



SSM-U4

Smart Static Meter



Use and Maintenance Manual

Rev. 05	Date 10/04/2019
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1. Introduction

SSM is a family of products designed to measure gas volume, which involves the application in end points of redelivery of natural gas networks. This document refers to the versions SSM-U4-GPRS, SSM-U4-RF169 and SSM-U4-NB. The product incorporates a static sensor for measuring the volume with an electronic processor able to guarantee the functions set forth by resolution 631/2013/R/GAS issued by AEEGSI on 27/12/2013, as well as to allow for remote reading and remote control of the flow without the use of additional external devices. SSM-U4 meters are used in low pressure measuring systems (<0.5 bar gauge) with a flow rate lower than 6m³/h (class A2 according to the classification of UNITS 11291).

SSM-U4 belongs to the family of electric and electronic equipment (EEE), and therefore only the electronic part (board and batteries) are under *Directive 2011/65/EU "RoHS 2"*.

This document provides information about the use of the device, with application starting from the firmware release LR 1.04 / NLR 0.05.

SSM is available in different models with the following main common features:

- IP 65 protection;
- Built-in temperature sensor;
- Local optical communication port complying with IEC EN 62056-21 (ZVEI);
- LCD display;
- 3 front keys (user interface);

The various models differ in the following features:

- Type of modem:
 - Wireless M-Bus 169 MHz mode-N;
 - GPRS/GSM;
 - NB-IoT.

1.1. Identification of the product

The product can be identified by the metrological cover shown in **fig.1** located on the front of the device, which bears the following symbols and data

- Type of model;
- Name of the logic device.

Type of model:

Code format **SSM-U4-GPRS; SSM-U4-RF169; SSM-U4-NB**

Name of the logic device:

Format	FIO-R-03-WV-YY-XXXXXX;
FIO	Fixed data indicating the manufacturer (Samgas Srl) according to the Flag Association coding;
R	Reserved;
03	Type of device (GAS meter);
W	Type of gauge;
V	Type of communication
YY	Year of manufacture;
XXXXXX	Progressive number;

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The available product versions are shown below:

Version Code "W"	Type of gauge	Version Code "V"	Type of communication
"4"	G 4	"0"	PM (169 MHz)
		"1"	PP (GSM)
		"4"	NB IoT (multiband)

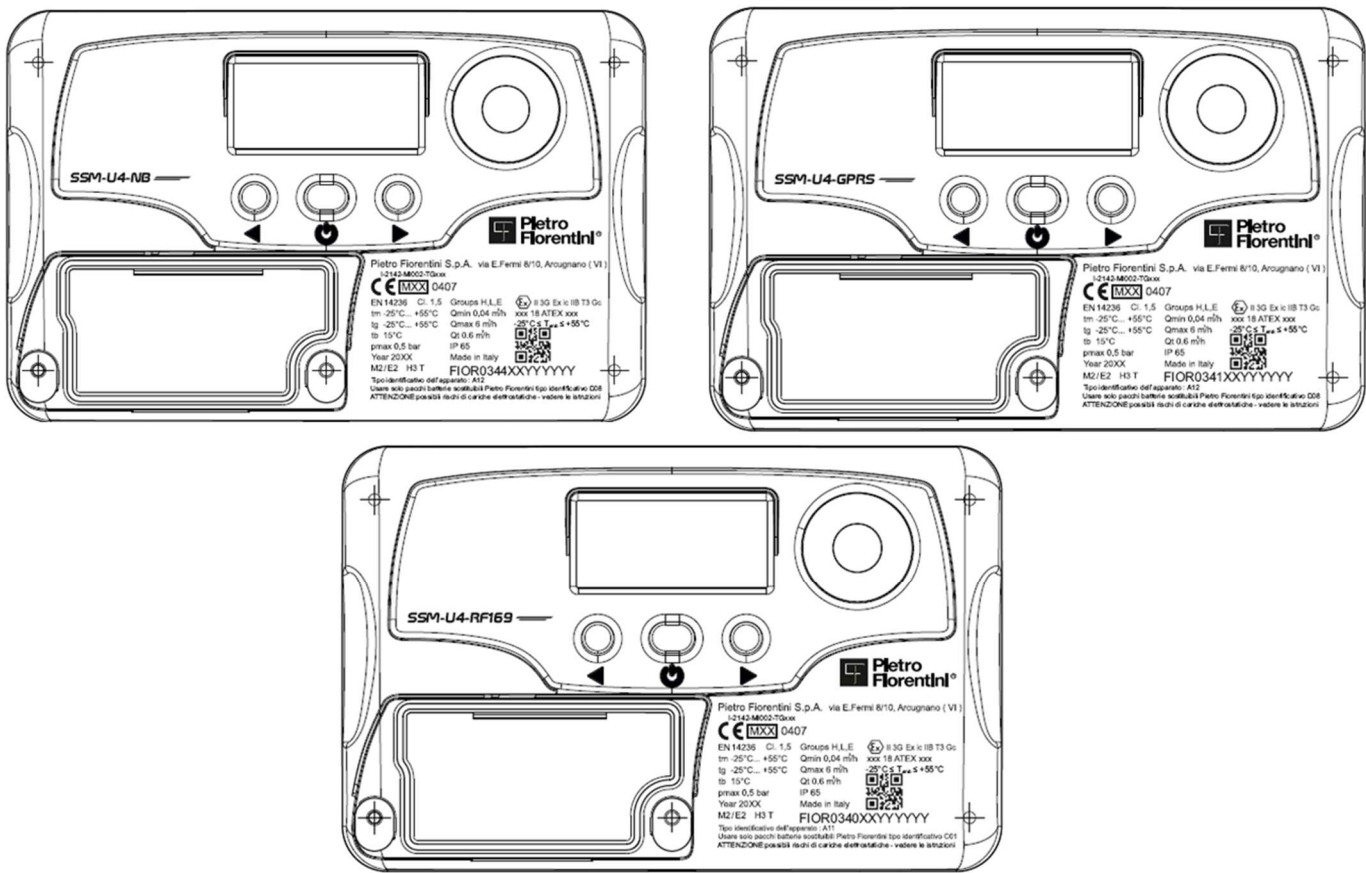


Fig.1 SSM-U models overview

1.2. Packaging content

The package contains the following parts:

Device

- SSM-U4 device including:
 - o Metrological battery;
 - o Replaceable communication battery;
 - o Two plugs for the protection of the connection fittings;

The batteries are already wired in their operating housing.

Manual

- User Manual:

The user manual and the use and maintenance manual are available for download on the website www.fiorentini.com

Certificates

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The EC declaration of conformity is attached to the transport document of the instrument.

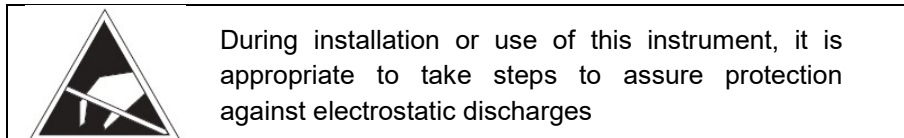
2. Safety instructions

SSM-U4 is an intrinsically safe device suitable for use in hazardous areas classified as Zone 2 Group IIB. The minimum installation category is ATEX Category II 3G. The harmonised CENELEC standards relevant to compliance with the EHSR requirements (Essential Health and Safety Requirements) of the ATEX Directive are EN 60079-0 and EN 60079-11.

