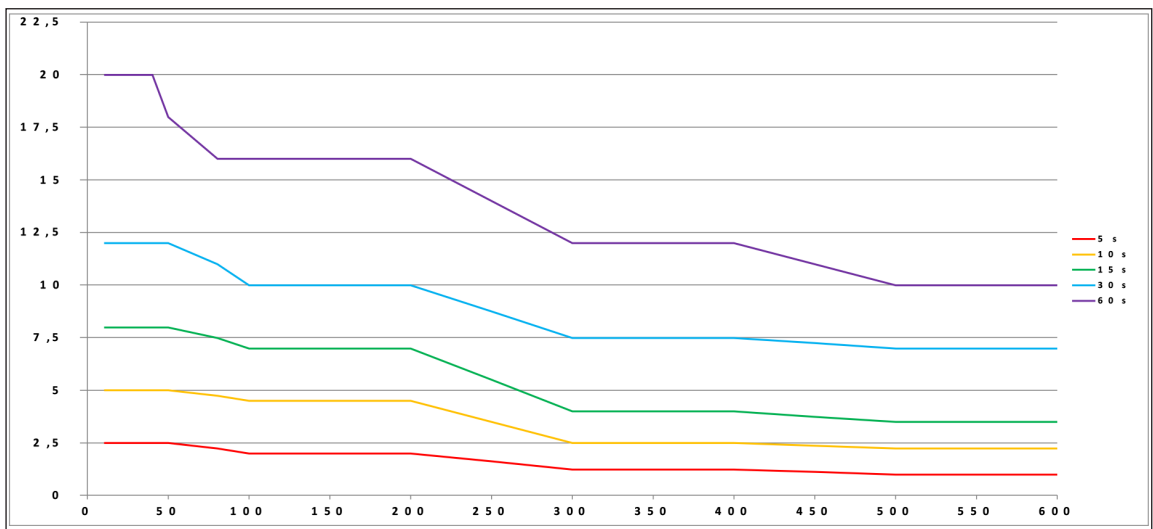
# 4. Battery life

## 4. Battery life

The converter is supported by an optional lithium battery pack and can operate for over 10 years in battery mode (depending on the configuration and working conditions). The residual life comes estimated by calculating the use of energy for the duration of the tool, so when the battery is replaced it is necessary to reset the battery usage counter. When switched on, the unit automatically takes the user to a screen selection (see SYSTEM START). Frequent unit waking up or entering very long shutdown times (feature 33 in the previous table) can shorten the expected battery life.

Battery levels	
	Battery charged
	25% or less
	10% or less

EN



Expected battery life (years) according to sensor diameter and sampling rate

## 5. Auto diagnostics

### 5. Auto diagnostics

During the measurement process, the FLC-406 detects automatically if error condition occurs and possibly stops the operation by reporting an alarm indication on the display. The following table describes the various conditions of alarm and converter behavior.



EN

Detected anomaly	Possible cause	Converter behavior	Icon displayed and corresponding error code
Excitation failure.	<ul style="list-style-type: none"> <li>■ Damaged sensor cables;</li> <li>■ Sensor disconnected;</li> <li>■ Damaged sensor coils.</li> </ul>	The measurement is forced to 0 and the error condition is displayed and recorded.	 101
Empty pipe detected on the fourth electrode.	<ul style="list-style-type: none"> <li>■ The sensor is not completely full of liquid;</li> <li>■ An air intake causes turbulence;</li> <li>■ Sensor disconnected;</li> <li>■ Damaged sensor cables;</li> <li>■ Low liquid conductivity.</li> </ul>	<p>The measurement is forced to 0 and the error condition is displayed and recorded.</p> <p>To save battery, the excitation of the coils is stopped until the error condition is overcome.</p>	 102
Empty pipe detected / invalid measurement on the measuring electrodes.	<ul style="list-style-type: none"> <li>■ The sensor is at least half empty;</li> <li>■ Air drawn in due to turbulence;</li> <li>■ Sensor disconnected;</li> <li>■ Damaged sensor cables;</li> <li>■ Low liquid conductivity;</li> <li>■ An electrical leak on the process influences the measurement;</li> <li>■ A high source of electromagnetic interference influences the measurement.</li> </ul>	<p>The measurement is forced to 0 and the error condition is displayed and recorded.</p> <p>To save battery, the excitation of the coils is stopped until the error condition is overcome.</p>	 103
The temperature exceeds the converter nominal operating range.	<ul style="list-style-type: none"> <li>■ The surrounding temperature is above the working range;</li> <li>■ The converter is installed with direct sunlight exposure.</li> </ul>	The error condition is displayed.	 201
Wet electronic board.	The cap or a cable gland has not been closed properly causing water or moisture condensation in the converter housing	The error condition is displayed.	 202
Supply voltage out of limit.	<ul style="list-style-type: none"> <li>■ The battery is damaged or discharged;</li> <li>■ An incorrect power source is connected to the converter.</li> </ul>	The error condition is displayed.	 301
Pulse overlap	Pulse settings are not compatible with the measured process.	The error condition is displayed.	 401
Communication error with 4-20 mA board	<ul style="list-style-type: none"> <li>■ Current loop interrupted;</li> <li>■ Problems on connection cable between 4-20 mA board and measurement board;</li> <li>■ 4-20 mA board malfunction</li> </ul>	The error condition is displayed.	 501
Incorrect Bluetooth parameters warning.	Bluetooth power-on interval too short, battery life will be reduced considerably.		 601
The firmware checksum differs from the expected value.	The memory of the internal program has changed.	The error condition is displayed and the program execution stopped.	 801



