



RSE



Smart GAS meter

RSE / 1,2 LA N1 – RSE / 2,4 LA N1



Use and Maintenance Manual
Point-to-Point Version (PP)

Rev. 00	Date 16/11/17
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Contents

1.	Introduction.....	5
1.1.	Identification of the product	5
1.2.	Packaging content	7
2.	Safety instructions	8
2.1.	Electrostatic discharges	8
2.2.	Connecting to other devices.....	8
2.3.	Power supply devices	8
2.4.	Safety instructions for installation in the hazardous area.....	9
3.	General description	9
4.	Main functions.....	11
4.1.	Shut-off valve.....	11
4.1.1.	Procedure for opening the valve through the user interface	11
4.2.	Digital outputs	11
4.3.	Data recording	11
4.4.	Acquisition.....	12
4.5.	Events and diagnostics	12
4.6.	Activation.....	12
4.7.	Communication	12
4.8.	User interface	12
5.	Installation.....	13
5.1.	Mechanics installation.....	13
5.2.	Connection to the system.....	14
5.2.1.	Using the ZVEI probe	14
5.3.	Power supply	15
5.3.1.	Connecting the batteries	15
5.3.2.	Power supply status.....	15
5.4.	Safety and fraud prevention.....	16
6.	User interface	17
6.1.	Keyboard.....	17
6.2.	Display	17
6.2.1.	Display testing capabilities	17
6.2.2.	Menu field	18
6.2.3.	Units of measurement field.....	18

6.2.4.	Numerical field	19
6.2.5.	Icons and alarms field.....	19
7.	Menu structure.....	20
7.1.	Chapters.....	20
7.1.1.	Volume totaliser under reference conditions in the current billing period	20
7.1.2.	Volume totaliser subject to alarm in current billing period	20
7.1.3.	Volume totaliser for price range 1 in current billing period.....	20
7.1.4.	Volume totaliser for price range 2 in current billing period.....	21
7.1.5.	Volume totaliser for price range 3 in current billing period.....	21
7.1.6.	Volume totaliser under reference conditions in the previous billing period	21
7.1.7.	Volume totaliser subject to alarm in previous billing period	21
7.1.8.	Volume totaliser for price range 1 in previous billing period.....	22
7.1.9.	Volume totaliser for price range 2 in previous billing period.....	22
7.1.10.	Volume totaliser for price range 3 in previous billing period.....	22
7.1.11.	Invoice Date	22
7.1.12.	Diagnostics.....	23
7.1.13.	User Message	23
7.1.14.	Redelivery Point (PDR) ID	24
7.1.15.	Valve status.....	24
7.1.16.	Maximum conventional flow rate	24
7.1.17.	Maximum current conventional flow rate referring to the previous billing period.....	25
7.1.18.	Current fee scheme identifier	25
7.1.19.	Fee scheme identifier referring to the previous billing period	25
7.1.20.	Status of the device	26
7.1.21.	Date	27
7.1.22.	Hour	27
7.1.23.	Current rate	28
8.	Configuration.....	29
9.	Maintenance.....	29
9.1.	Routine maintenance	29
9.1.1.	Replacing the batteries.....	29
9.1.2.	SIM Replacement.....	30
9.1.3.	Firmware update	30

9.2.	Device replacement and disposal.....	30
9.2.1.	Battery disposal	31
10.	Technical features	32
10.1.	General features	32
10.2.	Communication ports	33
10.3.	Power supply devices	33
11.	Declaration of conformity	34
11.1.	EC Declaration of conformity (DoC)	34
11.2.	Transmission features	34
11.3.	Limitations	34

1. Introduction

RSE is a family of products dedicated to measuring gas volume, which involves the application in end points of redelivery of natural gas networks. This document refers to versions RSE / 1,2 LA and RSE / 2,4 LA N1. The product incorporates a mechanical device for measuring the gas volumes based on the diaphragm metering technology with an electronic processor able to guarantee the functions set forth by the resolution 631/2013/R/GAS issued by AEEGSI on 27/12/2013, as well as to allow the remote reading and remote control of the flow without the use of additional external devices. RSE meters are used in low pressure measuring systems (<0.5 bar gauge) with a flow rate lower than 10m³/h (class A2 according to the classification of UNITS 11291).

RSE 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 involved device, with application starting from the firmware release LR xxx / NLR yyy.

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

- IP 55 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;
 - 868 MHz
 - GPRS/GSM;
 - NBloT (B20 800MHz and B8 900MHz)

1.1. Identification of the product

The product can be identified by the metrological cover shown in **fig.1** positioned on the front of the device as shown in **fig.2**, which bears the following symbols and data

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

Type of model:

Code format G4/G6 NB-IoT B8/B20

RSE / 1,2 LA N1; RSE / 2,4 LA N1

Name of the logic device:

Format FIO-R-03-WV-YY-XXXXXX;

FIO Fixed data indicating the manufacturer (Pietro Fiorentini SpA) according to the Flag Association;

R Reserved;

03 Type of device (GAS meter);

W Type of gauge;

S Type of communication

YY Year of manufacture;

XXXXXX Progressive number;

The intended product versions are shown below:

Version Code "W"	Type of gauge
"1"	G 1.6
"2"	G 2.5
"4"	G 4
"6"	G 6

Version Code "V"	Type of communication
"0"	PM (169 MHz)
"1"	PP (GSM)
"2"	868 MHz
"3"	NBloT B8
"4"	NBloT B20