This device is designed to comply with the requirements of Ex ic IIB T3 Gc protection type, ambient temperature range -25°/55°C and ATEX category II 3G.

2.1. Electrostatic discharges

This device is approved for installation in areas with low explosion risk (risk only for short periods). In these areas, sparks produced by electrostatic discharges might still generate explosions in extreme cases. Although during normal operation there are no dangerous potentials on the device, the use of dissipative footwear and of a damp cloth (% > 65%) is required during installation/maintenance. Further information can be found in EN60079-32.



Pietro Fiorentini SpA disclaims any liability resulting from the risks and consequences caused by non-compliance with these provisions

2.2. Connecting to other devices

There is no SSM-U4 connection with external devices.

SSM-U4 can connect, using the ZVEI optical port, to devices for the communication of data and commands useful for device configuration and maintenance.

SSM-U4 can connect, using the GSM/modem NB-IoT modem/wireless radio port, to local and/or remote devices for the communication of the data and commands useful for configuration, management, and maintenance of the device.

2.3. Power supply devices

SSM-U4 can be powered solely by a specific approved battery pack

As a matter of fact, the battery pack is a proprietary assembly consisting of a lithium battery and a cable ending with a special connector, enclosed by a protective sheath.

The battery pack is a device certified for exclusive use with the SSM-U4 device and it is the only permissible power supply device.

Caution!
Use only batteries of the type and model complying with the original.

The battery pack connector is polarized in such a way as to fit only in the connector specifically provided on the device, complying with the polarity.

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The following data are given on the battery pack:

- Model;
- Maximum output levels;
- Identification type of the battery pack and compatible device according to EN 60079
- Week and year of manufacture
- Quality pass upon acceptance

The metrological battery pack is sufficient to assure an autonomy of at least 16 years under the reference operating conditions specified in paragraph **Technical features**.

The transmission battery pack is sufficient to assure an autonomy of at least 8 years for the GSM module, an autonomy of at least 16 years for the RF 169MHz and NB-IoT module, under the reference operating conditions specified in paragraph **Technical features**.

2.4. Safety instructions for installation in hazardous area

This device must be installed and operated in compliance with the provisions and regulations in force.

The manufacturer shall not be liable for damage resulting from failure to comply with the instructions and from misuse.

Safety warnings

All operations must be performed by qualified personnel.

Transformation of spare parts

Any technical changes are forbidden. Use only original spare parts.

Transport

As a rule, meters must be transported in an upright position.

Upon receipt of the product, examine the supplied material.

Immediately notify any shipping damage.

Storage

As a rule, the meters must be stored in an upright position and in a dry place at ambient temperature.

WARNING

- Install in a compartment that meets the provisions in force on safety, away from any possible damage of mechanical origin, away from sources of heat or naked flames, in a dry place and protected from external agents;
- Install with the indicator device in a horizontal position, not in contact with the wall and raised from the floor;
- During installation, avoid mechanical stress to the inlet and outlet connections;
- The arrow on the top of the meter indicates the direction of the gas flow;
- The shut-off valve, located in the system upstream of the meter, must be opened in a gradual manner in order to allow the gas to flow evenly, without violent shocks that would damage the internal components of the meter;
- It is strictly forbidden to repair or make any modifications to the instrument;
- The installation, removal, and any operations in general must be performed by qualified personnel, in compliance with the provisions in force concerning safety.

3. General description

Figures 2 and 3 illustrate the structure and the main parts of the device.

The device consists of:

A metal enclosure containing:

- The mechanics for measuring the volumes;
- The flow shut-off valve;
- The sensor for measuring gas temperature;

A plastic enclosure containing:

- The electronic measurement and communication board;
- The battery(ies)

On the front of the plastic container there are:

- A segment and icon display;
- Three operator keys;
- Optical communication interface.

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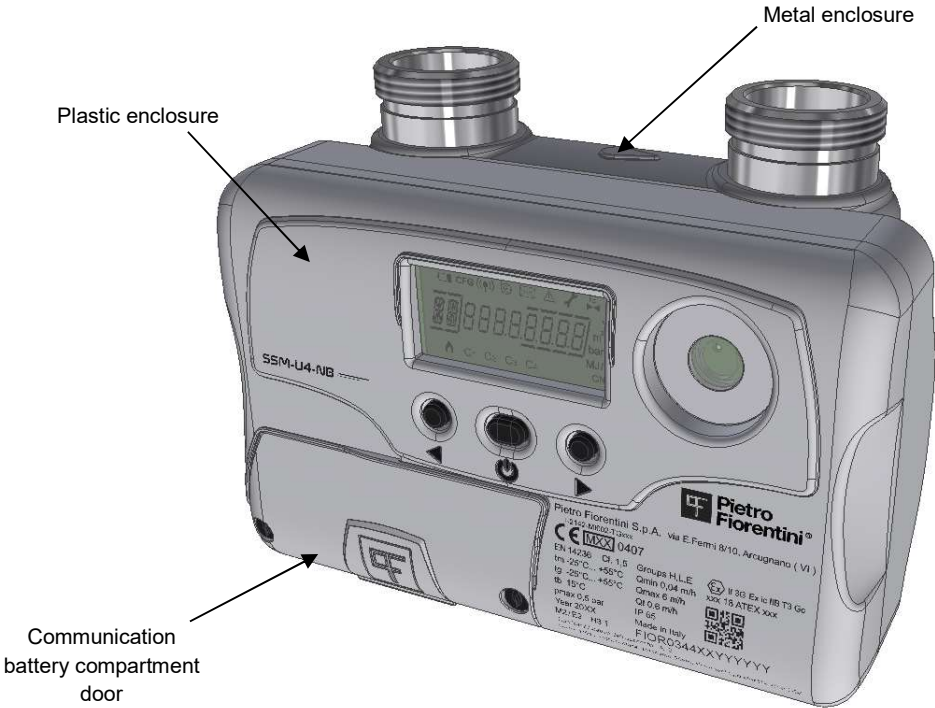


Fig.2 View SSM-U4

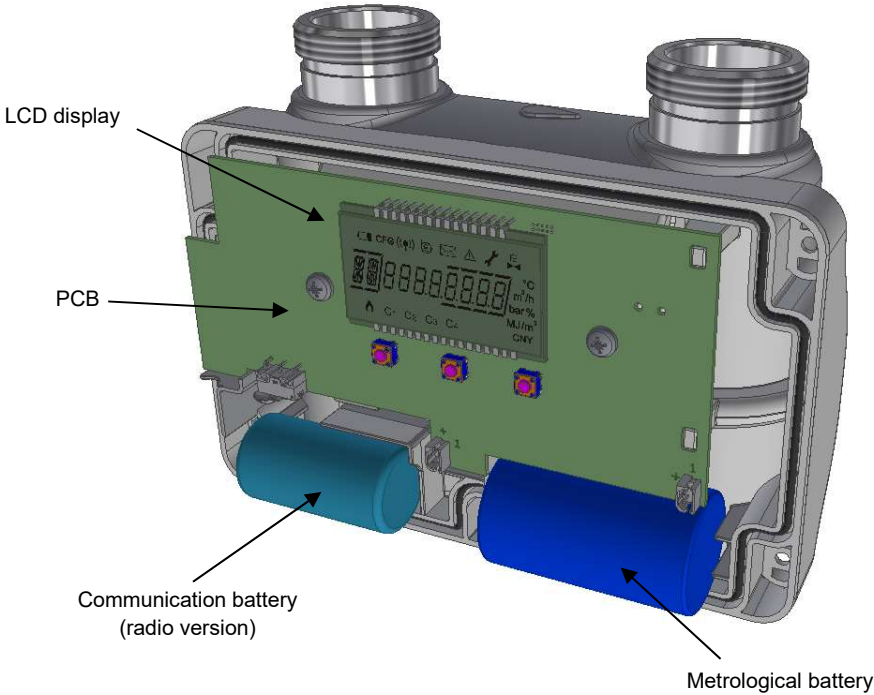


Fig. 3 – Meter internal view

SSM-U4 is a measuring instrument with accuracy class 1.5, as defined in Directive 2014/32/EU (MID). SSM-U4 is able to meter the amount of gas that goes through the meter in different consumption ranges in relation to the time in which it was measured, in compliance with the provisions of resolution 631/2013/R/GAS issued by AEEGSI on 27/12/2013.