## 5. Auto diagnostics / 6. PC interface software

EN

Detected anomaly	Possible cause	Converter behavior	Icon displayed and corresponding error code
The parameters checksum differs from the expected value.	Parameter data is corrupt.	The error condition is displayed and the program execution stopped.	 802
A watchdog reset has been performed	A disturbance has resulted in unmanaged behavior in the regular execution of the software.	The error condition is displayed and the program execution stopped.	 901

## 6. PC interface software

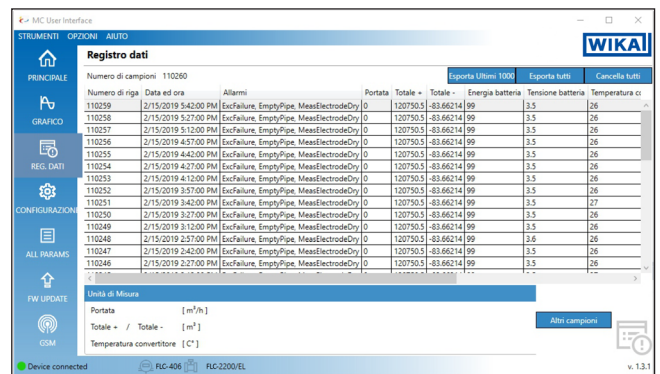
The supplied PC communication software is based on a proprietary protocol; its use is possible with the interface IrCOMM (USB to infrared adapter) and allows to:

- View live measurements in real time;

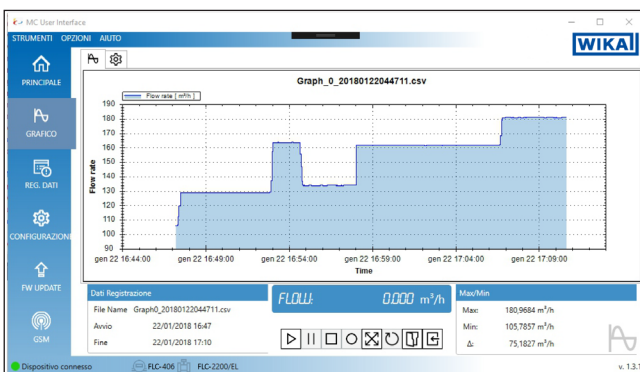
- View all parameters;
- Modify the editable parameters;
- Download the internal data logger;
- Update the firmware.



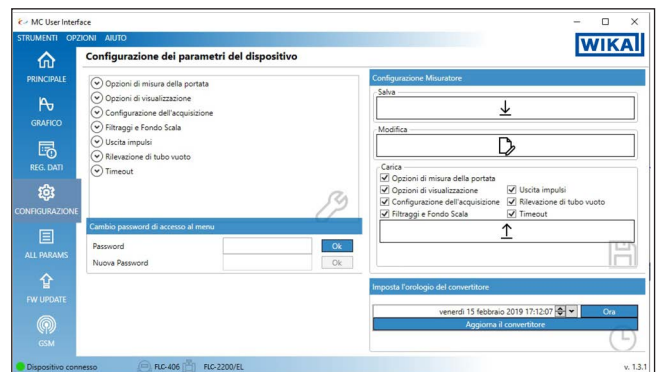
Main Dashboard - real live values and basic information



Data LOG - Internal process log download and CSV file export



Graphic - Recording of live measurements/Visualization



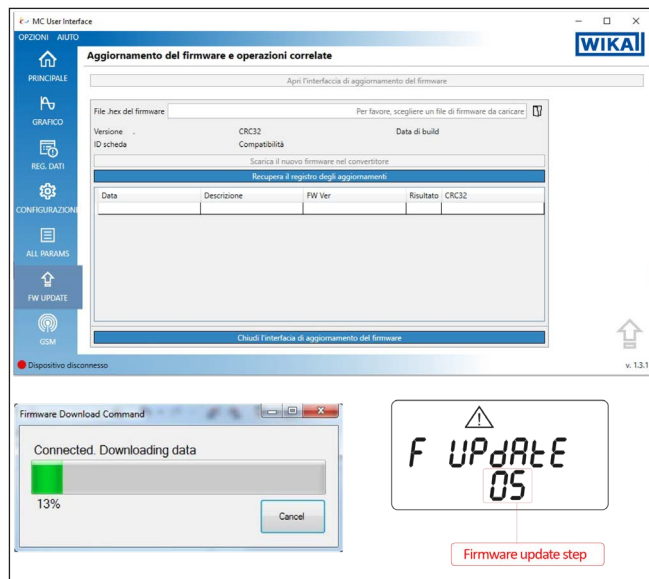
Configuration - Parameters setting & configuration

## 6. PC interface software

### 6.1 Firmware update

To update a newer firmware release, select the firmware ".hex" file and press "Download new firmware to converter". The progress of the firmware download is displayed while the instrument shows the sequence of internal operations. The previously installed firmware is saved in backup on a dedicated memory area, therefore in case of error during unloading, the converter will automatically restore the normal functionality. During the operation the red LED turns on lights up when the FLASH memory is cleared or written. At the end of the process, the unit will restart automatically.

