

## Operation Manual and Technical Specifications

### RPP-S SIGFOX Wireless Radon Probe



## 1 Meet

Portable radon measuring probe with rechargeable accumulator allows to watch radon results remotely over wireless mobile network of Internet of Things (IoT) SIGFOX. The probe can be placed anywhere in the world where this mobile network has coverage (<https://www.sigfox.com/en/coverage>). The probe autonomously sends in regular intervals measured current results (RVA - radon concentration (RaA+RaC), temperature, relative humidity and accumulator voltage) over wireless network SIGFOX. Configuration of probe and setting regular interval of sending are made over USB port and application in PC. Probe includes GPS module for better localization in wider measurement networks and for synchronization of real time clock in probe.

It is similar like RPP-U probe only with another type of wireless communication SIGFOX and GPS.

Probe is designed for continuous measuring of radon concentration. Portable probe basis is a measuring chamber with a semiconductor photodetector. Radon enters the chamber by diffusion through the input filter on the bottom of probe. The probe measures in autonomous and time continuous way (continual monitor). The probe sends results to server and saves time records in its internal memory (typically at an interval of 1 hour). Times of particular result records in internal memory and on server can be different in few seconds due to delay caused by radio transmission. Next saved value to internal memory is time record of measuring energy spectrum (typically at an interval of 12 hours). The probe can be switched on/off by switch. LEDs „STAT“ and „CHRG“ indicate current status of probe.

#### Features:

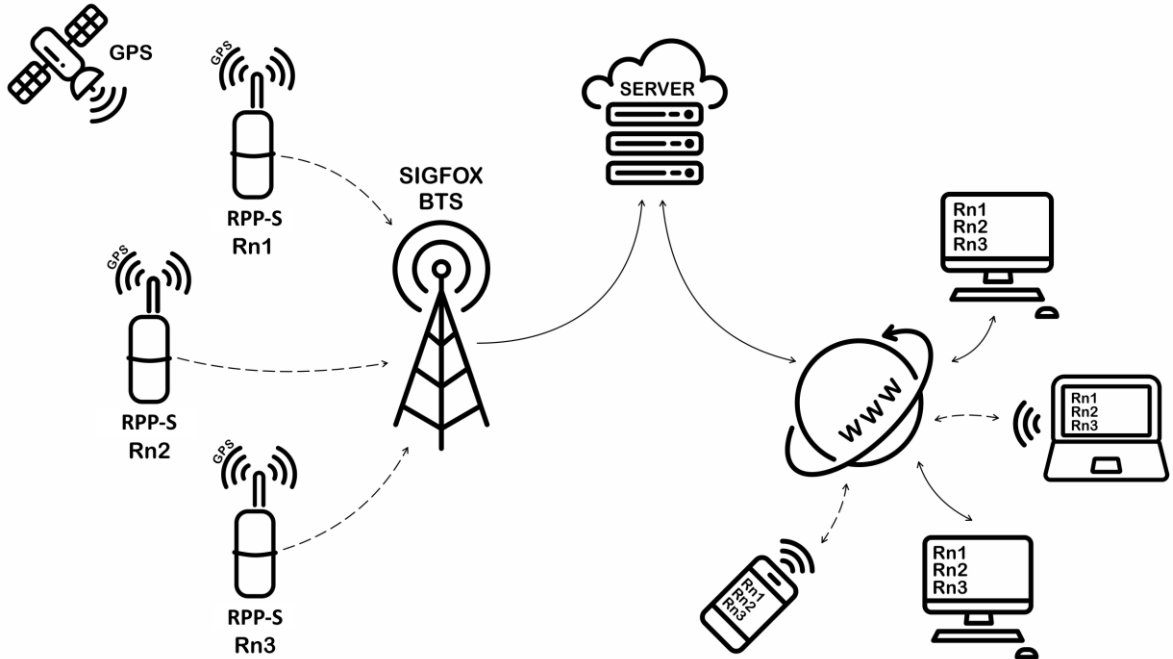
- Easy implementation into third-party systems (integrators) – format of SIGFOX message delivered
- Internal memory for backup of measured results (downloading over USB)
- Possibility of monitoring of GPS position on map
- Accumulator life up to 1 year after full charging or using permanent power adapter 230V
- Waterproof cover for electronics (IP67)

