EN

TERA Radon Program

TSR3DN Wireless and USB Radon Probe with Display

Technical Specifications & Operation Manual

v.1 – 2017

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Manual also available on www.tesla.cz

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Users should be familiar with operation basis of used product. If you experience any problems with your product, please contact us at:

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1 Introduction

This document describes technical specifications and user operation of the TSR3DN Wireless and USB Radon Probe with Display.

Product was developed and manufactured in the Czech Republic. 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

TSR3DN is designed for continuous measuring of radon concentrations in buildings.

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´.

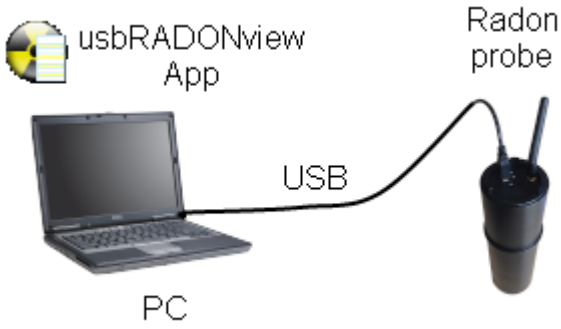
The probe is random for location in measured place, but generally it is put on the bottom of the probe. Bottom of the probe cannot be covered. The probe can be switched on/off by switch. LEDs „STAT“ and „CHRG“ indicate current status of probe see ´Operation manual´ below.

The resulting values can be downloaded continuously during measurement or at once at the end of measurement. Data from the radon probe can be downloaded to a PC directly via USB interface or wirelessly via antenna and Central Unit. Central Unit is not included with package of TSR3DN and it is sold and delivered extra ; see http://www.tesla.cz/ .

TSR3DN 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 TSR3DN immediately starts measuring and saving results into internal memory. Results are possible to continuosly watch on display. The resulting values are downloded after end of the measurement by B) or C) way.

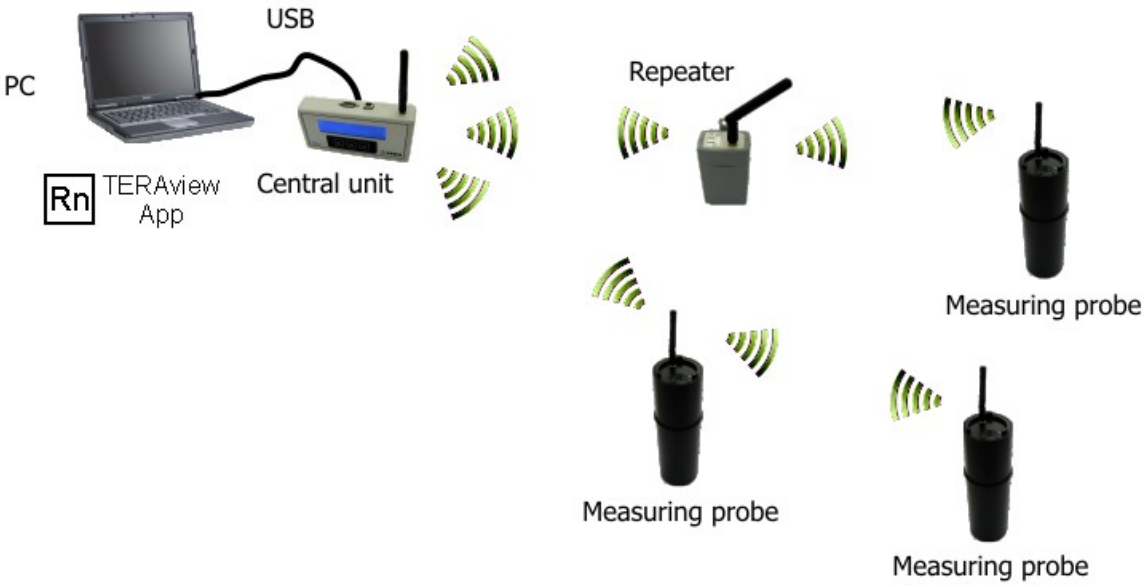
B) **Probe connected via USB** – Using usbRADONview app and USB cable is possible to download results to PC continuously during measurement or at once at the end of measurement. TERAview application, drivers and user manual is free downloaded on website: http://www.tesla.cz/.



