



## TERA Radon Program

### TSR3DNM USB Radon Probe with Display and Big Memory Technical Specifications & Operation Manual



v.1 – 2017

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## **1 Introduction**

This document describes technical specifications and user operation of the TSR3DNM USB Radon Probe with Display and Big Memory.

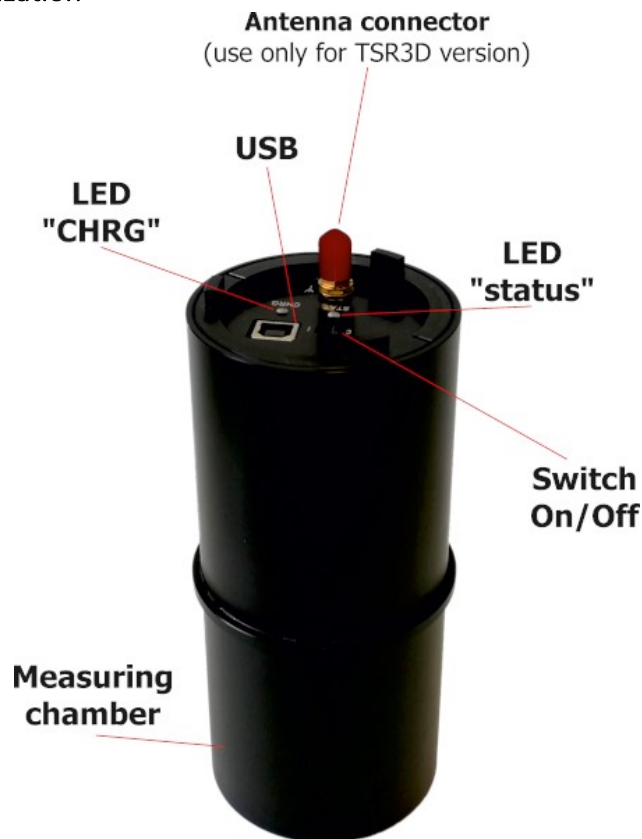
Product was developed and manufactured in the Czech Republic. All rights reserved TESLA. Offer or delivery of products or services related to the product does not include transfer of ownership rights.

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. Operating and safety instructions in the document are marked as follows:

***Attention! This formatted text indicates the operating and safety instructions.***

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.

## 2 Description and Utilization



TSR3D is designed for continuous measuring of radon concentrations in buildings and results are also shown on display.

Portable probe basis is a measuring chamber with a semiconductor detector. Radon enters the chamber by diffusion through the input filter on the bottom of probe. The probe measures in autonomous and time continuous way. It processes results every 4-minute intervals and from this counts short-term moving average of radon concentration ( 1 hour moving average - average of 15 4-minute process intervals). It also counts long-term moving average of radon concentration (24 hours moving average). The probe saves time records of these radon concentration values including values of humidity and temperature within its internal memory (typically at an interval of 1 hour). Next saved value is time record of measuring energy spectrum (typically at an interval of 12 hours). All results are shown on display as well see paragraph 'Display Operation'.

The probe is random for location in measured place, but generally it is put on the bottom of the probe. Bottom of the probe cannot be covered. The probe can be switched on/off by switch. LEDs „STAT“ and „CHRG“ indicate current status of probe see 'Operation manual' below.

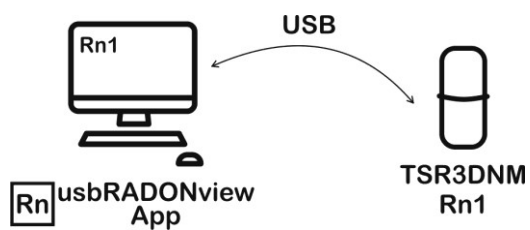
The resulting values can be downloaded continuously during measurement or at once at the end of measurement. Data from the radon probe is downloaded to a PC directly via USB interface. Capacity of internal memory is almost unlimited.