EN

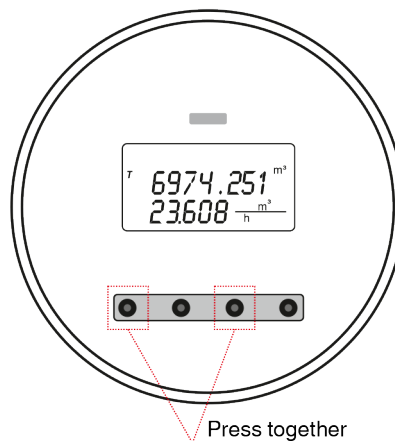


#### Firmware updating steps

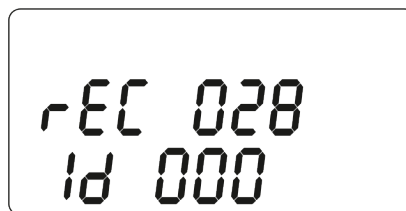
0	Firmware check installed
1	Awaiting download request
2	Download request received
3	Clear download memory
4	Firmware download
5	Checking the downloaded firmware
6	Checking the downloaded firmware
7	Firmware update installed
8	Backup of the new firmware installed
9	Updating OK
10	Firmware reset installed (only during startup)
11	Firmware reset installed (after error during update)

### 6.2 Download attempt log

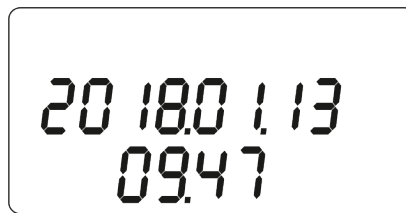
Any attempt to download the firmware is recorded in the internal memory. The log can store over 500 records: once completed, further downloads are not allowed. The download attempt log can be viewed on the converter display **function 35** or by pressing **P1** and **P3** together on the main display screen. Each log information scrolls automatically in 4 screens. **P3** and **P4** can be pressed at any time to go to the previous or next saved recording.



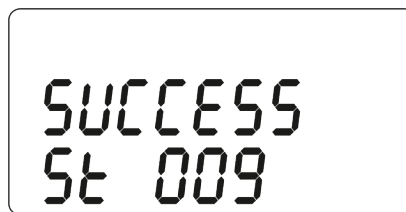
Access the download attempt log from the main display.



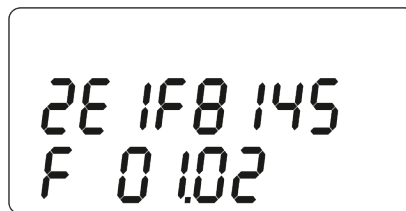
Screen 1: displays the record number and corresponding download ID.



Screen 2: displays the date (YYYY.MM.DD) and the time the attempt was made.

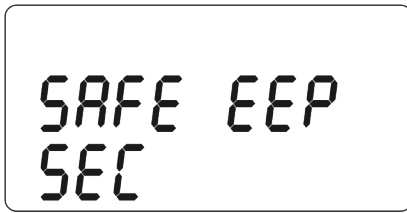


Screen 3: shows if the attempt was successful (SUCCESS) or not (FAIL). The last completed step is also reported.

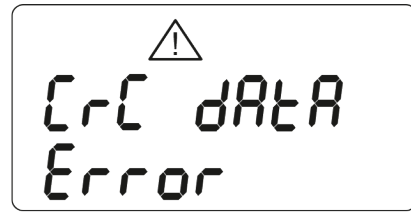


Screen 4: shows the checksum and version of the firmware downloaded. If the operation was not successful, FFFFFFFF can be shown as a checksum.

### 6.2.1 Additional information displayed



«Safe EEPROM secured»: the calibration and measurement parameters saved in the EEPROM memory are protected from writing attempts.



The checksum of the firmware or EEPROM data (parameters and / or totalizers)

## 7. GSM

The GSM module is an expansion of the FLC-406 electronic converter, which makes possible:

- Remote transmission of information available in the measuring instrument;
- Data reception for remote management of the instrument itself;
- Modification of some parameters;
- Converter FW update.

### 7.1 Main features

#### 7.1.1 Fully autonomous operation

The module works as a completely autonomous unit, similar to an external GSM data logger: at regular intervals (minimum 60 s) it acquires the measurement data from the FLC-406 and saves them in its internal Flash memory.

#### 7.1.2 Battery powered

Power is supplied via a battery pack with 2 batteries. Nominal battery life 5 years, with guaranteed minimum of 1 year regardless of module configuration.

#### 7.1.3 Worldwide compatibility

The internal modem (Telit HE910-GL) was chosen to guarantee worldwide operation at least for bands B5, B8, B2, B1, B4; Frequencies [MHz] 800/850, 900, AWS 1700.1900.2100. Europe, Australia, New Zealand, Brazil, North America.

#### 7.1.4 Data sending mode

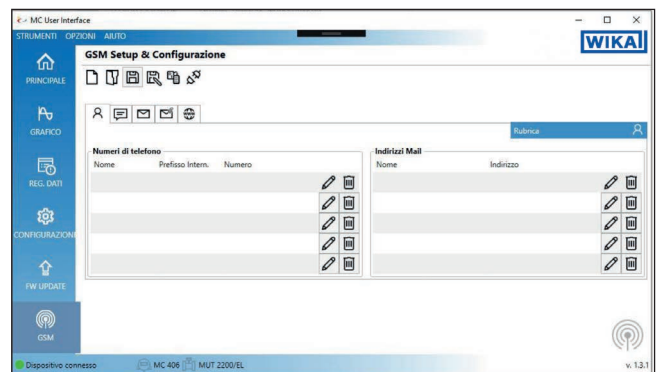
Sending measurement data includes the following modes; SMS, E-mail; Email with attachment (containing the latest log lines).

#### 7.1.5 Data transmission interval


The programmable data transmission interval is independent for each mode. The minimum interval is every hour. In case of error, the management of sending and attempts is completely delegated to the module.