*Before using the product, please read this manual carefully and understand all operating and safety precautions. Compliance with operational and safety precaution can prevent from damage to equipment or injuries to personnel. The product may only be used in the specified manner and for its intended purpose. The product may be provided to third persons along with this documentation only.*

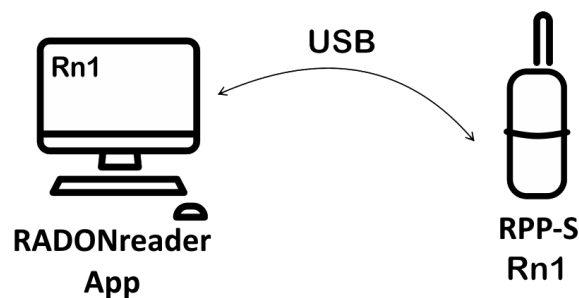
**Radon Probe can be operated by these ways:**

- A) **SIGFOX** - Thanks to its independent battery power, portable radon measuring probe supports flexible placing options within monitored structures. Accumulator will last for more than 1 year after full charging. After switching on probe immediately starts measuring and sending in simplex mode results over wireless mobile network SIGFOX to server SIGFOX and the same time the results are saved to internal memory of probe (every hour default).

**Attention!: The probes aren't possible to configure over network sigfox only over USB point B).**



- B) **USB** – After switching on the probe immediately starts measuring and saving results into internal memory too. Using RADONreader app and USB cable is possible to download results to PC continuously during measurement or at once at the end of measurement from internal memory of probe. RADONreader application, drivers and user manual is free downloaded on website: <http://www.piketronic.cz> .



## 2 You get

- RPP-S Radon probe
- Power adapter 230VAC/5VDC
- USB cable A-B
- Antenna
- Operation Manual
- ID and PAC code

### 3 My parameters

Product	SIGFOX Wireless Radon Probe
Type symbol	RPP-S
Average measurement sensitivity	0,25 count/hour/Bq.m-3 (method RaA+RaC; 15°C ÷ 30°C; rel. hum. 20% ÷ 40%)
Measuring range	MDA – 100 000 Bq/m <sup>3</sup> ; in peak up to 10 MBq/m <sup>3</sup> MDA = 100 Bq/m <sup>3</sup> per 1 hour or 20 Bq/m <sup>3</sup> per 24 hours
Measurement uncertainty	< 13% at 300 Bq/m <sup>3</sup> per 1 hour; < 3% at 300 Bq/m <sup>3</sup> per 24 hour
Measuring chamber capacity	0,176 dm <sup>3</sup>
Response rate	< 30 minutes (RaA); < 3 hours (RaA + RaC)
Radon records	calculated from <u>RaA</u> (quicker, less sensitive), ( <u>recorded only in internal memory</u> ) calculated form <u>RaA + RaC</u> (slower, more sensitive), ( <u>sended to server and recorded in internal memory</u> )
Measuring relative humidity range	0 – 100 % (WEB and recorded in internal memory)
Measuring temperature range	-40 to + 125 °C (WEB and recorded in internal memory)
Results sending and saving interval	15 - 255 minutes, default 1 hour
Results memory capacity	5000 records (208 days of 1 hours records), spectra 300 records
Powering	internal rechargeable accumulator; charging via USB
Accu life after full charging	>1 year (also depends on operating conditions)
Dimension	Ø 80 x 175 mm
Waterproof	IP67 (only for electronics)
Radio technology	SIGFOX RC1 868 MHz
Operating conditions	Temperature: -10 ° C to +40 ° C Recommended relative humidity: 10% - 75% Maximum working relative humidity: 0% - 99% * Increased humidity reduces the life of a charged battery. * There must be no condensation of water in the chamber - erroneous results
Detector life	50-100 million pulses; that means at an average concentration of 1000 Bq / m <sup>3</sup> -> 12 years; 10 000 Bq / m <sup>3</sup> -> 1 year

## 4 I work like this

### Switching on and off:

The probe measures radon concentration autonomously and sends messages to SIGFOX server only if the switch is in position „ON“. The switching on is signalized by LED diode „STAT“ according chart below. After switching on within 30 minutes the probe tries to synchronize the internal real-time clock according to the GPS signal if the signal is available and if this option is enabled in the probe using the RADONreader program.