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4. Main functions

4.1. Shut-off valve

With reference to the standards of the series UNI/TS 11291, SSM-U4 implements in particular the following services:

UNI/TS 11291-1 4.3.4 Service: Supply management

UNI/TS 11291-6 6 Flow shut-off

The gas flow shut-off valve is located within the body of the meter in the outlet connection and is not accessible without causing permanent damage to the meter.

The purpose of the valve is to shut off the gas flow towards the user solely for commercial purposes. **In no way or condition must the valve be considered and used as a device to assure safety conditions in the user's system in case of possible or patent gas leaks.**

The valve is specifically designed to assure its performance and operation for at least 15 years and it is able to provide the control microprocessor with the actual status of the valve (closed/open) and with information about correct operation.

The valve can be closed:

- By remote command sent via wireless communication channel (e.g.: from the SAC Remote Management Centre);
- When changing the battery is not authorised;
- Due to a break-in attempt beyond the threshold (configurable);
- The valve must be closed when the battery change takes too long;
- When there is no communication for a configurable time;
- When the residual battery power is below the critical level;
- In case of failure of the Gdm system.

The previously closed valve can be opened **only locally** by activating from the keyboard according to a special procedure (see chapter 4.1.1)

Opening of the previously closed valve must be authorised **in advance** by the SAC - Control Centre.

It is possible to display the status of the valve in the related SV menu (see chapter 6 and chapter 7.1.18).

To reactivate a previously closed valve, SSM-U4 must have first received the "authorisation for opening" from the Control Centre.

4.1.1.Procedure for opening the valve through the user interface

After receiving permission for opening the valve from SAC, with a set time window useful to perform such operation and the maximum number of possible attempts, the following appears on the display under the **SV** valve menu:

RE-OPEN → valve enabled to be opened

Press **ENTER** to access the submenu.

It might be required to enter a password to open the valve, according to the relevant setup: see section 7 of this document for specific details.

When the valve has opened, the display will read **OH (FIO)**.

Under the **SV** menu, the display will show:

OPEN → valve open

After re-opening of the valve, the device checks the flow by measuring the volume gone through in the 180 seconds following re-opening. The check threshold can be configured with dm3 resolution through local and remote communication. If the set threshold is exceeded, the valve will re-close automatically.

4.2. Digital outputs

SSM-U4 does not have any digital outputs

4.3. Data recording

With reference to the standards of the series UNI/TS 11291, SSM-U4 implements in particular the following services:

UNI/TS 11291-1 4.3.3 Service: Dynamic multi-rate capacity

UNI/TS 11291-1 4.3.7 Service: Metering and load profiles

UNI/TS 11291-6 5 Detection and recording of data

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4.4. Acquisition

The flow rate measurement is carried out continuously by means of a specific sensor, suitable for detecting the flow rate directly. The sensor is connected to the calculation board via an electrical connection

The control and detection of the temperature and flow rate sensors is directly performed by the microprocessor, which also performs an ongoing diagnostic activity to highlight any faults and fraud attempts made by blinding the sensors. The sensors are operated in a controlled manner, which is such as to assure proper operation during the whole SSM-U4 service life.

The temperature measurement, required to calculate the volumes at the thermodynamic conditions of reference, is carried out via a temperature sensor with a resolution of 12 bits, which provides a measurement in Kelvin degrees with a resolution of 0.0625°C.

The measurement of the gas temperature is acquired and updated every 30 s.

4.5. Events and diagnostics

With reference to the standards of the series UNI/TS 11291, SSM-U4 implements in particular the following services:

UNI/TS 11291-1 4.3.9 Service: Detection and reporting of faults
 UNI/TS 11291-6 7.1 Functional requirements - Event log
 UNI/TS 11291-6 7.6 Functional requirements - Diagnostics and alarms

4.6. Activation

With reference to the standards of the series UNI/TS 11291, SSM-U4 implements in particular the following services:

UNI/TS 11291-1 4.3.1 Service: Synchronisation
 UNI/TS 11291-1 4.3.6 Service: Software updating
 UNI/TS 11291-1 4.3.8 Service: Control and Maintenance of the infrastructure
 UNI/TS 11291-6 7.3 Functional requirements - Programming
 UNI/TS 11291-6 7.4 Functional requirements – Operations concerning commissioning and maintenance
 UNI/TS 11291-6 7.5 Functional requirements - Clock

4.7. Communication

SSM-U4 has two communication interfaces, a local one and a remote one:

Local interface:

Optical port Infrared port complying with standard EN 62056-21; it requires an external device (ZVEI probe);

The protocol used for the ZVEI optical port is DLMS.

The asynchronous format and the speed of the optical port are set to the following values:

Speed: 9600 baud, format: 1 (start bit), 8 (data bit), N (no parity), 1 (stop bit)

The ZVEI optical port is normally off and is activated when the display is switched on.

Remote interface:

GSM Modem Integrated in the device, antenna included and cannot be remote-controlled;
 The GSM modem, including the antenna, is integrated in the meter.
 NB-IoT modem Integrated in the device, antenna included and cannot be remote-controlled;
 The NB-IoT modem, including the antenna, is integrated in the meter.
 RF 169MHz module Integrated in the device, antenna included and cannot be remote-controlled;
 The RF 169MHz module, including the antenna, is integrated in the meter.

4.8. User interface

The user interface consists of an LCD display and three operator keys. The interface only allows the settings to be viewed and provides access to the **Sd** "status of the device" page in Chapter 3.

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5. Installation

SSM-U4 is suitable for installation in hazardous areas classified as ATEX Zone 2 and is ATEX certified with II 3G ic IIB T3 Gc marking.

3G: suitable for installation in Zone 2 classified atmospheres

IIB: suitable for use in areas with the presence of category IIB Gas (e.g: Ethylene).

T3: Maximum allowable surface temperature: 200°C.

Caution!

Before beginning installation, read and check the safety instructions contained in the first chapter carefully

5.1. Mechanics installation

The overall dimensions of SSM-U4 are shown below.

SSM-U4 is fitted to the system using a special shelf for GAS meter.