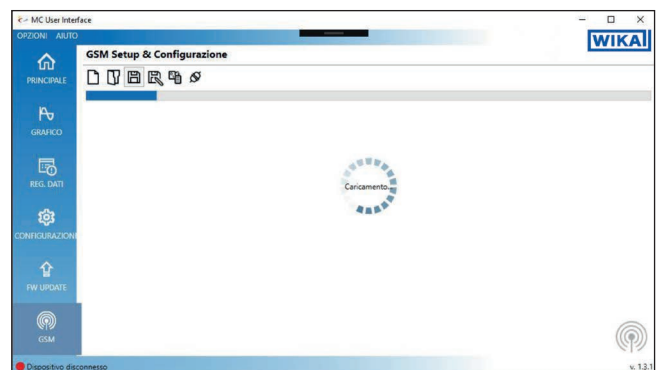
#### 7.1.6 Parameter configuration

The operating parameters are configured via the FLC-406 optical interface and via the MC User Interface software.



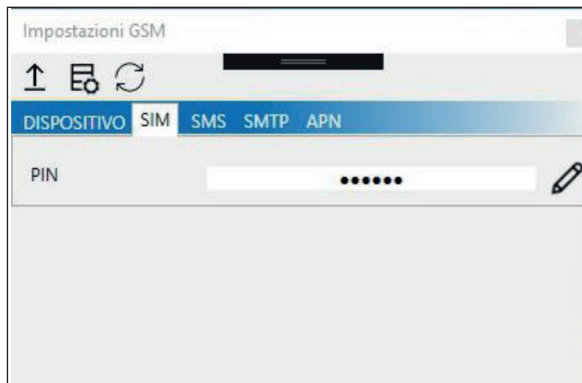
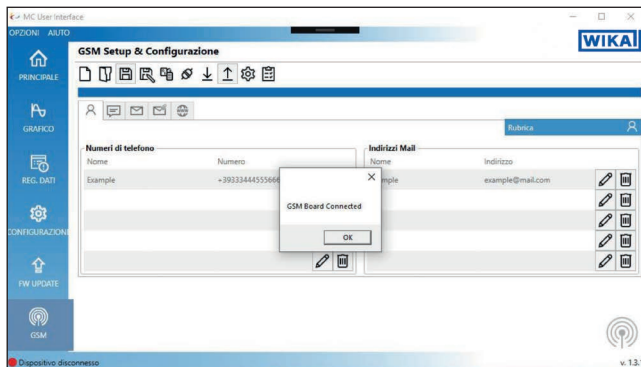
### 7.2 GSM connection

The software starts communication with the GSM module and downloads all its parameters by pressing the button .




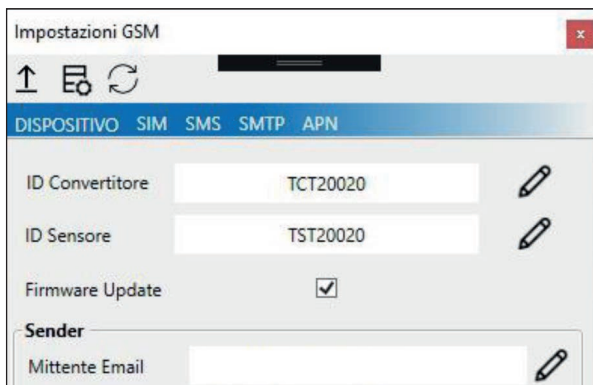
# 7. GSM


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## 7.3 Device settings

All communication parameters are set up by pressing the button .

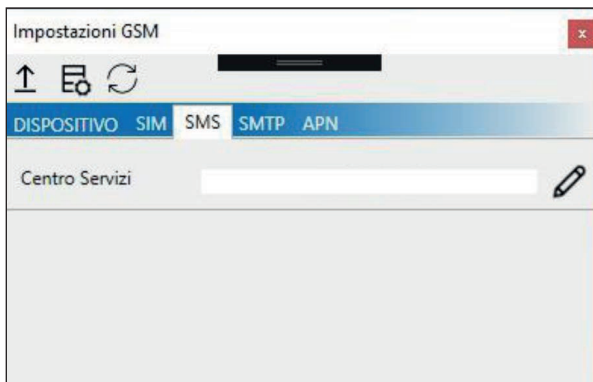


Press the button  to save the data on the form.



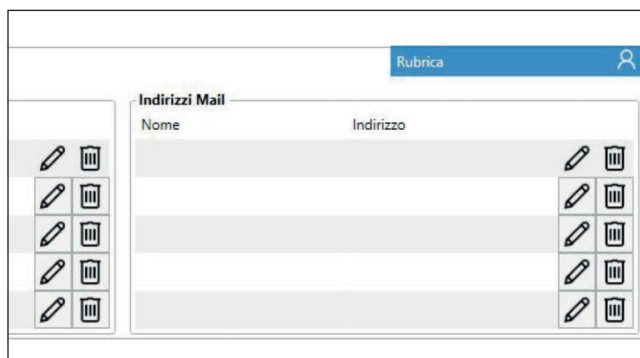
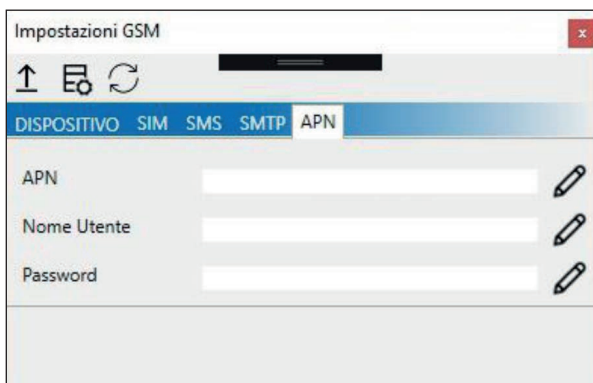
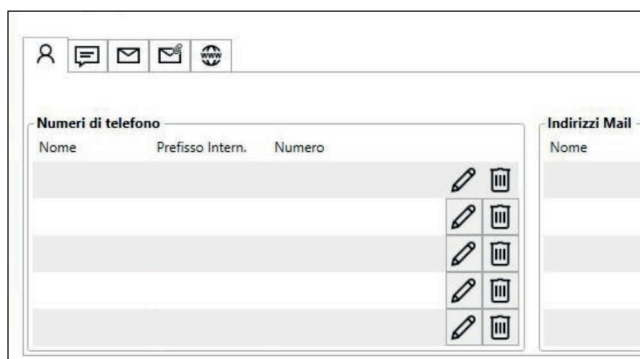
### NOTE

Without this operation, no data on the form will change.