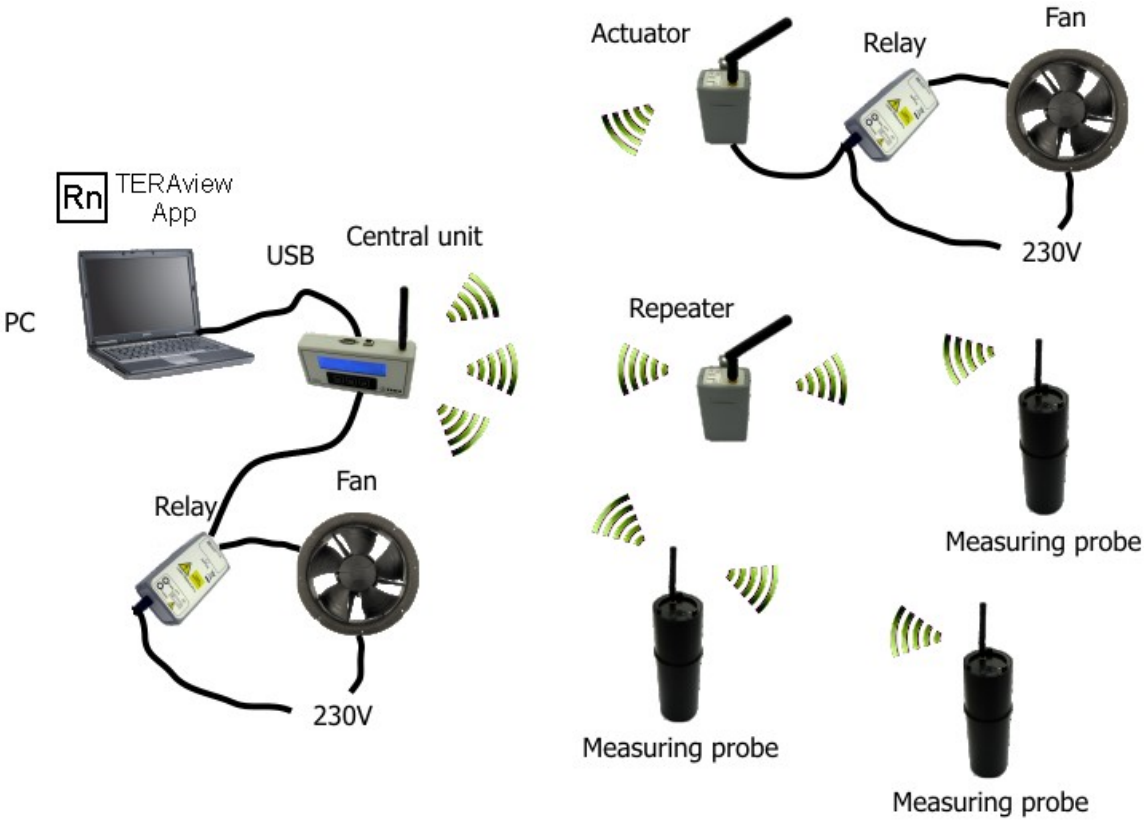
C1) **Wireless network for radon measurement** - Central Unit supports simultaneous data downloads from up to 16 probes. All values are saved again into central unit memory. Via connected computer to Central Unit and TERAview application on PC it is possible to download and process all data from system and configure whole system. Setting and configuration of TSR3DN Radon Probe and whole system is also managed by TERAview application on PC. TERAview application version 3.11.6 and higher, drivers and user manual with detail configuration description is free downloaded on website: http://www.tesla.cz/.

In case of time continuous measurement of radon concentration or in case of setting in regulation system the probe must be placed in radio range of Central Unit. Distance (radio range) between TSR3DN and central unit is up to 600m in open space. In buildings it depends on number of walls, building material, etc. Strength of radio signals (RSSI) is monitored by Central

Unit. If radio signal strength between individual elements is insufficient, TSR2 radon probe must be inserted or repeater must be used to extend the signal; see http://www.tesla.cz/



C2) **Wireless network for radon regulation –** Featuares of system are same as in C1) way. Radon measuring probes located in building transmit their current radon concentration values to central unit wirelessly. Central unit analyzes this information and on the basis of measured (set) concentration level value it sends command to actuator (wireless actuator or actuator in central unit can be use) which is hardwired with power relay. Power relay switches on a fan which decreases radon concentration within an area. After decreasing of radon concentration, actuator receives command to switch off fan. This cycle repeats depending on increasing or decreasing volume activity of radon in building.