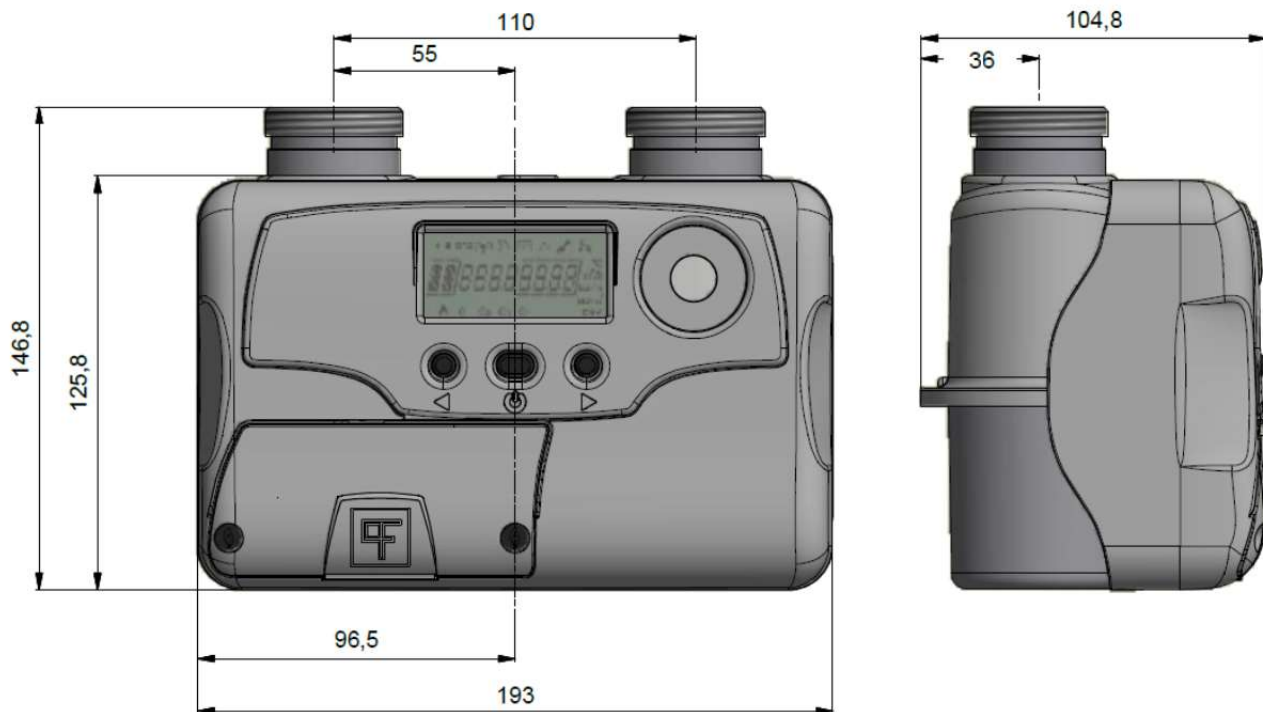


Fig. 4 – Overall dimensions

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5.2. Connection to the system

- After installation, SSM-U4 must be connected to the system. Before performing the connection, make sure that at least the portion of the system upstream of the meter has been cut off and that, therefore, no flow of gas occurs during installation;
- Before performing the connection, make sure that the maximum system pressure is lower than the maximum pressure set for the meter, which is fixed and equal to 0.5 relative bar;
- If required, use fittings (not supplied) to connect SSM-U4 to the piping.
- While tightening the fittings, do not exceed the torque of 110Nm;
- SSM-U4 operates only in vertical position;
- SSM-U4 is fitted with a shut-off valve in the "open" status; therefore, it is ready to deliver and measure.
- Ensure the fixtures on the customer side are closed.
- Slowly load the SSM-U4 meter with pressure.
- If piping has been subsequently installed on the meter for pressure measurement, check the tightness of the relevant connection.
- After leak testing, slowly remove pressure to the SSM-U4 meter.

When the leak test is passed, the meter is ready for use.

SAMGAS meters require no maintenance.

WARNING

When the meter is disassembled, it may contain a residual amount of gas. In light of the explosion hazard, safety measures must be taken, e.g.:

- After disassembling the SSM-U4 meter, clean it very well with inert gas.
- For transporting the meter with residual amounts of gas, use a vehicle with open or ventilated loading area.

5.2.1. Using the ZVEI probe

The ZVEI probe (available as an option) is equipped with magnetic coupling. Place the probe in the provided groove on the front part of SSM-U4 with the cable facing downwards. The magnet and the groove will retain the probe in place.

To enable communication on the ZVEI optical port, it is sufficient to switch on the display by pressing the middle key. It switches off automatically when the user interface and serial communication remain idle for more than 2 minutes.

5.3. Power supply

The SSM-U4 can be powered only by batteries.

The metrological battery is sized to assure operation of SSM-U4 for at least 16 years. The battery autonomy was estimated in the following operating conditions of reference:

Display message/ZVEI communication

15 minutes per month

Valve command:

1 complete command (including 1 closing and 1 opening) every year

Ambient temperature profile:

2% of the time at -25°C;

10% of the time at -10°C;

15% of the time at +5°C;

50% of the time at +20°C;

15% of the time at +35°C;

5% of the time at +50°C;

3% of the time at +70°C.

The GPRS transmission battery is sized to assure the operation of SSM-U4 for at least 8 years. The battery autonomy was estimated in the following operating conditions of reference:

GSM communication to the Distributor:

1 GSM cycle per day (20 s recording, 30 s continuous data transmission)

2 code updates in 15 years

The NB-IoT transmission battery is sized to assure the operation of SSM-U4 for at least 16 years. The battery autonomy was estimated in the following operating conditions of reference:

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NB-IoT communication to the Distributor:

- 1 recording per year (33s)
- 1 NB-IoT cycle every day (17 s data sending/receiving)
- 2 code updates in 15 years

The RF169 transmission battery is sized to assure the operation of SSM-U4 for at least 16 years. The battery autonomy was estimated in the following operating conditions of reference:

169 MHz Radio communication:

- Radio cycle Tx Only – Short message (Volume reading) transmitted – 4 sends/day
- Radio cycle Tx-Rx – Tx-Rx Sessions with long message

SSM-U4 implements and manages service quality logs, available only through the communication channels (not on the display) able to ascertain the deviation of the actual operating conditions from the reference ones.

5.3.1. Connecting the batteries

SSM-U4 is supplied with the metrological battery already connected and inserted in the appropriate compartment; therefore, SSM-U4 is ready for operation.

5.3.2. Power supply status

The power status shows the current battery level.

The calculation functionality of the actual battery use has been implemented in order to signal when the limit of 90% is reached. A weight has been configured for the main activities of the device, whether periodical or not. Therefore the actual consumption of the battery is calculated according to the time elapsed, the individual functions actually performed and the weight in terms of consumption. When this estimate exceeds 90% of threshold setting, the appropriate alarm event will trigger.

5.4. Safety and fraud prevention

The solutions implemented on the SSM-U4 meter to assure safety comply with the requirements set forth by standard UNI TS 11291.