## 7.4 Phone number and email settings

Up to 5 mobile numbers / email addresses can be set.



## 7. GSM

### 7.5 Scheduling



The user can program the 4 independent programmers of the module: SMS, e-mail, e-mail with attachment. For each scheduler it is possible to choose one of the four predefined types:

- Hourly interval (Send data/sms every hour).
- Daily per hour (Send data every day at a specified time).
- Day of the week (sends data every week at the selected day and time).
- Day of the month (Send data every month at the selected day and time).

You can also build a flexible schedule by choosing Day of the week, Day of the month and Time.

The screenshot shows the 'Add Schedule' interface. It includes a 'Schedule Type' dropdown menu set to 'None'. Below this is a 'Schedule Overview' section with a grid for selecting days of the week (Mon-Sun) and a 'Day Of Month' grid (1-31). To the right is an 'Hour' grid (00:00-23:00) with checkboxes for each hour.

### 7.6 Data saving


To save the data on the module it is necessary to save the configuration file (including telephone / e-mail number and all the scheduler data) by pressing the button , then upload the file to the module by pressing the button .



#### NOTE

Without this operation, no data on the settings will change.

### 7.7 Test

Press the button  to test all the functions of the GSM module.

The screenshot shows the 'GSM Test' interface. It displays a status bar with 'I WIND', the time '11:46', and the date 'Lu 02/18/2019'. Below the status bar are icons for messages, email, and settings. The 'A:' field contains 'Example <+39333444555666>'. The test results section shows: 'TST20020', '11:31 18/02/2019', '24 C', '0 m3/h', '120750,5 m3', '-83,66214 m3', '99%', and 'bq = OK'. At the bottom right, it shows '36 / 160' and two buttons: 'Ultimo Log' and 'Invia'.

#### SMS send test

The screenshot shows the 'GSM Test' interface. It displays a status bar with 'I WIND', the time '11:47', and the date 'Lu 02/18/2019'. Below the status bar are icons for messages, email, and settings. The 'A:' field contains 'Example <example@mail.com>'. The 'Oggetto:' field is empty. The test results section shows: 'TST20020', '11:31 18/02/2019', '24 C', '0 m3/h', '120750,5 m3', '-83,66214 m3', and '99%'. At the bottom, there are two buttons: 'Ultimo Log' and 'Invia'.

#### Email send test

The screenshot shows the 'GSM Test' interface. It displays a status bar with 'I WIND', the time '11:52', and the date 'Lu 02/18/2019'. Below the status bar are icons for messages, email, and settings. The 'Test Connessione Dati' section has a 'Start' button. The 'Test Connessione Ftp' section has a 'Start' button.

#### Data site connection test

## 8. 4-20ma output module

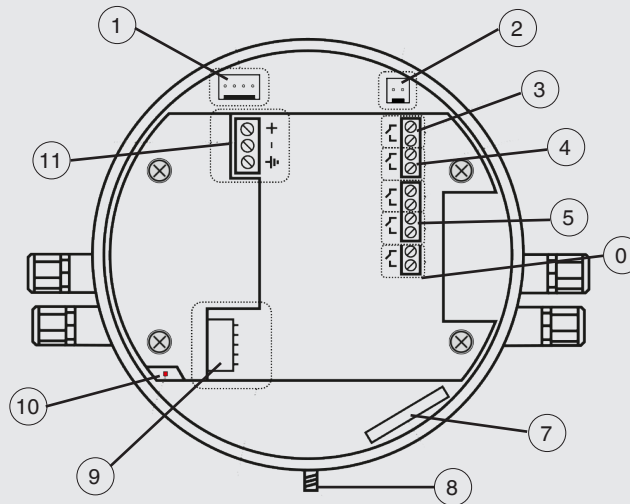
### 8. 4-20 mA output module

The 4-20 mA output module is an expansion of the FLC-406 electronic converter, which makes it possible to transmit one of the quantities measured on the 4-20 mA line LOOP POWERED

[Loop voltage 24Vdc; maximum impedance 800 ohms].

It is possible to map on this output:

- Instant flow rate;
- Instantaneous flow rate as a percentage of the full scale;
- Pressure;
- Temperature T1;
- Temperature T2.



- |                         |                           |
|-------------------------|---------------------------|
| ① Sensor signal         | ⑦ SIM gate                |
| ② Sensor coils          | ⑧ Grounding connection    |
| ③ Positive pulse output | ⑨ Battery pack connection |
| ④ Negative pulse output | ⑩ LED Power indicator     |
| ⑤ Pressure sensor input | ⑪ 12/24 V input           |
| ⑥ 4-20 mA output        |                           |

It is possible:

- To select the flow rate value to be associated with 4 mA and that to associate with 20 mA.
- To select the current values to be generated in case of Overload / Underload according to the standard NAMUR N43 (es. AO-LL = 3.8mA, AO-UL = 21.6 mA).
- To manage error reporting via 4-20 mA by selecting the current values to be generated in the event of:
  - ▶ Reverse flow
  - ▶ Empty pipe
  - ▶ Coil error
  - ▶ Generic error

It is also possible to activate the simulation mode, setting the flow rate value that the instrument detects and verifying the correctness of the 4-20mA signal generated by the module. This simulation has a maximum duration of 20 minutes, after which the meter returns to normal operation. During the simulation mode, the total counters are not increased. In case of malfunction of the module, the error code 501 will be displayed on the instrument display.