**TSR4M Radon Probe can be operated by these ways:**

- A) **Standalone probe** - 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 TSR4M immediately starts measuring and saving results into internal memory. The resulting values are downloaded after end of the measurement by B) way.



- B) **Probe connected via USB** – Using usbRADONview app and USB cable is possible to download results to PC continuously during measurement or at once at the end of measurement. usbRADONview application, drivers and user manual is free downloaded on website: <http://www.tesla.cz/>.



### 3 Scope of Delivery

- TSR3DNM USB Radon Probe with display and big memory
- Power adapter 230VAC/5VDC
- USB cable A-B
- Probe holder
- Operation Manual

## 4 Product Specification

Product	TSR3D Wireless and USB Radon Probe with display
Type symbol	042 127 211 000
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> ; 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 RaA (quicker, less sensitive) calculated from RaA + RaC (slower, more sensitive)
Measuring relative humidity range	10 – 90 %
Measuring temperature range	-20 to + 60 °C
Records saving interval	1- 255 minutes, default 1 hour
Results memory capacity	29 999 985 records; 9 927 040 spectra
Powering	internal rechargeable accumulator; charging via USB
Accu life after full charging	>1 year (also depends on operating conditions)
Built-in display	graphical, 128 x 64 pixels, orange
Current radon concentration results	short-term (0,5 hour running average from RaA)  long-term (24 hours running average from RaA + RaC)
Dimension	Ø 80 x 175 mm
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

## 5 Operating Instructions

### Switching on and off:

The probe measures radon concentration autonomously and communicates in wireless network only if the switch is in position „I“ (switch on). The switching on is signalized by LED diode „STAT“ according chart below.

If the switch is in position „0“ (switch off) the probe doesn't measure radon concentration and doesn't communicate in wireless network. 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 only if switch is in position „I“ (switch on).

### 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 3x	Radon probe has just been turned off.
Green / Yellow blink after 5s	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:

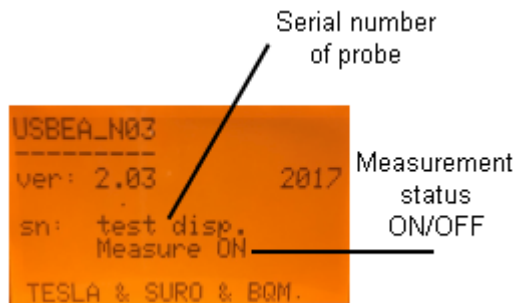
Setting and configuration are realized by usbRADONview application. UsbRADONview application, drivers and user manual with detail configuration description are free downloaded on website: <http://www.tesla.cz/>.

## 6 Display Operation

Built-in display can continuous show measured result and basic parameters of probe. By reason of power saving the display isn't switched on permanently but it is switched on by pushing of button below display. By next pushing of button is changed screen on another in cyclic order. Approximately after 1 minute without pushing of the button the display is automatically switched off.



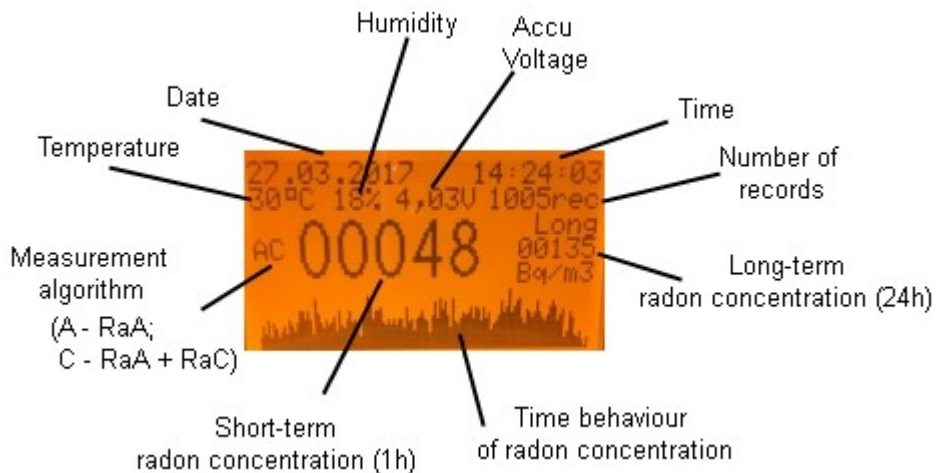
After first pushing of button from switched off display status is shown into screen. There is shown basic information about probe as is version of firmware, serial number and status measurement running ON/OFF.