With reference to the standards of the series UNI/TS 11291, SSM-U4 implements in particular the following services:

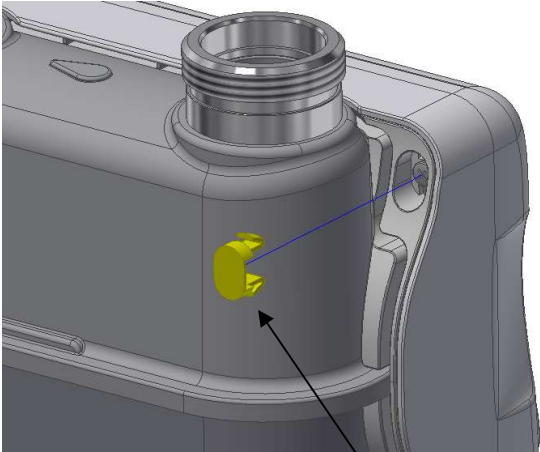
- UNI/TS 11291-1 4.3.2 Service: Detection and reporting of fraud
- UNI/TS 11291-1 4.3.10 Service: Safety management
- UNI/TS 11291-6 7.2 Functional requirements - Access

SSM-U4 implements all safety criteria defined by the reference standards and, in particular, by UNI TS 11291. In detail:

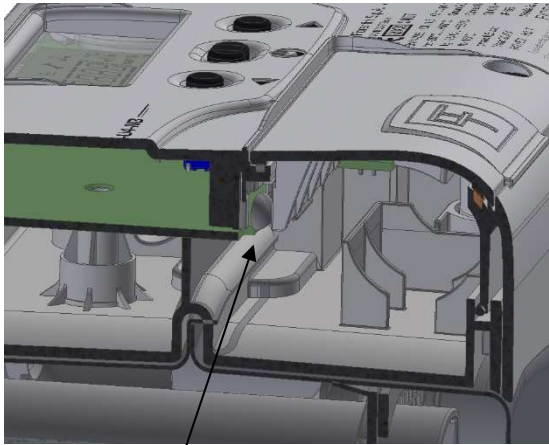
- Access to the electronics is not possible without removing the mechanical and metrological seal and without permanently damaging the metrological cover;
- Access to the memory device is not possible without permanently and patently damaging the meter;
- Access to the flow shut-off valve and the temperature sensor is not possible without permanently and patently damaging the meter;
- Access to the metrological battery and to the non-replaceable transmission battery is not possible without removing the mechanical and metrological seal and without permanently damaging the metrological cover;
- Access to the replaceable communication battery is not possible without leaving a record of the event in the Metrological Log of the meter;
- The interface equipment usually available to the user can only be used to read the data and it is not possible to perform any configuration;
- The configurations that can be performed through the communication channels which the device is equipped with – which can only be carried out by authorised personnel – leave a track since they are stored in the appropriate memory log (Metrological Log);
- Attempts to tamper with proper operation of the meter are detected and recorded in the Metrological Log;
- Attempts by unauthorised personnel to access the meter through the communication channels which it is equipped with are detected and recorded in the Metrological Log;
- The commands sent by external devices through the communication channels which the device is equipped with are verified in terms of source authenticity;
- The messages transmitted through the communication channels conveying sensitive information are all efficiently encrypted;
- Attempts to access the meter through the communication channels made with wrong passwords or encryption keys are detected, listed and made available to the control centre;
- The duration of the conditions is monitored and recorded.

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Metrological seal



Anti-tamper switch

Fig. 5 – Meter seals

6. User interface

The user interface consists of three operator keys and a display. The following paragraphs describe the interaction methods between operator and user interface, and the meanings of the various fields on the display

With reference to the standards of the series UNI/TS 11291, SSM-U4 implements in particular the following services:

UNI/TS 11291-1 4.3.5 Service: Consumer information
UNI/TS 11291-6 8.2 Construction requirements - Display

6.1. Keyboard

The interaction occurs through three keys on the front of the device.



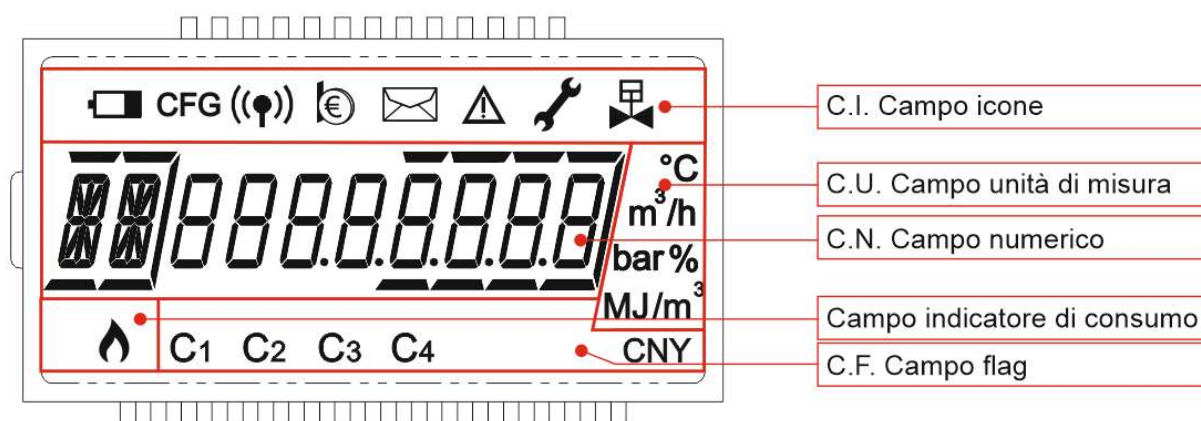
6.2. Display

The black and white LCD display consists of 8 7-segment characters and a set of icons and symbols whose meaning is described below.

The size of the digits shown by the 8 7-segment characters are compatible with the requirements of MID and EN12405-1.

The construction technology of the LCD element (display) is such as to assure a lifetime of over 15 years under operating conditions which also include prolonged exposure to sunlight.

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The display (the layout of which is shown in Figure AB. 1) is divided into the following fields:

- Numerical field (NC)
- Explanatory field (CE)
- Icons Field (CI) (battery, CFG, antenna, coin, envelope, alarm, spanner, valve)
- Flag Field (CF) (C1, C2, C3, C4)
- Consumption indicator field (flame)
- Units of measurement field (CU) (°C, m³, /h, bar, %, MJ, /m³, KWh, CNY)

The device is equipped with three buttons marked with ">", "<", and the central button, intended for the user for normal consultation.

Under normal operating conditions, the display is completely off.

By activating the central button (●) the display (DY) turns on and performs a 2 sec lamp test during which all segments are lit.

To assure a long battery life, the display is usually kept OFF. To switch it on just press the middle key.

The information processed by SSM is presented through the display and the control buttons (>, ●, <).

The information is organised in "chapters", and each chapter consists of "pages".

When the display is lit, the icon of the "consumption indicator" field flashes with each acquisition of an basic gas flow rate (> 1L): it is normally off.

The >, ●, < keys are always activated in "short" mode; the ● key can be activated in short (< 2 sec) or long (>2sec) mode.

After the lamp test, the display automatically shows the first page of the "Default chapter" (or chapter 0). The other pages of the default chapter can be scrolled with the > or < buttons.

Chapter 0 represents the set of pages normally consulted by the user and is characterised by having all the flag fields off.

The chapter 0 pages are organised in relation to the particular application of the SSM, but the first page must in any case represent the Vb volume totaliser.

In any page of the default chapter, pressing and holding the "●" button activates the presentation of the "Chapters" menu, as shown in Table 1.

When the DY is in the presentation menu of the chapters, each pressing of > or < activates the presentation of the next/previous chapter; a normal activation of ● allows the DY to enter the display mode of the pages of the displayed chapter. Each time you press < or > in the page display mode, the DY views the next/previous lines of the page; pressing and holding the E allows DY to exit the page display mode and go back to the chapter display mode. Pressing and holding ● in the chapter presentation mode allows the SSM to go back to viewing the pages of the default chapter. You can leave the default chapter only from the display time-out (display switch-off).