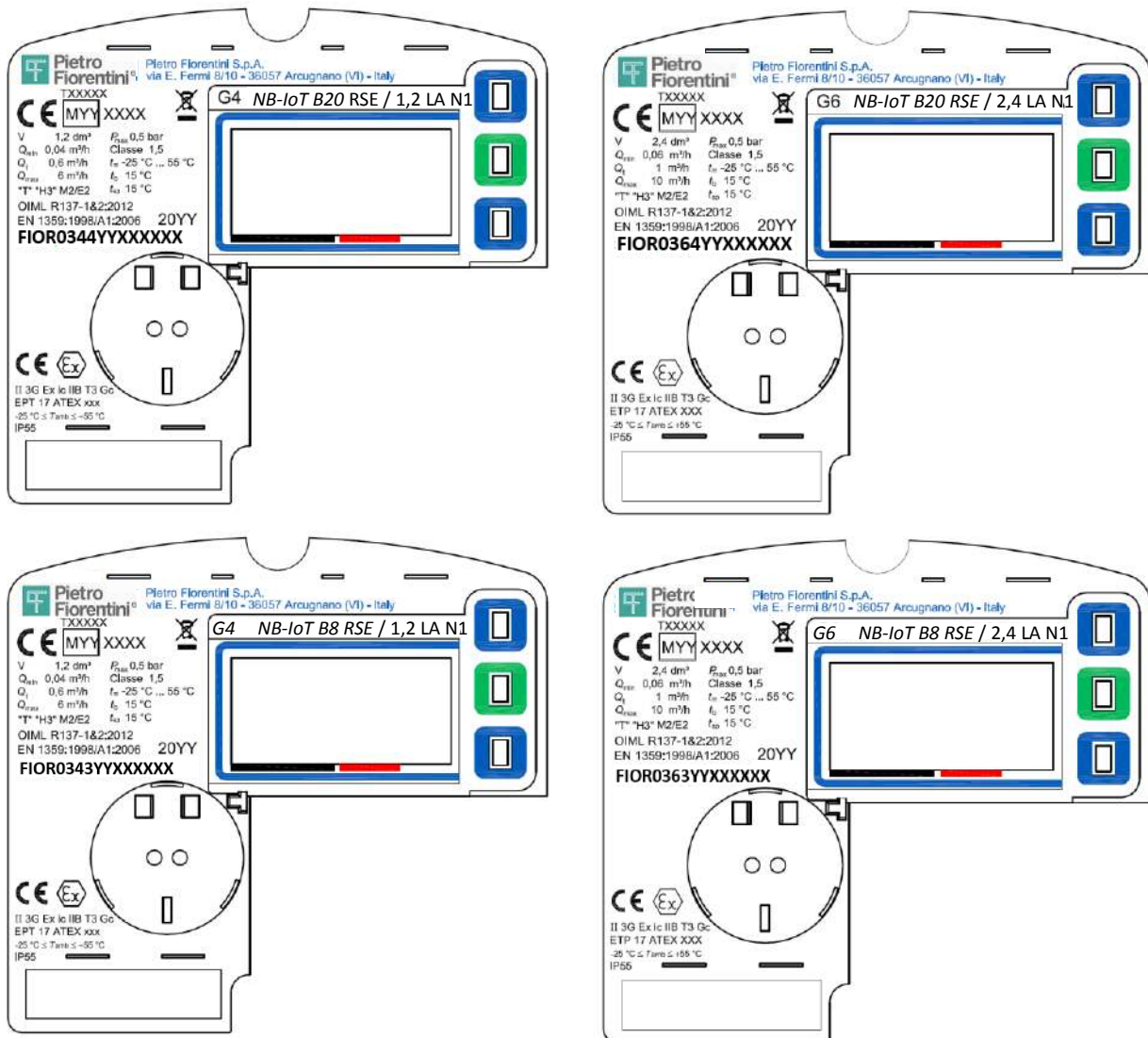

Fig.1



Fig. 2

1.2. Packaging content

The package contains the following parts:

Device

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

The batteries are already wired inside in their operating seat.

Manual

- User Manual:

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

Certificates

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

2. Safety instructions

RSE 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 the type of protection Ex ic IIA T3 Gc, 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 from electrostatic discharges could generate explosions in extreme cases. Although during normal operation there is no presence of 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.



During the installation or use of this instrument, it is appropriate to take steps to assure protection against electrostatic discharges.

Pietro Fiorentini SpA denies all liabilities resulting from the risks and consequences caused by non-compliance with these provisions

2.2. Connecting to other devices

There is no RSE connection with external devices.

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

RSE can connect, using the NBloT 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

RSE can be powered exclusively by a special 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, coated by a protective sheath.

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

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

The connector of the battery pack is polarized in such a way as to fit only in the connector specifically provided for on the device, observing the correct polarity.

The following data are given on the battery pack:

- Model;
- Maximum output levels;
- Week and year of manufacture;
- Quality pass upon acceptance

The metrological battery pack is sufficient to assure an autonomy of at least 15 years under the reference operating conditions specified in paragraph **Technical features**.

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

2.4. Safety instructions for installation in the hazardous area

This equipment has to be installed and operated in compliance with the provisions and regulations in force.
The manufacturer cannot be liable for damage resulting from failure to follow instructions and inappropriate use.

Safety warning

All works 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 shall be transported being kept in vertical position.
Upon receipt of the product, examine the supplied material.
Immediately notify any shipping damage.

Storage

As a rule, meters have to be stored in vertical 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 with respect to 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, positioned in the system upstream of the meter, has to be opened in a gradual manner in order to make the gas flow homogeneously, without violent shocks that could 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 works in general have to be performed by qualified personnel, in compliance with the provisions in force concerning safety.

3. General description

Figures 3 and 4 illustrate the structure and the main parts of the device.

The device consists of:

A metal enclosure containing in it:

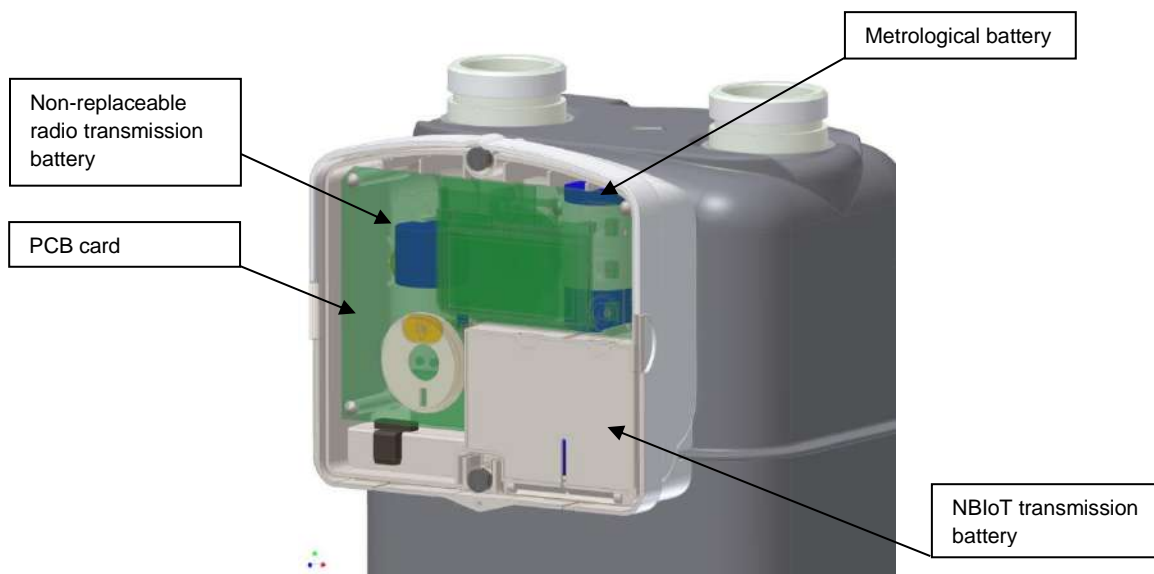
- The mechanics for measuring the volumes complying with that of the RS/2001 meter;
- The flow shut-off valve;
- The sensor for measuring gas temperature;
- The permanent memory device (see paragraph 4.3 data recording);