## 9. Bluetooth – Modbus module

### 9. Bluetooth® – Modbus module

The Bluetooth® - Modbus module is an expansion of the FLC-406 electronic converter, which makes it possible to communicate the instrument with a PC via Bluetooth and Modbus.

For communication on the PC side, a USB dongle will be provided to be connected to a USB socket on a computer with Windows operating system.

#### 9.1 Bluetooth communication

Bluetooth is a device that consumes a lot of current so, to guarantee battery life, it will be activated periodically by the FLC-406 in order to search for a possible connection request from a PC. The periodicity of the ignition can be set from menu item 44. The following values are available:

- 0 = Off
- 1 = Power on every 30 seconds
- 2 = Power on every 60 seconds
- 3 = Power on every 2 minutes
- 4 = Power on every 5 minutes
- 5 = Power on every 10 minutes
- 6 = Power on every 15 minutes
- 7 = Power on every 30 minutes
- 8 = Power on every 60 minutes
- 9 = Always powered.

The switch-on duration is set by menu item 45, in a range between 3 and 30 sec.

- For distances between FLC-406 and PC shorter than 1 meter, a switch-on duration of 3 s is recommended (default).
- For distances between 2 and 4 meters, a switch-on time of 4 s is recommended.
- For distances over 5 meters we recommend an ignition duration of 5 s or more.

The module activates the Bluetooth connection with the selected periodicity and for the set duration, in search of the PC. Once the connection with the PC is established, the Bluetooth module will remain on for a maximum of 15 minutes allowing configuration and/or data download operations using the User Interface software.

By simultaneously pressing the **P1** and **P4** keys (device reset) you can immediately activate the search for Bluetooth communication. This activation will last for a maximum of 30 seconds and then the device will re-search for the connection with the periodicity set in parameters 44 and 45. The instruments are shipped by Euromisure with Bluetooth disabled. It is therefore necessary to activate the Bluetooth connection at the first start by going to menu item 44 and selecting a value other than 0.

For a first function test and for the initial configuration of the device, it is recommended to set parameter 44 to 1 (switch on every 30 seconds). At the end of this phase it is necessary to set the Bluetooth to turn on every 10 minutes.



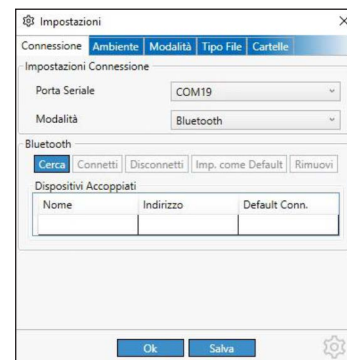
#### NOTE

It is important to remember that the Bluetooth device has a high current consumption therefore, in order to preserve battery life, it is recommended to select a power-on interval of not less than 10 minutes. In case of selection of lower intervals, the instrument signals error 601.

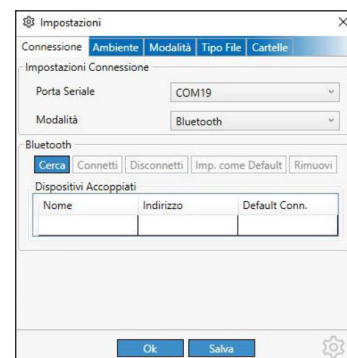
#### 9.2 PC connection through software interface

Communication between FLC-406 and PC (Windows) via Bluetooth is managed with the User Interface software, selecting Bluetooth instead of IrCOMM according to the following procedure:

- Insert the USB dongle into a free USB slot; a COM communication port will be generated.
- Open the User Interface software and select the menu item **Options-> Settings-> Connection**.



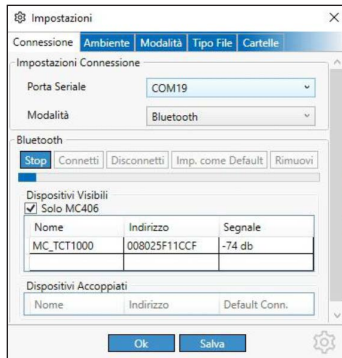
- Select the COM port corresponding to the USB dongle.
- Select **Mode-> Bluetooth**.
- Click on **Search**.



The software will start searching for visible devices nearby. If the flag on "FLC-406 only" is selected, only FLC-406 devices will be filtered, otherwise all visible Bluetooth devices will be displayed.

## 9. Bluetooth – Modbus module

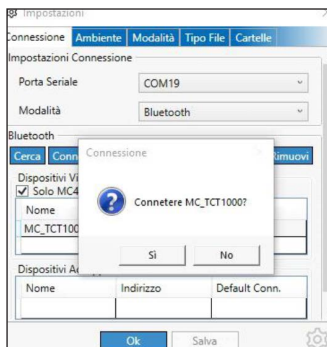
EN



paired device.

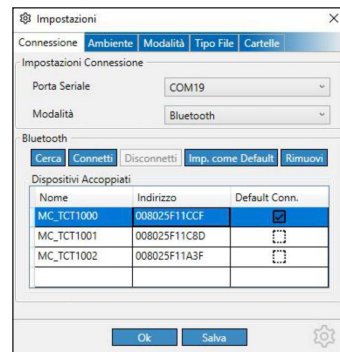


Once a device is found, click on the corresponding line. This will stop the search and connect to the device.