In the page display mode, the flag field indicates to which chapter the displayed pages refer.

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If no key is pressed for more than 2 minutes, the display goes back to off status.

The chapters are indicated in the explanatory field, in the numerical field and in the flag field with the following modes and sequence:

Sequence	Explanatory Field	Numerical field	Flag Field	Notes
1	PC	Pt-Corr	off	Default chapter of the data relating to the current billing period <i>Table 2</i>
2	PP	Pt-PrEc	C1	Chapter of the data relating to the previous billing period <i>Table 3</i>
3	GE	GEn	C2	Main parameter chapter <i>Table 4</i>
4	SE	SErUIZIo	C3	Service Chapter <i>Table 5</i>
5	CM	169 GPrS Nb-iot	C4	RF 169 MHz or GPRS or NB-IoT communication chapter according to the <i>Table 6</i> and <i>Table 7</i> model

Table 1

Once you reach the last chapter, the sequence restarts from the first.

The pages depend on the chapters and are represented in the following sequences; once you reach the last page, it resumes from the first of the same chapter.

6.2.1. Chapter 0 (default) - Current rate period

Sequence	Explanatory Field	Numerical field	Flag Field	Notes
1	T	8 digits: 5 integers 3 decimals; including non-significant zeros	off	Vb volume totalizer (um= m ³)
2	TA	8 digits: 5 integers 3 decimals; including non-significant zeros	off	Vb volume totalizer in alarm (um= m ³)
3	T1	8 digits: 5 integers 3 decimals; including non-significant zeros	off	Vb volume totalizer in range 1 (um= m ³)
4	T2	8 digits: 5 integers 3 decimals; including non-significant zeros	off	Vb volume totalizer in range 2 (um= m ³)
5	T3	8 digits: 5 integers 3 decimals; including non-significant zeros	off	Vb volume totalizer in range 3 (um= m ³)
6	Dc	E.g.: 15-07-18	off	Current date: dd-mm-yy format
7	Hc	E.g.: 23-58-21	off	Current time: hh-mm-ss format
8	Fn	F1, F2, F3	off	Current price range

Table 2

6.2.2. Chapter 1 - Previous billing period

Sequence	Explanatory Field	Numerical field	Flag Field	Notes
1	T	8 digits: 5 integers 3 decimals; including non-significant zeros	C1	Vb volume totalizer (um= m ³)
2	TA	8 digits: 5 integers 3 decimals; including non-significant zeros	C1	Vb volume totalizer in alarm (um= m ³)
3	T1	8 digits: 5 integers 3 decimals; including non-significant zeros	C1	Vb volume totalizer in range 1 (um= m ³)
4	T2	8 digits: 5 integers 3 decimals; including non-significant zeros	C1	Vb volume totalizer in range 2 (um= m ³)
5	T3	8 digits: 5 integers 3 decimals; including non-significant zeros	C1	Vb volume totalizer in range 3 (um= m ³)
6	Qm	5 digits: 2 integers 3 decimals; excluding non-significant zeros	C1	Maximum conventional flow rate in the period (um= m ³ /h)
7	TP	Rate plan	C1	Rate plan
8	DP	dd-mm X	C1	Date when the previous billing period has been closed X=reason for closing the period (according to UNITS standard)

Table 3

6.2.3. Chapter 2 - Main parameters

Sequence	Explanatory Field	Numerical field	Flag Field	Notes
1	SW	InFo	C2	Sub-chapter to access the FW device
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				pages and the operating status (press E)
2	SW	Log	C2	Sub-chapter to access the log pages of the last 32 FW updates (press E)
3	SW	PArAm	C2	Sub-chapter to access the chronology of the last 128 modified metrological parameters (press E)
4	ME	Message (the characters scroll with the < and > keys once E is pressed)	C2	If there is no message, it displays NO MSG
5	ID	PdR (the digits scroll with the < and > keys once E is pressed)	C2	
6	SV	OPEN CLOSED.xx RE-OPEN (Press E for sub-menus)	C2	Valve Status xx = blank, code of reason for closure
7	DG	XXXX	C2	Hexadecimal code of the Diagnostics bits according to UNITS standard
8	Qm	5 digits: 2 integers 3 decimals; excluding non-significant zeros	C1	Maximum conventional flow rate in the current period (um= m³/h)
9	TP	Rate plan	C1	Current rate plan

Table 4

6.2.3.1. Info Parameter (1)

Pressing the central E key accesses the first Information sub-page relating to the device firmware and the general operating status. Press > or < to scroll in sequence the following parameters identified by a prefix:

Explanatory Field	Numerical field	Flag Field	Notes
SW	ppp xxxx	C2	Display page of the parameter with ppp prefix whose value is xxxx

The following is the description table of field and value meaning – prefixes:

01L	Metrological Firmware (LR) - CRC16 in hexadecimal
02L	Metrological Firmware (LR) - Firmware release to be read as nn.ss (e.g. 0104 = 01.04 = 1.04)
03b	Metrological Firmware (LR) -Bench boot section 0 - CRC16 in hexadecimal
04b	Metrological Firmware (LR) -Bench boot section 0 - Firmware release to be read as nn.ss (e.g. 0101 = 01.01 = 1.01)
05b	Metrological Firmware (LR) -Bench boot section 1 – CRC16 in hexadecimal
06b	Metrological Firmware (LR) -Bench boot section 1 – Firmware release to be read as nn.ss (e.g. 0101 = 01.01 = 1.01)
07n	Non-Metrological Firmware (NLR) - CRC16 in hexadecimal
08n	Non Metrological Firmware (NLR) - Firmware release to be read as nn.ss (e.g. 0006 = 00.06 = 0.06)
-	Firmware update date (00-00-00 if default version)
-	Firmware update time (00-00-00 if default version)
11	Days (d) of operation
12	Hours, minutes and seconds (h-m-s) of operation
13	Days (d) of operation in active status
14	Hours, minutes and seconds (h-m-s) of operation in active status
15	LR parameters editing events meter

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16	FW upgrade events meter
17	FW upgrade not completed successfully events meter
18	Firmware restart events meter
19	CRC errors relative to LR data meter
20	Fraud events meters

6.2.4. Chapter 3 - Service

Sequence	Explanatory Field	Numerical field	Flag Field	Notes
1	Sd	-2 , -1, 0, 1, 3	C3	Status of the device (the maintenance and/or configured status is highlighted by the dedicated icon)
2	t	Excluding non-significant zeros: 3 digits, 2 integers, 1 decimal E.g.: 15.0	C3	Current gas temperature in °C (um= °C)
3	EV	dd-mm-yy	C3	Date of the first metrological log event (usually corresponds to the logbook reset event)
4	Rc	ContEGG	C3	Count Resolution menu (see note 1)
5*	Mc	ModoConv	C3	Conversion speed menu (see note 3)
6	Cd	ContrASt	C3	Display contrast menu (see note 2)

* Available only in Sd status = -2

Table 5

Note 2: a short activation of E on the CONTRAST page activates the relative submenu with the presentation of the contrast level (Set X) whose X value corresponds to the light intensity of the display in question; use the > or < keys to modify the brightness; use the E key to quit the submenu and go back to the main Cd page

6.2.5. Chapter 4 - Communication

Provides the parameters useful for communication and dependent on the SSM model

GSM/NB IoT model:

Sequence	Explanatory Field	Numerical field	Flag Field	Notes
1	TC	CC xx nn	C4	Communication Test Page
2	QC	CSq xx	C4	Current CSQ value (99 = not detected)
3	lc	Nnnnnnn or -----	C4	lccd code (if detected)


Table 6

RF 169 model:

Sequence	Explanatory Field	Numerical field	Flag Field	Notes
1	TC	169 Off or 169 On	C4	Communication test page

Table 7

6.3. Alarm icon

The icon on the display  used to indicate the alarm, turns on steady for one or more of these alarm in progress conditions:

- Error in the measuring system
- Unauthorised battery door opening error (tampering)
- Integrity error of the FW code
- Temperature out of range or in error

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- Reverse flow beyond threshold error (default >150L reverse, programmable)

When one or more of these alarms that were active, are cleared (i.e. the alarm condition disappears), the icon will flash to indicate that no alarm is active but it occurred during the gas day period.