If the switch is in position „OFF“ the probe doesn't measure radon concentration and doesn't send messages to server. In switching off mode the probe only keeps running real time for correct date and time of records in case of switch it on again. By switching off the probe doesn't lose previous records of measurement. The switching on is signalized by LED diode „STAT“ according chart below.

Download data from probe over USB is possible always, no matter what position of switch is.

### LED diode „STAT“:

It signalizes status radon probe according to following chart:

Color	Description
Green blink 3x	Radon probe has just been turned on.
Green blink after 5s	Radon probe measures and works correctly
Yellow blink 4x	Radon probe has just been turned off.
Green / Yellow blink after 8s	Radon probe measures but troubles are occur. – especially low capacity of accumulator. Warnings and errors are shown in PC application.
No light, No blinking	Radon probe doesn't measure or accumulator is empty or device is damaged. Charging process of accumulator is described in chapter „Basic Maintenance/ Accumulator charging“

### Power supply:

According to operation method the radon probe can be supplied:

- 1) By internal accumulator for portable use – Radon probe includes internal accumulator which is able to ensure autonomous operation of probe for more than 12 months without charging. Depends on climatic condition of probe use. Accumulator is charged with USB port and provided USB cable. The USB cable is possible to connect to PC or to delivered power adapter. Status of accumulator and charging process are described in paragraph 'Basic Maintenance/Accumulator charging'
- 2) By mains power supply 230V/50Hz for stationary use – Radon probe is permanently supplied by delivered power adapter. Power adapter is connected to probe via provided USB cable. In case of blackout internal accumulator ensures UPS function.

### Configuration:

Setting and configuration are realized by RADONreader application. RADONreader application, drivers and user manual with detail configuration description are free downloaded on website: <http://www.piketronic.cz>.

**Attention!:** *Values and interval of sent SIGFOX data message to server are same as values and interval of saved data into internal memory of probe. The interval of sent SIGFOX message is set by interval of saved data into internal memory of probe „Concentration Record“ in RADONreader application.*

### Type of SIGFOX messages:

During of probe operation is sent various type of SIGFOX messages to server. Description of particular types of messages is below:

**Value** - Regular message with measured data (RVA - radon concentration (RaA+RaC), temperature, relative humidity, accumulator voltage (battery), status of high voltage). Time interval is adjustable (default 1 hour).

**Start** – Extra message is sent immediately when probe is switched on

**Kealive1** – Extra message is sent regularly every midnight with information about configuration and status of probe.

**Kealive2** - Extra message is sent regularly every midnight with information about configuration and status of probe.

**GPS** - Extra message is sent regularly every midnight with information about GPS position of probe. If probe „see“ less than 2 GPS satellites the message isnt sent.

Data from Extra messages are shown on server under „Service details“ and it means following current information about the probe:

**Battery [mV]** – Voltage of probe internal accumulator. Voltage should not fall below 3.5 V, in limit conditions falls below 3.3V. In MONTES web application you can configure your alarm message to SMS, email or call if voltage of accumulator is too low.

**HV voltage [-]** – Status of high voltage in measuring chamber (frequency of charging). Number should not raise over 40 (service information).

**Impulses [tis.]** – Number of impulses catch by detector from beginning (service information).

**HW [-]** – Serial number of probe.

**SW [-]** – Version of probe software.

**Period [min]** – Time interval of measured data saving to internal memory and time interval of measured data sending to server.

**Channel Max. [-]** – Description of last energy spectrum - Channel (Energy) in maximum of whole spectrum [x 0,1 MeV]. Expected energy peak for Po-218 is in 60-61 channel as 6,00MeV. Expected energy peak for Po-214 is in 77-78 channel as 7,69MeV. (expert information).

**Pulses at Max. [-]** – Description of last energy spectrum – Number of caught impulses with energy in Channel Max.

**Ch. Max. d2 [-]** - Description of last energy spectrum – Channel (Energy) in maximum of spectrum area Po-218 [x 0,1 MeV] (expert information). Expected energy peak for Po-218 is in 60-61 channel as 6,00MeV

**Ch. Max. d3 [-]** - Description of last energy spectrum – Channel (Energy)in maximum of spectrum area Po-214 [x 0,1 MeV] (expert information). maximum of whole spectrum [x 0,1 MeV]. Expected energy peak for Po-214 is in 77-78 channel as 7,69MeV.