Version comparison

version	wireless	USB	battery	rechargeable accu	switch on/off	diagnostic LED	advance FW a SW*	compatibility
TSR4/TSR3/TSR3DN	x	x		x	x	x	x	x
TSR2–OS3.08NP*	x		x				x	x
TSR2	x		x					

* TSR2–OS3.08NP – Radon probe TSR2 firm upgraded FW and SW

* advance FW and SW:

Choice of measuring algorithm – Measuring from RnA or from RnA+RnC
Automatic results download from central unit to files in PC during the measurement
Setting spectra record interval
Date and time of spectrum are available in records.
Quicker download data from probes if you download data after end of the measurement.
Possibility of various identification writing into internal memory of probe

Compatibility

TSR3DN radon probe is wirelessly compatible with only these type of devices:
TSR4,
TSR2- OS 3.08 NP (firm upgraded FW and SW),
TCR3- OS 3.08 NP (firm upgraded FW and SW),
TCR4 - OS 3.08 NP (firm upgraded FW and SW),
TCR4A,
TRR2 - OS 3.08 NP (firm upgraded FW and SW),
TAR2 - OS 3.08 NP (firm upgraded FW and SW).

TSR3DN radon probe isnt wirelessly compatible with these type of devices:
TSR2, TCR3, TCR4, TRR2, TAR2.

3 Scope of Delivery

- TSR3DN Wireless and USB Radon Probe with display
- Power adapter 230VAC/5VDC
- USB cable A-B
- Antenna
- Operation Manual

4 Product Specification

Product	TSR3DN Wireless and USB Radon Probe with display
Type symbol	042 127 202 000
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^3; MDA = 100 Bq/m^3 per 1 hour or 20 Bq/m^3 per 24 hours
Measurement uncertainty	< 13% at 300 Bq/m^3 per 1 hour; < 3% at 300 Bq/m^3 per 24 hour
Measuring chamber capacity	0,176 dm3
Response rate	< 30 minutes (RaA); < 3 hours (RaA + RaC)
Measuring algorithm	quicker, less sensitive (calculated from RaA) slower, more sensitive (calculated form RaA + RaC)
Measuring relative humidity range	10 – 90 %

Measuring temperature range	-20 to + 60 °C
Radio interface	868MHz
Max number of measuring network elements	16
Probe to terminal unit distance (RF range)	depends on number of walls and building material, up to 600 m in open space
Possibility of using repeater for RF range extending	yes
Results reading interval (from probe)	240-65535 sec (4 min - 18.2 hours)
Records saving interval (probe)	1- 255 minutes, default 1 hour
Results memory capacity in probe	150 days
Powering	internal rechargeble accumulator; charging via USB
Accu life after full charging	>1 year
Built-in display	graphical, 128 x 64 pixels, orange
Radon concentration results display	short-term (1 hour running average) long-term (24 hours running average)
Dimension	Ø 80 x 175 mm

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.

It is possible to download data from probe over USB in both position of switch.

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“

Antenna installation:

Supplied antenna is screwed on antenna connector. When installing antenna, hold antenna by knurled end.

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 frequency of wireless data downloading from probe. 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 is different according to operation way of radon probe.

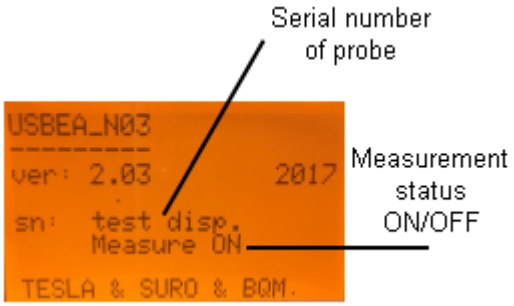
If the probe is used for autonomous measurement and data downloading via USB interface then the setting and configuration are realized by usbRADONview application. UsbRADONview application, drivers and user manual with detail configuration description are free downloaded on website: http://www.tesla.cz/.