On the next gas day, this flashing status will also be restored and the icon will be turned off.

If, during the flashing one or more alarm conditions should occur, the alarm icon will be displayed steady on.

7. Configuration

The device configuration can occur from the local ZVEI port or remotely from SAC, always by means of the DLMS protocol, as specified in the provisions of standards series UNI/TS 11291.

8. Maintenance

8.1. Routine maintenance

8.1.1. Replacing the batteries

The SSM-U4 metrological battery is sized to assure an autonomy of more than 16 years under normal environmental and operating conditions (see paragraph 10.3) and, therefore, it is not necessary to replace it.

The transmission battery is proportioned to ensure an autonomy as defined in chapter 5.3; some product versions foresee the possibility to replace the battery.

To replace it, just remove the black seals on the front battery cover; unscrew the two tightening screws; remove the front cover and disconnect the battery connector from the board.

Repeat the same steps in reverse order to connect the new battery (**Fig.6**).

When the front battery cover is removed, an electro-mechanical anti-tampering device will trigger a front cover removal signal.

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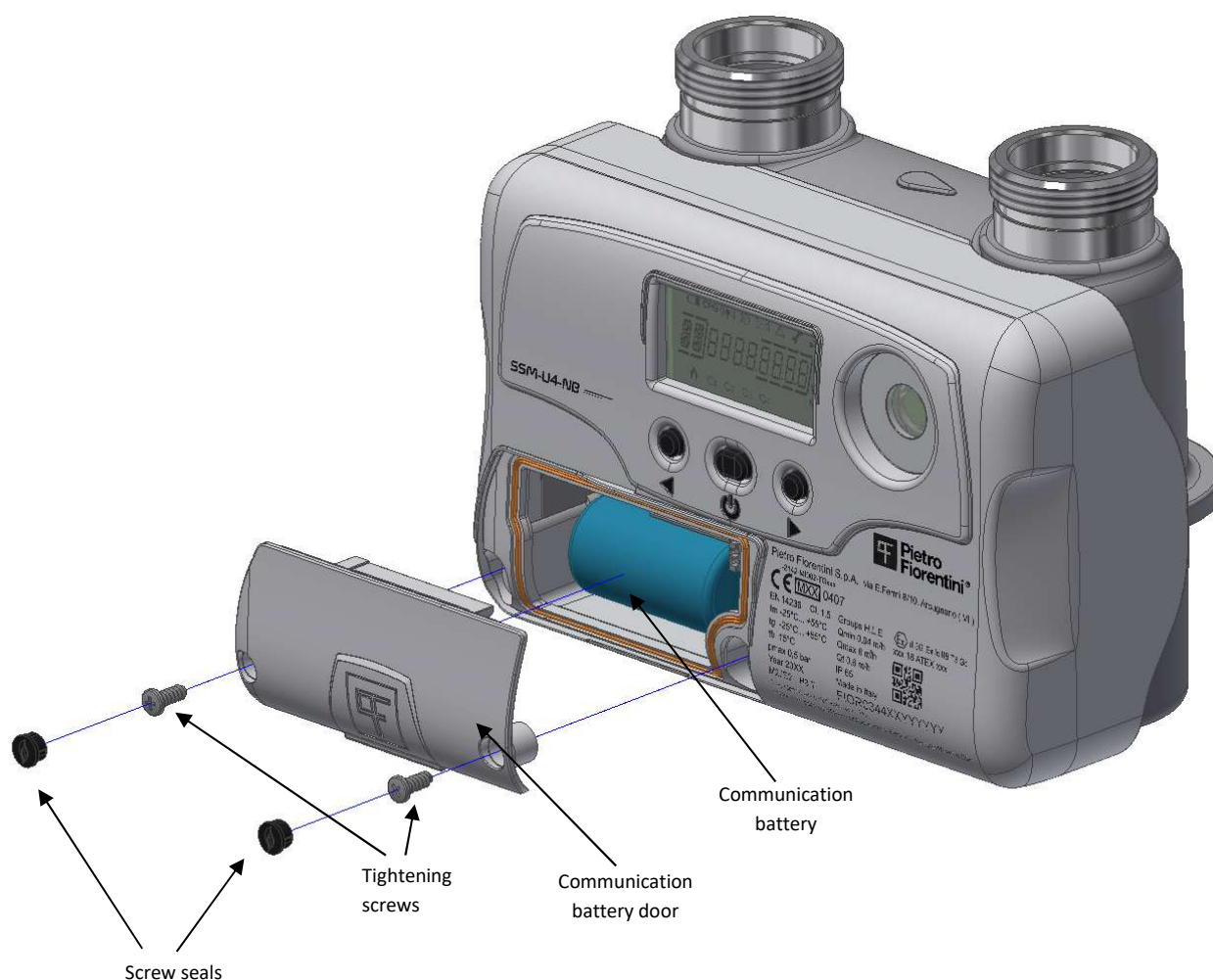


Figure 6 – Battery replacement



8.1.2. SIM replacement (only for SSM-U4-GPRS and SSM-U4-NB versions)

To replace the SIM, proceed as follows:

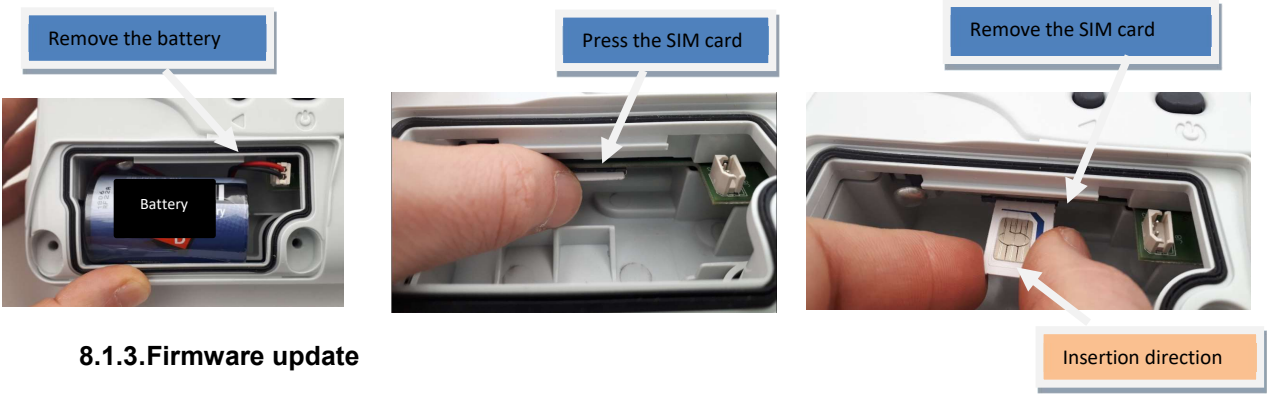
- Remove the seals on the front battery cover (fig.6);
- Unscrew the two tightening screws (fig.6).
- Remove the front battery cover (fig.6);
- Open the battery cover;
- Remove the battery;

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- Press the SIM card to load the push/pull extraction mechanism;
- Remove the SIM card;
- To reinsert the SIM card follow these same steps in reverse order, paying attention to the proper insertion direction in the appropriate slot.