A plastic enclosure containing in it:

- The electronic measurement and communication card;
- The battery(batteries)

On the front of the plastic container there are:

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


Fig.3 View of RSE / 1,2 LA, RSE / 1,2 LA N1

Fig. 4 – Meter internal view

RSE is a measuring instrument with accuracy class 1.5 or 1 (upon request), as defined in Directive 2014/32/EU (MID). RSE is able to count the amount of gas that has passed through the meter in different consumption ranges in relation to the time in which it was measured, in compliance with the provisions of the resolution 631/2013/R/GAS issued by AEEGSI on 27/12/2013.

4. Main functions

4.1. Shut-off valve

With reference to the standards of the series UNI/TS 11291, RSE 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 inlet connection and is not accessible without causing permanent damage to the meter itself.

The purpose of the valve is to intercept the gas flow towards the user exclusively for commercial purposes. **In no way or condition must the valve be considered and used as a useful device to assure safety conditions in the user's plant in case of possible or patent gas leakages.**

The valve is specifically designed to assure its performance and functioning 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 its correct operation.

The valve can be closed:

- Due to a remote control 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 attempted beyond the threshold (configurable);
- 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 the keyboard according to a special procedure (see chapter 4.1.1)

The 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, RSE must have first of all 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, under the **SV** valve menu the following will appear on the display:

VAL 40 r —————> valve enabled to be opened

Press **ENTER** to access the submenu.

It could be necessary to enter a password to configure valve opening: 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:

VAL 00 A —————> valve open

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

4.2. Digital outputs

RSE does not have any digital outputs

4.3. Data recording

With reference to the standards of the series UNI/TS 11291, RSE 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

4.4. Acquisition.

The flow rate measurement is carried out continuously by means of the mechanical system consisting of two measuring chambers (of known volume) with deformable diaphragms, which expand and contract alternately. This movement, induced by the pressure difference between the inlet and outlet passages, operated by a crank mechanism, is transmitted to a pin that makes a complete turn every cyclic volume of gas passing through.

The movement of the pin causes the rotation of an encoder; such rotation is detected by means of two optical sensors. The management of both HW and SW is carefully optimised to minimise the consumption of the measuring circuit and the processor awakening time.

The optical sensor provides sufficient resolution to allow the measurement of the amount of gas, both during operation and for the certification/production/calibration steps, using in this case a modified counting algorithm.

The two pairs of LED phototransistor sensors are positioned at 90° to one another. For each rotation of the encoder divided into full and empty sectors, a given sequence of statuses is therefore available.

The coding of this sequence allows identifying a regular counting, a reverse rotation, or an oscillation. In this way, it is possible not to affect the taken measurement in any way.

The system, consisting of an encoder and optical sensors, represents the interface between the measuring mechanics and the calculation and management electronics.

The piloting and detection of the optical sensors is entrusted directly to the microprocessor, which also performs an ongoing diagnostic activity to highlight any faults and fraud attempts made by blinding the sensors. The piloting of the sensors is carried out in a controlled manner, which is such as to assure proper operation during the whole RSE life-cycle.

The measurement of the temperature, required for the calculation of the volumes on the reference thermodynamic conditions, is carried out using a temperature sensor with a resolution of 10 bits, which provides a measurement in Kelvin degrees with a resolution of 0.25°C in a time span of 50ms.

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, RSE implements in particular the following services:

UNI/TS 11291-1 4.3.9 Service: Detection and reporting of anomalies
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, RSE 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: Management 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

RSE has two communication interfaces, a local one and a remote one:

Local interface:

Optical port Infrared port complying with the 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:

NBLoT modem Integrated in the device, antenna included and cannot be remote-controlled;

The NBLoT modem, 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 allows only the consultation of the parameters and provides access to the **SD** "status of the device" menu.

5. Installation

RSE is suitable for installation in hazardous areas classified as ATEX Zone 2, with II 3G Ex ic IIB T3 Gc certification.

3G: suitable for installation in Zone 2 atmospheres

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

T3: Maximum allowable surface temperature: 200°C.

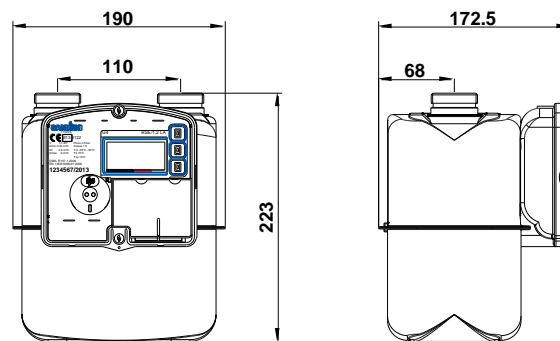
Caution!

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

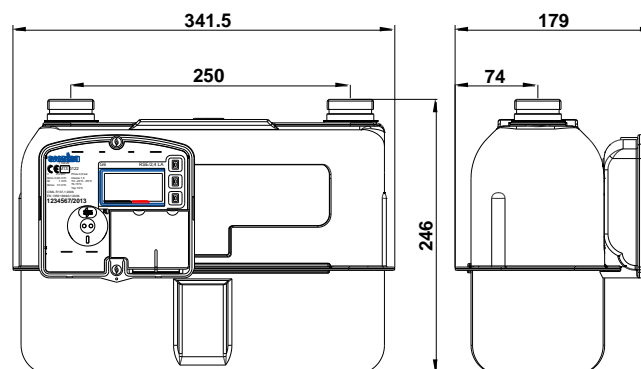
5.1. Mechanics installation

The overall dimensions of RSE are shown below.

RSE is fastened to the system using a special shelf for GAS meter.