**Discrimination 1 [-]** – Discriminating energy channel for beginning of area d2 (Po-218)(expert information).

**Discrimination 2 [-]** - Discriminating energy channel for dividing line between area d2 (Po-218) and area d3 (Po-214)(expert information).

**Discrimination 3 [-]** - Discriminating energy channel for ending of area d3 (Po-214)(expert information).

**Calibr. C.. A [-]** – Calibration constant for radon concentration from Po-218(RaA)(service information).

**Calibr. C. AC [-]** - Calibration constant for radon concentration from Po-218(RaA)+ Po-214(RaC)(service information).

**Gain [-]** – Offset of energy spectrum (service information)

**GPS Position [-]** – GPS position of probe.

**Satellites [-]** – Number of visible satellites during last position measuring. If probe „see“ less than 2 GPS satellites the message „GPS“ isnt sent..

**Altitude [m]** – Altitude of probe location.

**Start [-]** – Time of last probe switching on and the „Start“ message was sent to server.

#### **Installation:**

The probe can operate in random position or probe is possible to stand to the bottom. For outdoor installation the producer offers on request the special cover with solar panel for long time operation.

During installation is necessary to test strength of radio signal SIGFOX on the measuring spot. For this case is possible to use test extra message „Start“. This message is sent immediately when probe switch is switched on to position „I“. Whether the message was delivered to server correctly you can make sure in your account on SIGFOX server.

If the „Start“ messages repeatedly didnt come to server the radio network hasnt good coverage on this spot and probe is necessary to shift or removeto another place where will be better radio signal and smaller radio shadow. Generally this radio sevice use the towers of mobile operators for spreading.

If the „Start“ message came to server it is possible to find out probable quality of radio signal on the spot according parameter RSSI or according colors of radio icon at this message on server. Strength of radio signal is affected by all sorts of effects therefore relevant radio quality on the spot is possible to find out after longer operation and from more incoming messages to server.

**Green icon** - RSSI under 122 dB – very good quality of radio signal

**Orange icon** – RSSI from 122 to 135 dB – worse quality of radio signal

**Red icon** - RSSI 135 dB – limit quality of radio signal

## 5 Basic Maintenance

### Accumulator charging:

During portable use of radon probe is essential to monitor state of internal accumulator and recharge it if necessary. If accumulator is discharged the probe automatically turns off. The probe is switched on again powering USB port.

Current state of accumulator can be determined in two ways:

- 1) By LED diode 'STAT' - If LED starts blinking in green-yellow color it indicates that system is working incorrectly and one of main case is low voltage of accumulator (see paragraph "Operation Manual / LED diode "STAT"").
- 2) In RADONreader application - where you can check current accumulator voltage. Voltage should not fall below 3.5 V, in limit conditions falls below 3.3V.

Accumulator is charged via USB port using supplied USB cable. USB cable can be connected to PC or to supplied power adapter. Connect USB cable with power to USB port of probe. LED diode 'CHRG' next to USB port of probe indicates charging status according to following chart:

### LED diode 'CHRG'

Color	Description
Green	Accumulator is fully charged
Yellow	Accumulator is being charged
Green - Yellow alternate blinking	Accumulator is damaged, contact Service Center
No light, No blinking	It is not connected to an external power supply or device is damaged.

Accumulator is fully charged when LED diode 'CHRG' is green. You can disconnect USB cable.

### Recalibration:

We recommend regular recalibration of the device at the manufacturer within 1-2 years.

Within the warranty period, one recalibration is free from the manufacturer.

## 6 Repairs

Any repairs and non basic maintenance must be performed exclusively by Piketronic s.r.o..

## 7 Warranty

- This product is covered by warranty of 24 months from purchase date.
- In case of buying MONTES service the warranty is extend for term of use the service.
- In case of warranty claim, please contact our Service Department.
- Warranty covers any defects in materials or workmanship and excludes any damage resulting from or caused by transport or handling or by any misuse.
- Warranty ceases if product has been used improperly or its seal is broken.
- In case of warranty claim, warranty period is prolonged by number of days product was undergoing warranty repairs.
- After the end of its life, product must be handled as e-waste.

**8 Accessories**

Radon Probe accessories are available at producer or at distributor.

**Probe holder**



**Reserve antenna**



**Transport waterproof case for 4 probes**



**Outdoor cover with solar powering**