When the transparent front cover is removed, a mechanical anti-tampering device will trigger a front cover removal signal.



8.1.3.Firmware update

In case of release of a new firmware version, notes that describe the changes made compared to the previous version are distributed. The firmware update can easily be performed also remotely. Contact Pietro Fiorentini for further details.

8.2. Device replacement and disposal

For environmental reasons, when removal is required, the device must not be disposed of with common waste. Dispose of the device pursuant to the provisions of It. Legislative Decree 14 March 2014, no. 49 "Implementation of directive 2012/19/EU on waste electric and electronic equipment (WEEE).



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8.2.1. Battery disposal

When disposing of the batteries, they must be removed from the device, as indicated in Directive 2006/66/EC art.12 paragraph 3. The device is equipped with two non-rechargeable batteries, with Lithium – Thionyl chloride technology (Li-SOCl₂) described in paragraph 10.3.

Metrological battery

The Size D metrological battery, with bobbin technology, rated voltage of 3.6 Vdc, rated capacity 19 Ah, is located in the compartment containing the circuit board, underneath it. To access the battery, remove the front battery cover by breaking the two seals and unscrewing the two tightening screws. It is subsequently necessary to remove the rear metrological seal and the four screws. It is now possible to remove the metrological battery.

The battery bears the symbol of separate waste collection for batteries and accumulators, displaying a crossed-out wheeled waste bin.



Communication battery

The battery communication:

- Size D, rated voltage of 3.6 Vdc, rated capacity 19 Ah for the product versions SSM-U4-GPRS and SSM.U4-NB
- Size C, rated voltage of 3.6 Vdc, rated capacity 8.5 Ah for the product version SSM-U4-RF169

is located in the specific compartment at the bottom left part of the electronic numerator. To remove it, just remove the two seals on the front battery cover; unscrew the two tightening screws; remove the front battery cover; open the battery cover and disconnect the battery connector from the board.

The battery bears the symbol of separate waste collection for batteries and accumulators, displaying a crossed-out wheeled waste bin.



9. Technical features

9.1. General features

Parameter	Features	
Enclosure	Main body:	Polycarbonate
	Transparent body:	Polycarbonate
Protection rating	IP 65	
Dimensions (overall)	SSM-U4	Max 147mm(H) x 193mm(L) x 105mm(D)
Centre distance	SSM-U4	110 mm
Gas type	2nd Family gas, H, L and E type	UNI EN 437:2003
Operating pressure	0.5 bar	
Display	Black and white LCD with segments	
Resistance to high temperatures "T"	Resistance to high temperatures	EN 14236:2007, paragraph 7.2
Keyboard	3 front operator keys	
Operating/storage temperature	-25°C to +55°C / -25°C to +70°C	
Certifications	Atex (II 3G Ex ic IIB T3 Gc), MID	
Frequency band	(1) GSM/GPRS: 900MHz, 1800MHz (2) NB-IoT: 791-960 MHz (3) RF169: 169MHz	
Metrological battery	Type:	3.6 V lithium battery
	Format:	Size D
	Autonomy:	>16 years
Transmission battery (GPRS)	Type:	3.6 V lithium battery
	Format:	Size D
	Autonomy:	>8 years
Transmission battery (NB)	Type:	3.6 V lithium battery

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	Format:	Size D
	Autonomy:	>16 years
Transmission battery (RF169)	Type:	3.6 V lithium battery
	Format:	Size C
	Autonomy:	>16 years
Microprocessor	STM32L152	32 bit
Code memory	384 Kbyte Flash type	
Data memory	Type:	EEPROM 12 Kbyte
	Data storage	>20 years
Real Time Clock	RTC always active Accuracy according to EN62054-21	
Accuracy	Accuracy class 1.5/1	According to MID

(*) Operating conditions

Ambient temperature	Ta min (-25°C)
Range	Max
Use of local display:	15 minutes per month
Use of local interface	15 minutes per month
Valve control	1 cycle per year
Code update	2 in 15 years

9.2. Communication ports

Parameter	Features	
Local communication port	Physical level	ZVEI (IEC 62056-21)
	Speed	9600 baud
	Application level	DLMS protocol

9.3. Power supply devices

SSM-U4 can be powered ONLY by a special approved battery pack.

Metrological battery

Powering of the metrological equipment is guaranteed by a non-rechargeable lithium battery with duration > 16 years under reference operating conditions (see *Table 8* below).

A single non-rechargeable cell is used, with Lithium - Thionyl chloride technology (Li-SOCl₂)

The main features are:

Size D with bobbin technology;

Rated voltage of 3.6 Vdc.

Rated capacity 19 Ah.

The bobbin technology assures a maximum current limited by significant intrinsic internal resistance; however, it still provides sufficient current for the device operation.

Wiring with polarised connector, to assure proper connection to the printed circuit board.

The cell is fastened inside the meter; it cannot be replaced and it is protected by metrological seals.

GPRS and NB-IoT Battery

The GPRSe NB-IoT versions have an additional replaceable battery, positioned in a compartment accessible without removing the metrological seals.

A single non-rechargeable cell is used, with Lithium - Thionyl chloride technology (Li-SOCl₂)

The main features are:

Size D with bobbin technology;

Rated voltage of 3.6 Vdc.

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Rated capacity 19.0 Ah.

The bobbin technology assures a maximum current limited by significant intrinsic internal resistance; however, it still provides sufficient current for the device operation.

Wiring with polarised connector, to assure proper connection to the printed circuit board.

The cell is enclosed within the meter, accessed by a small panel that can be opened without removing the metrological seals, yet protected by a mechanical anti-tampering device.

RF169 Battery

The RF169 version has an additional replaceable battery, located in a compartment accessible without removing the metrological seals.

A single non-rechargeable cell is used, with Lithium - Thionyl chloride technology (Li-SOCl₂)

The main features are:

Size C with bobbin technology;

Rated voltage of 3.6 Vdc.

Rated capacity 8.5 Ah.

The bobbin technology assures a maximum current limited by significant intrinsic internal resistance; however, it still provides sufficient current for the device operation.

Wiring with polarised connector, to assure proper connection to the printed circuit board.

The cell is enclosed within the meter, accessed by a small panel that can be opened without removing the metrological seals, yet protected by a mechanical anti-tampering device.

Reference operating conditions			
Ambient temp.	2%	of the time at	-25°C
	10%	of the time at	-10°C
	15%	of the time at	+5°C
	50%	of the time at	+20°C
	15%	of the time at	+35°C
	5%	of the time at	+50°C
	3%	of the time at	+70°C
User interface	15 minutes per month		Buttons/Zvei
	15 minutes per month		Display
Temperature measurement	1 measurement every 30 sec		
Range	Qmax		

Table 8