MODEL RSE / 1,2 LA N1



MODEL RSE / 2,4 LA N1

Fig. 5 – Overall dimensions

5.2. Connection to the system

- After installation, RSE must be connected to the system. Before performing the connection, make sure that at least the portion of the plant upstream of the meter is sectioned and that, therefore, there cannot be any flow of gas during the 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 necessary, use fittings (not supplied) to connect RSE to the piping.
- During the tightening of the fittings, do not exceed the torque of 110Nm;
- RSE operates only in vertical position;
- RSE is provided with a shut-off valve in the "open" status; therefore, it is ready to deliver and measure.
- Verify that the utilities on the customer side are closed.
- Slowly load the RSE meter with pressure.
- If on the meter a piping for pressure measurement has been subsequently installed, check the tightness of the related connection.
- After leak testing, slowly remove pressure to the RSE meter.

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

Pietro Fiorentini meters require no maintenance.

WARNING

When the meter is disassembled, it may contain a residual amount of gas. Considering the danger of explosion, it is necessary to take safety measures, e.g.:

- After disassembling the RSE meter, clean it very well with an inert gas.
- For transporting the meter with residual amounts of gas, use a vehicle with an open or vented 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 RSE with the cable facing downwards. The magnet and the groove will retain the probe in place.

To enable the communication on the ZVEI optical port, it is sufficient to activate 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 RSE meter can be powered exclusively by batteries.

The metrological battery is dimensioned to assure the operation of RSE for at least 15 years. The battery autonomy was estimated in the following reference operating conditions:

The NBloT transmission battery is dimensioned to assure the operation of RSE for at least 16 years. The battery autonomy was estimated in the following reference operating conditions:

NBloT communication to the Distributor:

3 NBloT cycles per day with NB-LoT network which supports the PSM (Power Safe Mode) and network timing parameters equal to or better than those suggested by the meter to the network with appropriate network functions.

2 code updates in 15 years

Display message/ZVEI communication

5 minutes per month

Valve control:

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

Ambient temperature profile:

5% of the time at -25°C;

20% of the time at -10°C;

50% of the time at 22°C;

20% of the time at 55°C;

5% of the time at 70°C.

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

5.3.1. Connecting the batteries

RSE is supplied with the metrological battery already connected and inserted in the related compartment; therefore, RSE is ready for operation.

5.3.2. Power supply status

The power status shows the current battery level.

The functionality of calculation of the actual use of the battery 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 the value set as threshold, the appropriate alarm event is triggered.

5.4. Safety and fraud prevention

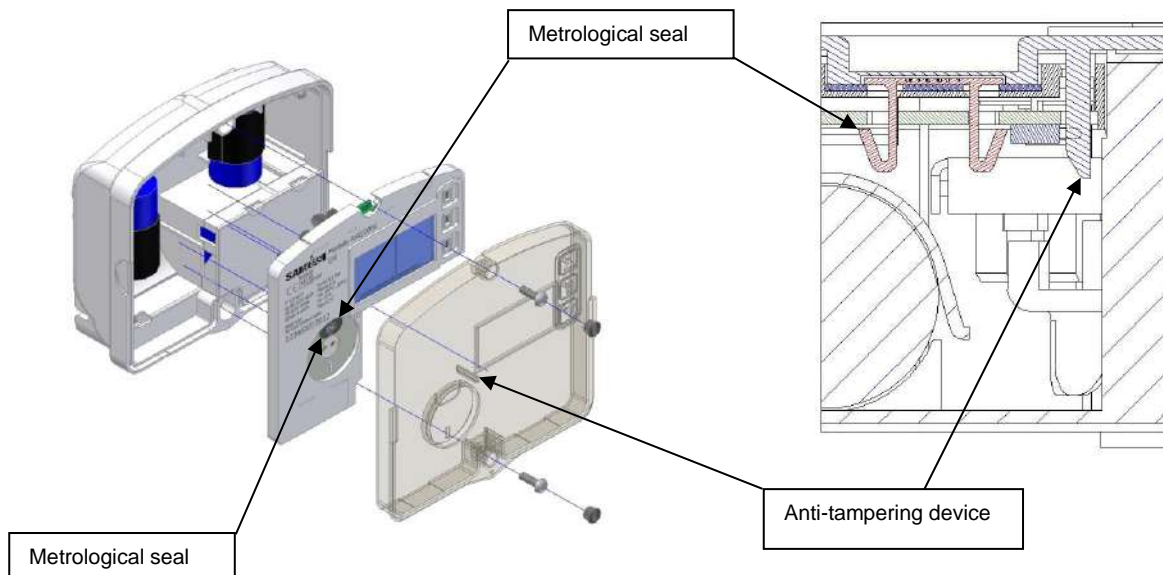
The solutions implemented on the RSE meter to assure safety comply with the requirements set forth by the standard UNI TS 11291.

With reference to the standards of the series UNI/TS 11291, RSE 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

RSE implements all safety policies 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;
- Using interface equipment usually available to the user it is only possible to read the data and it is not possible to perform any configuration;
- The configurations that can be performed through the communication channels with which the device is equipped - which can be carried out only by authorised personnel - leave a track as they are stored in the relevant memory log (Metrological Log);
- Attempts to tamper with the proper functioning of the meter are detected and recorded in the Metrological Log;
- Attempts to access the meter through the communication channels with which it is equipped by unauthorised personnel are detected and recorded in the Metrological Log;
- The commands sent by external devices through the communication channels with which the device is equipped are verified in terms of the 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.



6. User interface

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

With reference to the standards of the series UNI/TS 11291, RSE 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

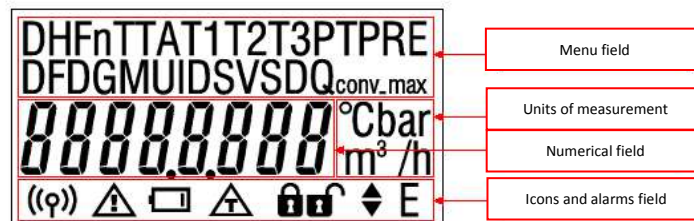
The interaction occurs through three keys: up and down scrolling (blue) and Enter (green) on the front of the device.

6.2. Display

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

The size of the digits represented 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.



The meaning of the graphical elements is outlined in the following table:

Menu field	Each menu can be identified by a letter or a combination of letters and numbers
Units of measurement field	See table for units of measurement
Numerical field	8 7-segment digits displaying the value associated with the displayed menu
Icons and alarms field	See table for icons and alarms

To allow a long battery life, the display is usually kept OFF. To activate it, just press the green middle key.

6.2.1. Display testing capabilities

When the display is turned off and the green middle key is pressed, a test sequence is displayed to check the presence of defective segments or icons.

The test sequence lasts 3 seconds and turns on all segments and icons of the display at the same time. At the end of this step, the first page of the menu is displayed. The description of the menu and the order in which the information is displayed are shown below.