If the probe is used for wireless measurement and wireless data downloading then setting and configuration of probe and whole measuring system is realized by Central Unit connected to PC and TERAview application. Central Unit is not included with package of probe and it is sold and delivered extra; see http://www.tesla.cz/. TERAview application, drivers and user manual with detail configuration description are free downloaded on website: http://www.tesla.cz/. For successful probe configuration in measuring system is essential to know probe radio channel number (communication wireless channel) and P2P address (identification in wireless net). Both parameters are printed out on probe serial number plate. Probe radio channel number is possible to change by TERAview application and it must be identical to central unit radio channel number. P2P address is permanent and it can occur in one big wireless net only once. Only Central Unit P2P address can be identical to P2P address of other elements in network.

6 Display Operation

Built-in display can continuous show measured result and basic parameters of probe. By reason of power saving the display isnt 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.

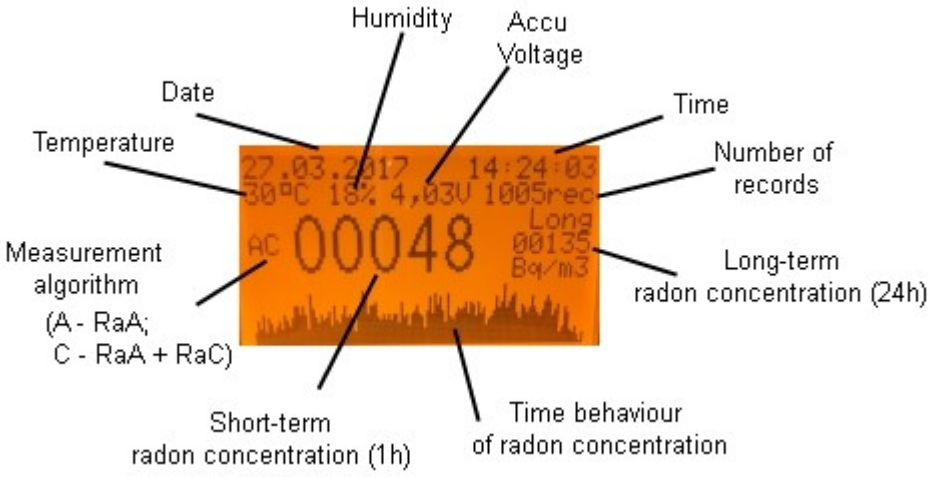
After first pushing of button from switched off display status is shown intro screen. There is shown basic information about probe as is version of firmware, serial number and status measurement running ON/OFF.



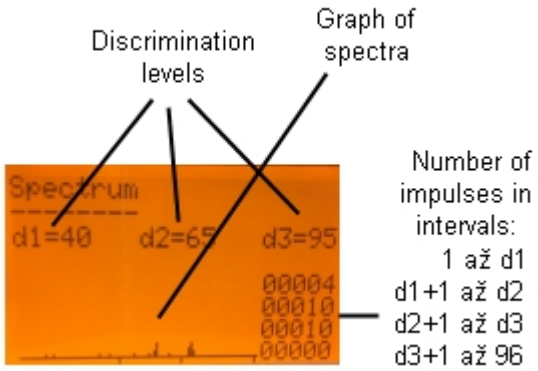
Go on basic data screen is possible by three ways:

- 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.

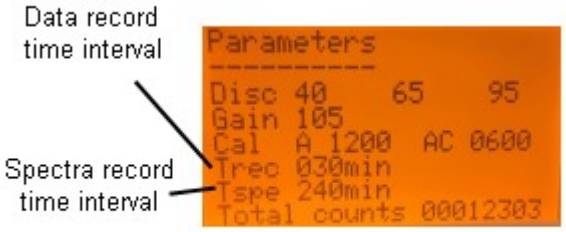


Basic data screen always mainly shows by bigger numerals the value of 1 hour moving average of radon concentration in Bq/m3 counted from RaA + RaC . Time behaviour of radon concentration is graphical shows in array of 128 x 24 pixels. It is always the graph of concentration records in memory calculated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

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 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 TERAview and 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.

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 .

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 or at distributor.

Probe holder

Reserve antenna

12 Revision History

Revision	Date	Comments
Rev.1:	31.1.2017	Initial release