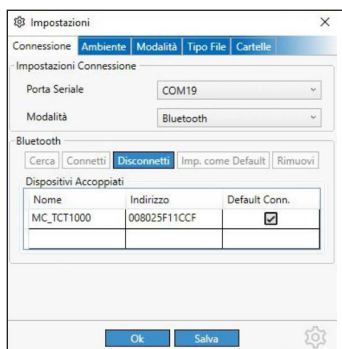


If multiple devices are paired, you can select which one to use at startup.

From the settings menu, select the device in the list of Paired Devices.



With the device connected, click on "Disconnect" to terminate the connection.



- Click on **Connect** to connect the device.
- Click on **Imp. Default** to set the device to connect at startup.
- Click on **Remove** to remove it from the list.

The next time you start, you can connect directly to the last



# 10. Converter installation

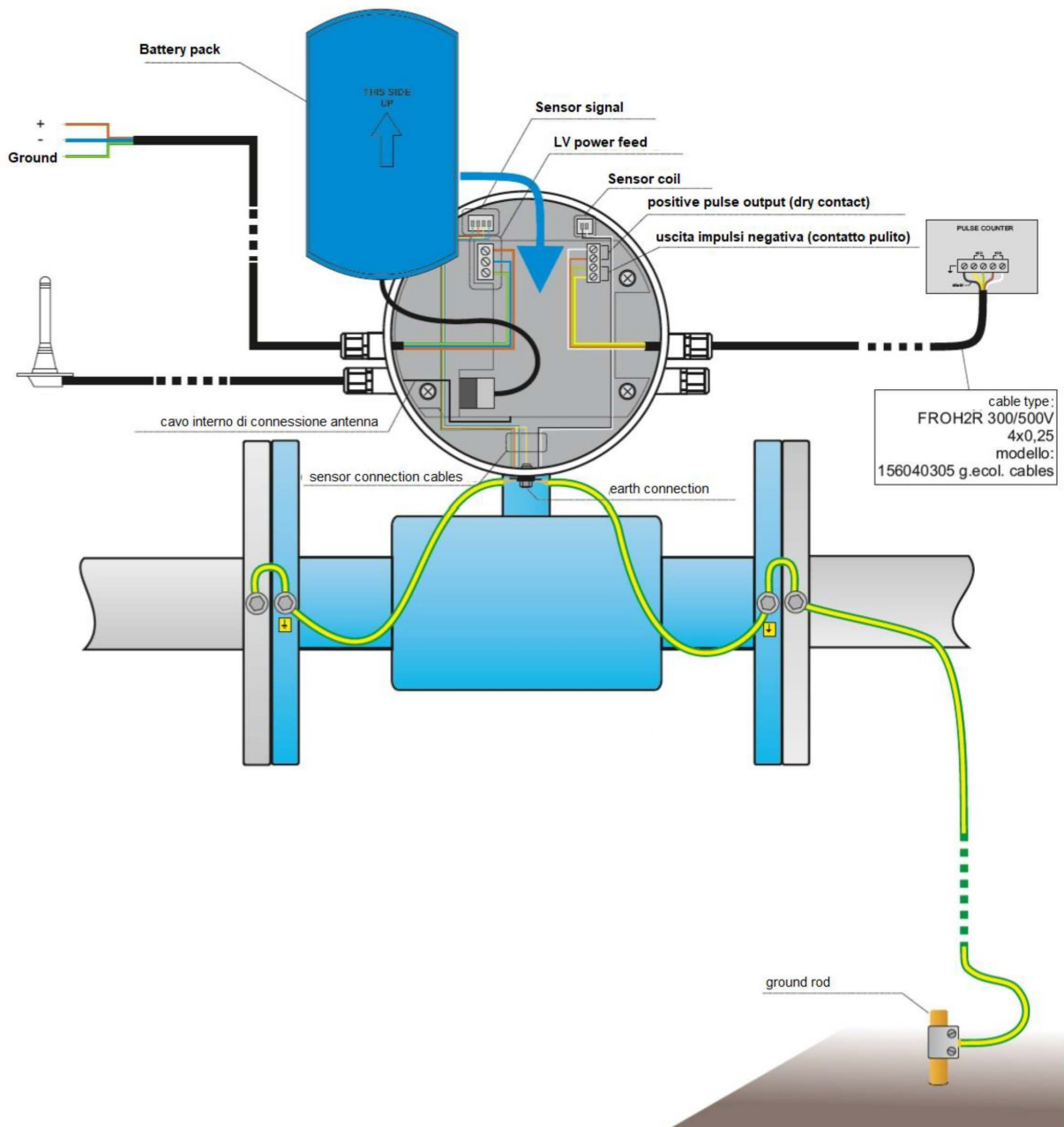
## 10. Converter installation

Once the meter has been installed, the pulse outputs can be wired; the maximum voltage allowed is 30 V AC or DC (no polarity attention is required). The clean electronic contacts can handle a current up to 100 mA. The battery pack must also be connected to the motherboard (if it is not shipped already connected). You must remove the battery pack, insert the connector and put it back in place. Observe the orientation of the package as shown (see the image below). At this point the allowed parameters can be viewed and adjusted.

### 10.1 Grounding recommendation

The purpose of the ground connection is to protect the system from external electromagnetic interference and set the reference of meter measurement. A clean ground connection with the lowest possible resistance is required. We recommend using at least a 4mm<sup>2</sup> / AWG11 cable to make the ground connections. In the event that the liquid is not electrically connected to the pipes (plastic or internal coating), grounding rings are required. Missing or incorrect grounding will result in unpredictable behavior.