6.2.2. Menu field

Icon	Meaning	Notes
T	Volume totaliser at the reference conditions	
TA	Volume totaliser in alarm	
T1	Volume totaliser under reference conditions for range 1	
T2	Volume totaliser under reference conditions for range 2	
T3	Volume totaliser under reference conditions for range 3	
PRE	Added to T, TA, T1, T2 or T3	When the count refers to previous billing periods
DF	Invoice date	
DG	Diagnostics	
MU	User message	
ID	Re-delivery point identifier	
SV	Valve status	
Q_{conv.max}	Maximum conventional flow rate	
Q_{conv.max}	Maximum conventional flow rate referring to the previous billing period	
PT	Current pricing plan	
PT PRE	Pricing plan referring to the previous billing period	
SD	State of the device	
D	Date	
H	Hour	
Fn	Current price range	









6.2.3. Units of measurement field

Icon	Meaning	Notes
°C	When a temperature value is displayed	
bar	When a pressure value is displayed	
m³	When a volume value is displayed	
/h	When a flow rate value is displayed	Used together with the icon m³

6.2.4. Numerical field

It consists of 8 7-segment digits and gives the value associated with the displayed menu page.

6.2.5. Icons and alarms field

Icon	Description	On	Flashing
	Communication	Radio communication method	
	General alarm	Active alarm	Alarm not active but previously recorded and not yet displayed
	Low battery	Low battery to be replaced (residual charge <10%)	
	Temperature alarm	Active alarm	Alarm not active but previously recorded and not yet displayed
	Valve status	Valve closed	
	Valve status	Valve open	
	Available scrolling keys	Available scrolling keys to navigate the submenus	
	Enter key available	Enter key available	

7. Menu structure

This section shows the hierarchy of the pages making up the interface with the user.

Under normal operating conditions, the display is completely off. Pressing the green Enter key, the display turns on and performs a test in which all segments and icons are lit simultaneously for three seconds. At the end of the test, the first page of the menu is displayed.

If no key is pressed for about two minutes, the display returns to off status.

The various menus can be navigated by pressing the up and down arrow keys. Pressing the up button, it is possible to go back to the previous page; pressing the down button, it is possible to move to next page.

Some menus consist of various submenus; in this case, the letter E (Enter) is displayed on the bottom right corner of the display. By pressing the green Enter button, the submenu appears. By pressing the up and down buttons, it is possible to navigate inside the submenus.

7.1. Chapters

The various menus are identified by the letters shown on the display under "menu field".

Here below, there are the menus displayed in sequence, scrolling down after switching on the display.

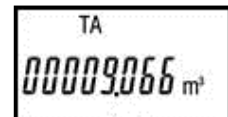
The sequence is circular; the list can be scrolled indifferently downwards and upwards. Once the corresponding end is reached, the display continues in the order defined below.

7.1.1. Volume totaliser under reference conditions in the current billing period



Abbreviation	T
Format	5 integers and 3 decimals *
Unit	m ³
Pressing enter	-
Legal relevance	YES

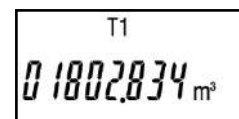
7.1.2. Volume totaliser subject to alarm in current billing period



Abbreviation	TA
Format	5 integers and 3 decimals *
Unit	m ³
Pressing enter	-
Legal relevance	YES

*) The display format of these totalisers can be changed to 4 integers + 4 decimals through the specific function of the "SD" menu. See the relative section for details.

7.1.3. Volume totaliser for price range 1 in current billing period



Abbreviation	T1
Format	5 integers and 3 decimals
Unit	m ³
Pressing enter	-
Legal relevance	YES

7.1.4. Volume totaliser for price range 2 in current billing period

T2
00030,805 m ³

Abbreviation T2
Format 5 integers and 3 decimals
Unit m³
Pressing enter -
Legal relevance YES

7.1.5. Volume totaliser for price range 3 in current billing period

T3
00079,690 m ³

Abbreviation T3
Format 5 integers and 3 decimals
Unit m³
Pressing enter -
Legal relevance YES

7.1.6. Volume totaliser under reference conditions in the previous billing period

T	PRE
00000,698 m ³	

Abbreviation T PRE
Format 5 integers and 3 decimals
Unit m³
Pressing enter -
Legal relevance YES

7.1.7. Volume totaliser subject to alarm in previous billing period

TA	PRE
00000,000 m ³	

Abbreviation TA PRE
Format 5 integers and 3 decimals
Unit m³
Pressing enter -
Legal relevance YES

7.1.8. Volume totaliser for price range 1 in previous billing period

T1	PRE
000089583 m ³	

Abbreviation T1 PRE
Format 5 integers and 3 decimals
Unit m³
Pressing enter -
Legal relevance YES

7.1.9. Volume totaliser for price range 2 in previous billing period

T2	PRE
00020690 m ³	

Abbreviation T2 PRE
Format 5 integers and 3 decimals
Unit m³
Pressing enter -
Legal relevance YES

7.1.10. Volume totaliser for price range 3 in previous billing period

T3	PRE
00066989 m ³	

Abbreviation T3 PRE
Format 5 integers and 3 decimals
Unit m³
Pressing enter -
Legal relevance YES

7.1.11. Invoice Date

DF
09-02-13

Abbreviation DF
Format dd-mm-yy
Unit -
Pressing enter -
Legal relevance YES

It expresses the date on which the data of the previous period refer (T/TA/T1/T2/T3 PRE)

7.1.12. Diagnostics



Abbreviation	DG
Format	4 digits (Hexadecimal Code)
Unit	-
Pressing enter	-
Legal relevance	YES

The encoding of the information shown complies with the provisions of the standard UNIT11291-11-, chapter 5.4.9.2, given here below.

Bit	Meaning
15	Reserved
14	Reserved
13	Reserved
12	1 = Valve enabling anomaly
11	1 = Daylight Saving Time active
10	1 = Tampering detected
9	1 = Battery level critical
8	1 = Battery level lower than 10%
7	1 = Device not configured or under maintenance; 0 = device configured
6	1 = Memory error
5	1 = Flow rate error
4	1 = Device generic error
3	1 = Measurement algorithm error
2	1 = Metrological Event Log \geq 90%
1	1 = Metrological Event Log complete
0	1 = Clock synchronisation failed

The 16 bits mentioned above are represented using a hexadecimal encoding (0 – F) by sets of 4, as shown below:

BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DIGIT	4				3			2		1						

Example:

Diagnostics:

Hexadecimal encoding : 0 8 0 2

Binary encoding : 0000 1000 0000 0010

Meaning:

Bit 1 = 1 → Metrological Event Log complete

Bit 11 = 1 → Daylight saving time active

7.1.13. User Message



Abbreviation	MU
Format	Text – 100 characters
Unit	-
Pressing enter	-
Legal relevance	NO

User message; information displayed pursuant to the provisions of the standard UNITS11291-11-1, chapter 5.4.8.13.