Go on basic data screen is possible by three ways:

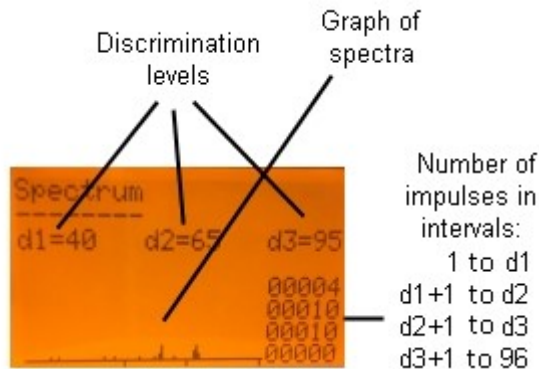
- by next pushing of button on intro screen
- automatically after 5 seconds from intro screen
- directly from switched off display by pushing of button for longer than 1 second

Changing of three data screens is cyclic without intro screen and is possible to make by pushing of button. Data screens are on following pictures.



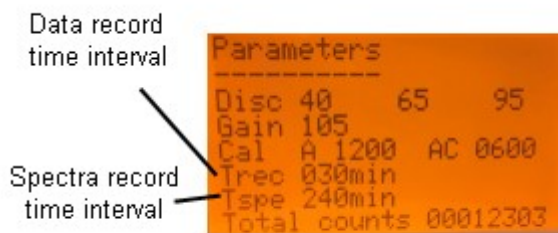
Basic data screen always mainly shows by bigger numerals the value of 1 hour moving average of radon concentration in Bq/m3 counted from RaA + RaC . Time behaviour of radon concentration is graphical shows in array of 128 x 24 pixels. It is always the graph of concentration records in memory calculated from

RaA + RaC. In older version of probe the graph shows concentration records calculated according to setting „Measurement algorithm“ AC or A in probe (on display then also see AC or A). Every column means single data record. So for example if data record time interval is 30 minutes the graph shows time behaviour of radon concentration for last 64 hours.



Second graph shows current energy spectrum in array of 96 x 24 pixels and its parameters. Energy spectrum is divide into 96 interval and radon concentration is calculated from intervals d1-d2 (RaA) or from d1-d3 (RaA+RaC). Discriminations d1, d2, d3 are shows below graphs as well.

Numbers of impulses in discrimination intervals are counted during spectra record time interval (Trec) or till then if one of particular intervals reaches 255 impulses.



Parameters on third data screen are especially service data but record time intervals are useful.

**Notice:** By display and button isnt possible to setup of probe. For setting of probe parameters is necessary to used the PC software application usBRADONview.

## 7 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 over USB port.

Current state of accumulator can be determined by these 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 usBRADONview 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.

**8 EC Declaration of Conformity**

EC Declaration of Conformity will be delivered by Tesla producer on request. If interested, please use contacts on the web [www.tesla.cz](http://www.tesla.cz).

**9 Repairs**

Any repairs and non basic maintenance must be performed exclusively by TESLA manufacturer.

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**10 Warranty**

- This product is covered by warranty of 24 months from purchase date.
- 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.

**11 Accessories**

Radon Probe accessories are available at producer [www.tesla.cz](http://www.tesla.cz) or at distributor.

**Probe holder** (is included in package)



**12 Alternatives**

TSR3DNM probe is easy and quick to change in manufacturer to new type of these probes:

**TSR3D** – WLAN Wireless and USB Radon Probe with Display

**13 Revision History**

Revision	Date	Comments
Rev.1:	31.1.2017	Initial release