EN



### Compact configuration

## 10. Converter installation

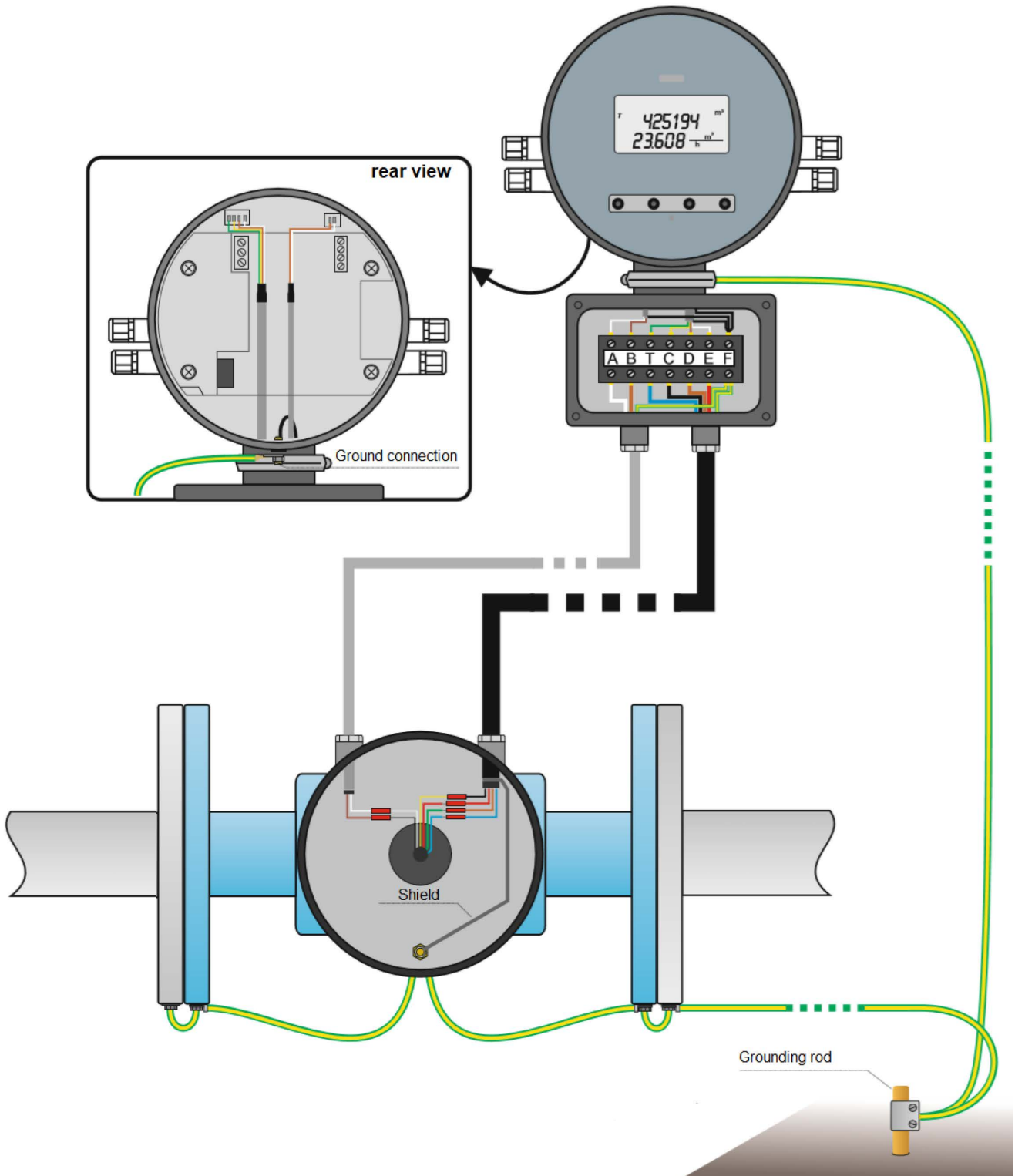
### 10.2 Separate configuration

All the grounding recommendations described on the previous page are also valid for this configuration. Please note that both the sensor and the converter must be grounded using two separate wires. Avoid placing the signal and power cables close together to minimize interference.

### 10.3 Remote configuration

Battery and pulse connection not shown, please consult the compact version.

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Separate configuration

# 11. Dismounting, return and disposal

## 11. Dismounting, return and disposal



### WARNING!

Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment. Take sufficient precautionary measures.

### 11.1 Dismounting



### WARNING!

Do not disconnect while under voltage.

If you decide to put the converter out of service because it is definitely no longer in use, disconnect it from the electrical power source (FLC-406) and from the connection cables to the sensor before proceeding to its removal and its disposal.

### 11.2 Return



### WARNING!

Strictly observe the following when shipping the instrument. All instruments delivered to WIKA must be free from any kind of hazardous substances (acids, bases, solutions etc.).

When returning the instrument, use the original packaging or a suitable transport packaging.

### To avoid damage:

1. Wrap the instrument in an antistatic plastic film.
2. Place the instrument, along with the shock-absorbent material, in the packaging. Place shock-absorbent material evenly on all sides of the transport packaging.
3. If possible, place a bag, containing a desiccant, inside the packaging.
4. Label the shipment as transport of a highly sensitive measuring instrument.

### 11.3 Disposal

Incorrect disposal can put the environment at risk.

Dispose of instrument components and packaging materials in an environmentally compatible way and in accordance with the country-specific waste disposal regulations.

The manufacturer declares that the design, development and construction of the CONVERTER have been carried out in compliance with the directive on the reduction of the use of dangerous substances with particular attention to waste electrical and electronic equipment (WEEE) supporting, from an environmental point of view and the protection of the health of the worker, the intervention of the subjects who participate in the installation, use and disposal of their products (manufacturer, distributors, consumers, operators involved in WEEE treatment).



Strictly observe the following when shipping the instrument. All instruments delivered to WIKA must be free from any kind of hazardous substances (acids, bases, solutions etc.).

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