7.1.14. Redelivery Point (PDR) ID

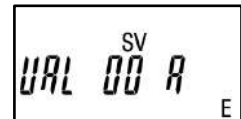


Abbreviation ID
Format 14 digits
Unit -
Pressing enter E
 By pressing enter, it is possible to scroll the 14 digits in both directions using the arrow keys.

Legal relevance Yes

Redelivery Point (PDR) ID

7.1.15. Valve status



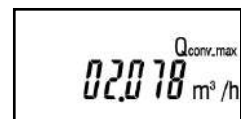
Abbreviation SV
Pressing enter Press the middle button to access the valve menu.
 The menu structure is shown below:
 To enter the password, use the up and down buttons to select the numbers; then, press the enter button to confirm.
 To perform the leak test, press the Enter button.
 Here below, there are all the submenus:

menu id	Operation	Description
VAL	00 A	Valve open
	20 C	Valve closed
	40 r	Valve enabled to be opened
VR	Nn	VR time remaining
VT	Nn	VT number of attempts
VP	Password entering / Opening	VP - - - - → opening not enabled VP PSSd --> opening not enabled, but can be enabled by entering password; press "Enter" to enter the password PUD 0 - - - --> enter password to enable valve opening VP OPEn --> opening enabled, press "Enter" to confirm valve opening
		Up and down to select Enter to confirm
VL	nn	VL leak test and result (dm3)

After re-opening of the valve, the device verifies the flow by measuring the volume transited in the 180 seconds following re-opening. If the set threshold is exceeded, the valve will re-close automatically.

Legal relevance NO

7.1.16. Maximum conventional flow rate



Abbreviation Qconv_max
Format 2 integers and 3 decimals
Unit m³/h
Pressing enter -
Legal relevance YES

7.1.17. Maximum current conventional flow rate referring to the previous billing period


Abbreviation Qconv_max PRE
Format 2 integers and 3 decimals
Unit m³/h
Pressing enter -
Legal relevance YES

7.1.18. Current fee scheme identifier


Abbreviation PT
Format 2 integers and 3 decimals
Unit m³/h
Pressing enter -
Legal relevance YES

7.1.19. Fee scheme identifier referring to the previous billing period


Abbreviation PTPRE
Format 2 integers and 3 decimals
Unit m³/h
Pressing enter -
Legal relevance YES

7.1.20. Status of the device

**Abbreviation
Format**

SD
Encoding (1 digit) Possible values:

-2	Production	[No sub-state present]
-1	Factory	[No sub-state present]
0	Operation	UNI/TS Status Normal
1		UNI/TS Status Maintenance
3		UNI/TS Status Not Configured
Other values > 0		[Not used]

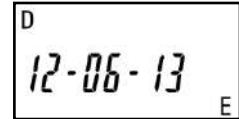
**Unit
Pressing enter**

-
E
Pressing the middle button, access is granted to the maintenance menu.
The menu structure is shown below:

Count Lo	Resolution of totalisers T and TA Pressing "Enter" activates resolution with 4 integers + 4 decimals after activating "high resolution" mode. The display will read "Count Hi". Pressing "Enter" again brings the resolution back to the 5 integers + 3 decimals configuration (Count Lo). If the operator makes no selection, the resolution goes back automatically to the default value (5 integers + 3 decimals) at midnight the next day.
T ---- °C	Current temperature of the gas: (refreshed every 2 seconds)
Set Lcd	LCD contrast setting Press enter, and then the up and down keys to select the desired contrast. Press enter again to confirm.
CC	Press Enter to run the GSM communication test The password must be entered Results: CC -- up in progress CC oo dn communication successful CC 88 dn – communication failed
CSQ	Value of RSSI GSM signal received (last connection carried out) 99 == signal missing
lccid	Press Enter to view the ICCID code of the inserted SIM card. Use the UP (rh) and DOWN (lh) keys to scroll the code. Press Enter to quit the display.
back	Press "Enter" to exit the current menu

Legal relevance

NO

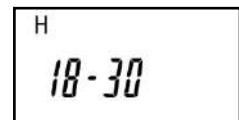
7.1.21. Date


Abbreviation D
Format dd-mm-yy
Unit -
Pressing enter E

By pressing enter, it is possible to display the information relative to the device's firmware and the general operating status; each piece of information is identified by the relative prefix, as shown in the table below:

01l	Metrological Firmware (LR) - CRC16
02l	Metrological Firmware (LR) - Firmware release
03b	Metrological Firmware (LR) -Bench boot section 0 - CRC16
04b	Metrological Firmware (LR) -Bench boot section 0 - Firmware release
05b	Metrological Firmware (LR) -Bench boot section 1 - CRC16
06b	Metrological Firmware (LR) -Bench boot section 1 - Firmware release
07n	Non-Metrological Firmware (NLR) - CRC16
08n	Non-Metrological Firmware (NLR) - Firmware release
-	Date of firmware update (00-00-00 if default version)
-	Time of firmware update (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 counter
16	FW upgrade events counter
17	FW upgrade not completed successfully events counter
18	Firmware restart events counter
19	CRC errors relative to LR data counter
20	Fraud events counter

Legal relevance YES

7.1.22. Hour


Abbreviation H
Format hh-mm-ss
Unit -
Pressing enter E

By pressing enter, it is possible to view the log of the last 32 firmware updates.

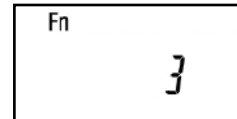
For each firmware update, a block of three submenus is added:

- CRC16 LR of the firmware
- Updating date
- Updating time

The firmware loaded at the factory is the first record (date and time set to 00-00-00).

If the download fails, 4 dashes ("----") are displayed, followed by the date and time of the attempt.

Legal relevance YES

7.1.23. Current rate

Abbreviation Fn

Format 1 digit

Possible values:

- 1 Range 1
- 2 Range 2
- 3 Range 3

Unit -

Pressing enter E

By pressing Enter it is possible to view the editing history of the last 128 parameters set.

For each parameter change, a block of 4 submenus is added:

- Parameter ID:
 1. Basic temperature;
 2. Fallback temperature
- Value (old);
- Date of change;
- Time of change;

Legal relevance YES

8. 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 the standards series UNI/TS 11291.

9. Maintenance

9.1. Routine maintenance

9.1.1.Replacing the batteries

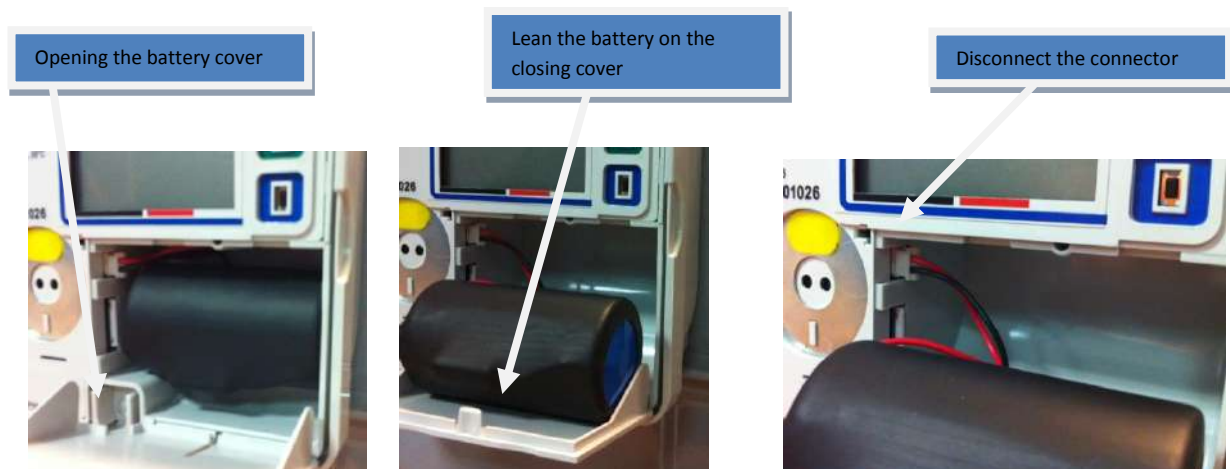
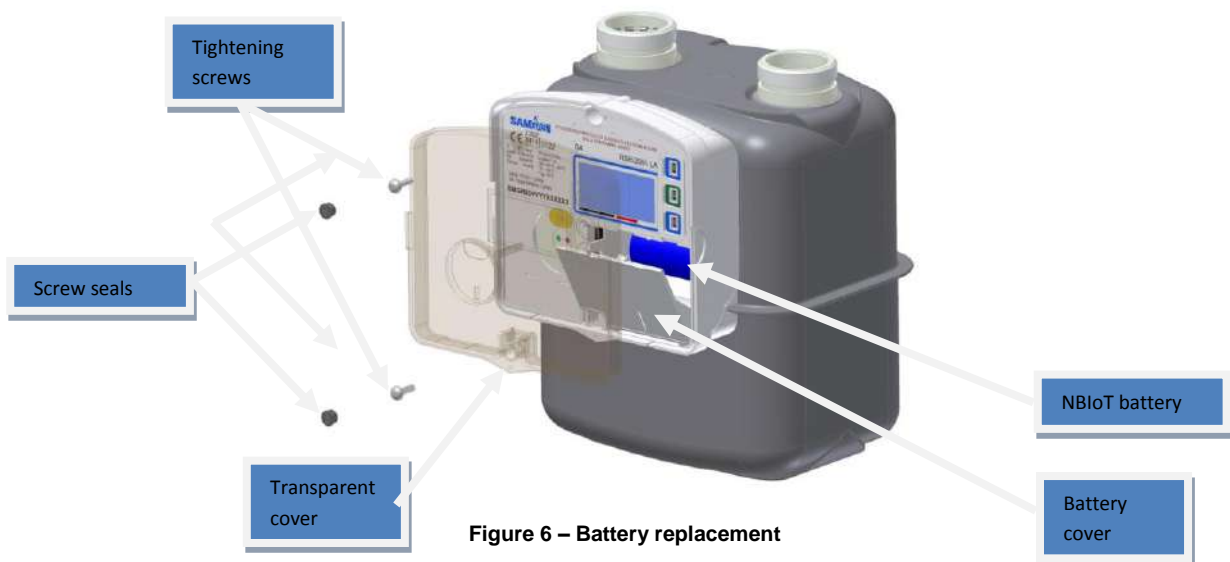
The RSE metrological battery is sized to assure an autonomy of more than 15 years under normal environmental and operating conditions (see paragraph 10.3) and, therefore, it is not necessary to replace it.

The NBloT transmission battery is sized to assure an autonomy of more than 16 years under normal environmental and operating conditions (see paragraph 10.3) and it is possible to replace it

To replace it, just remove the seals on the front cover; unscrew the two tightening screws; remove the front transparent cover; open the battery 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 transparent front cover is removed, a mechanical anti-tampering device will trigger a signal of occurred removal of the front cover.

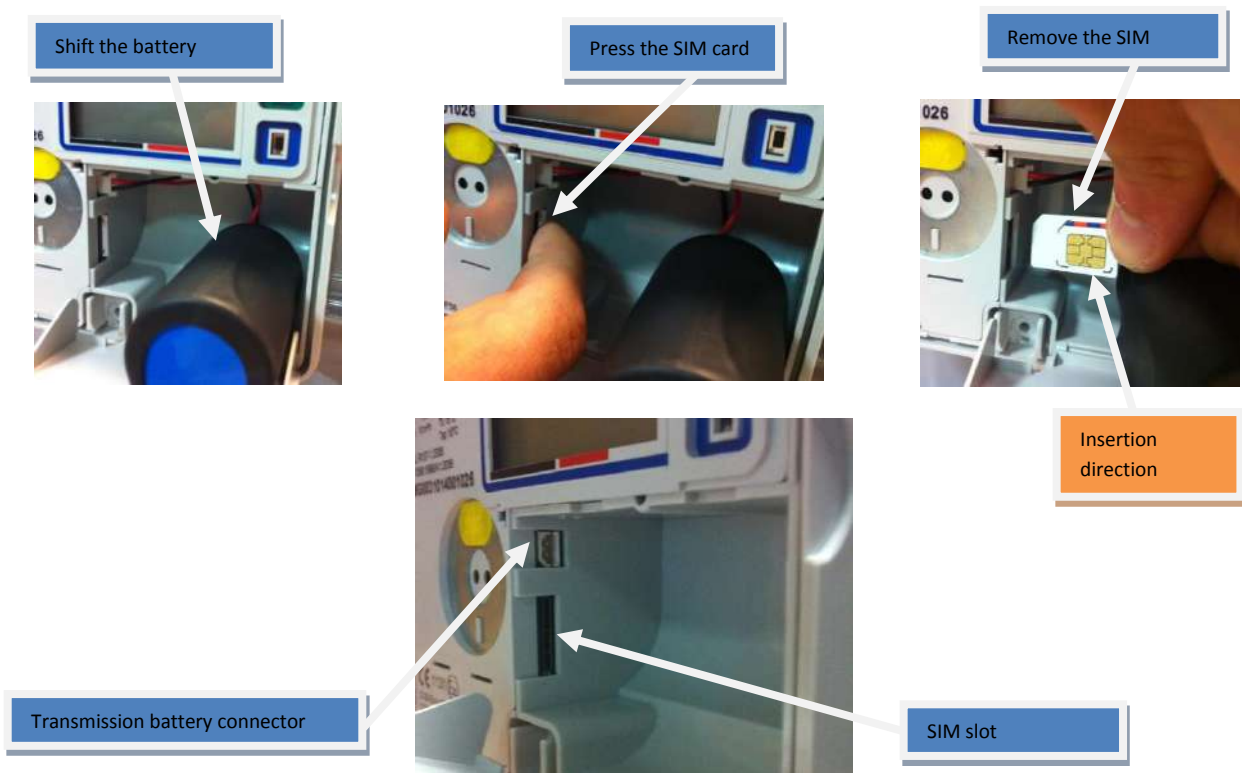


9.1.2. SIM Replacement

To replace the SIM, proceed as follows:

- Remove the seals on the front cover (fig.6);
- Unscrew the two tightening screws (fig.6).
- Remove the transparent front cover (fig.6);
- Open the battery cover;
- Shift the battery;
- Press the SIM card to activate the push/pull extraction mechanism;
- Remove the SIM;
- To reinsert the SIM follow these same steps in opposite sequence paying attention to the proper insertion direction in the relevant slot.

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



9.1.3. Firmware update

In case of release of a new firmware version, the 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.

9.2. Device replacement and disposal

For environmental-friendly purposes, when it is necessary to remove the device, it must not be disposed of with common waste.

Dispose of the device pursuant to that set forth by Legislative Decree -14 March 2014, no. 49 "Implementation of directive 2012/19/EU on waste electric and electronic equipment (WEEE).



9.2.1. 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 a Lithium – Thionyl chloride technology (Li-SOCl₂) as described in paragraph 10.3.

Metrological battery

The Size C metrological battery, with Bobbin technology, rated voltage of 3.6 Vdc, rated capacity 8.5 Ah, is located in the compartment containing the circuit board, underneath it. To access the battery, you must remove the outer transparent cover by breaking the two seals and unscrewing the two tightening screws. Then, in sequence, break the metrological seal and the cover where all the metrological texts of the instrument are found. You may then unscrew the three tightening screws of the circuit board to access the battery compartment. Remove the battery by unscrewing the two tightening screws of the fastening u-bolt and disconnect the connector from the board.

The battery bears the symbol of separate waste collection for batteries and accumulators, displaying a crossed-out wheeled waste bin (Photo 1).

Communication battery

The Size D communication battery, rated voltage of 3.6 Vdc, rated capacity 14 Ah, is located in the specific compartment at the bottom right part of the electronic numerator. To remove it, just remove the two seals on the front cover; unscrew the two tightening screws; remove the front transparent 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 (Photo 1).



10. Technical features

10.1. General features

Parameter	Features	
Enclosure	Main body: Transparent body:	Polycarbonate Polycarbonate
Protection degree	IP 55	
Dimensions (overall)	RSE/1,2 RSE/2,4	Max 223(H) x 190(L) x 172.5(P) Max 246(H) x 341.5(L) x 179(P)
Centre distance	RSE/1,2 RSE/2,4	110 mm 250 mm
Gas type	Methane gas, town gas, propane and butane gas from the first to the third family	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 1359:1998+A1:2006, paragraph 6.5.5
Keyboard	3 front operator keys	
Operating/storage temperature	-25°C to +55°C / -25°C to +60°C	
Certifications	Atex (Ex ic 3G IIB T3 Gc), MID	
Frequency band	NB IoT (B20 800MHz, B8 900MHz)	
Maximum transmitted power	23dBm±2dBm	
Metrological battery	Type: Format: Autonomy:	3.6 V lithium battery Size C > 15 years
Transmission battery	Type: Format: Autonomy:	3.6 V lithium battery Size D >16 years
Microprocessor	STM32L152	32 bit
Code memory	384 Kbyte Flash type	
Data memory	Type: Data storage	EEPROM 12 Kbyte >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:	10 minutes per month
Use of local interface	5 minutes per month
Valve control	1 cycle per year
Code update	2 in 15 years

10.2. Communication ports

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

10.3. Power supply devices

RSE can be powered EXCLUSIVELY by a special approved battery pack.

Metrological battery

Powering of the metrological equipment is guaranteed by a non-rechargeable lithium battery with a duration > 15 years under reference operating conditions (see table below).

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

NBIoT battery

The NBIoT version has 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.

Rated capacity 14.0 Ah.

A 5F super capacitor with EDLC technology is placed in parallel to the battery to provide peak currents appropriate for the operation of the NBIoT module.

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.	5% of the time @ -25°C 20% " @ -10°C 50% " @ 22°C 20% " @ 55°C 5% " @ 70°C	
Communication	3 connections per day	
User interface	5 minutes per month	Buttons/Zvei
	10 minutes per month	Display
Temperature measurement	1 measurement every 30 sec	
Range	Qmax	
Code update	Twice in 15 years	

11. Declaration of conformity

11.1. EC Declaration of conformity (DoC)

Pietro Fiorentini S. p. A hereby declares that the device complies with the essential requirements and other provisions of the Directive 2014/53/EU. The full text of the EC declaration of conformity is available on our website at the following address: <https://www.fiorentini.com>

11.2. Transmission features

Band	Tx(MHz)	Rx(MHz)	Power Transmitted in Band (dBm)
NB-IOT Band 8	880 - 915	925 - 960	23dBm±2dB
NB-IOT Band 20	832 - 862	791 - 821	23dBm±2dB

11.3. Limitations

The device fulfils the RF specifications when the antenna used by this transmitter is installed guaranteeing a separation distance of at least 20cm from all persons and must not be placed or operate together with another antenna or transmitter.