

TERA Radon Program

TSRS Radon Sensor UART and RELAY
Technical Specifications & Operation Manual



v.2 – 2019

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1 Introduction

This document describes technical specifications and user operation of the TSRS Radon Sensor.

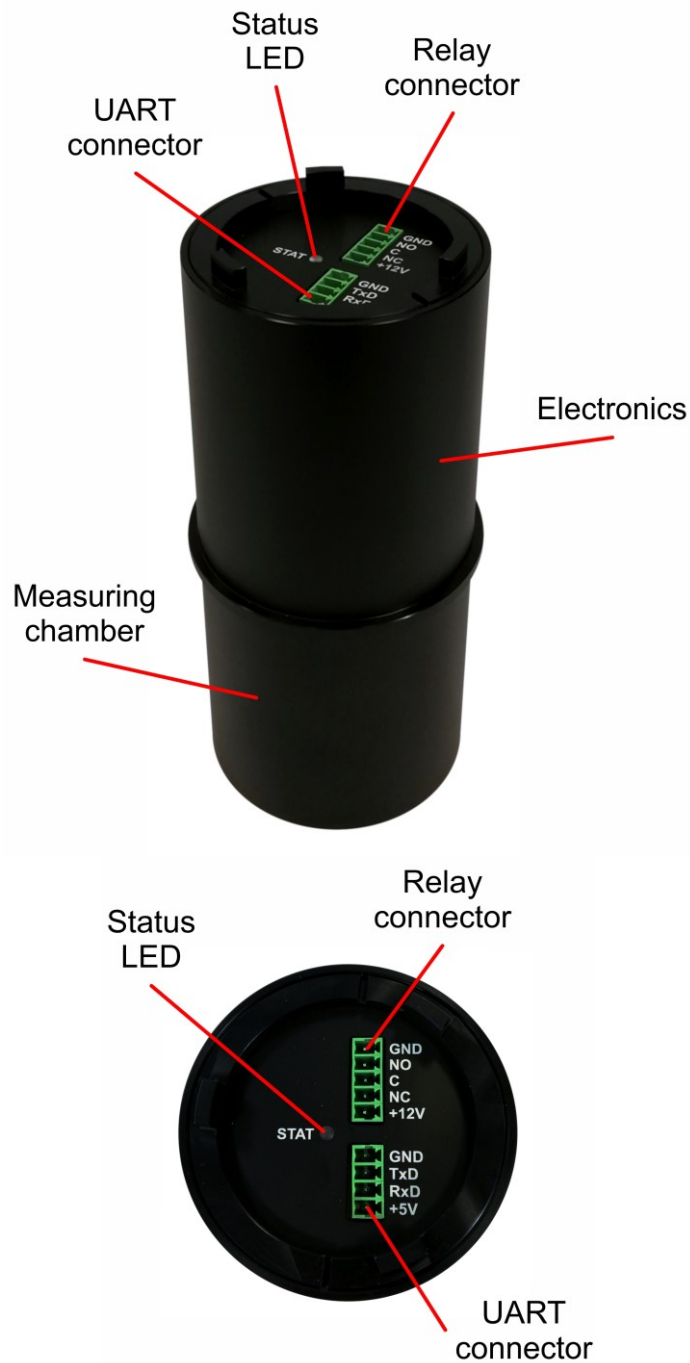
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Before using the product, please read this manual carefully and understand all operating and safety precautions. Compliance with operational and safety precaution can prevent from damage to equipment or injuries to personnel. Operating and safety instructions 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



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

Sensor basis is a measuring chamber with a semiconductor photodetector. Radon enters the chamber by diffusion through the input filter on the bottom of sensor. The sensor measures only if power supply is present. It processes current results every 4-minute intervals and from this it 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 sensor also 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). The resulting values can be downloaded continuously during measurement or at once at the end of measurement from internal memory. Current measured data for UART interface is updated every 4 minutes. The sensor is random for location in measured place, but generally it is put on the bottom of the sensor. Bottom of the sensor cannot be covered.

Sensor can communicate over simple serial interfaces UART and/or can indicate crossing of adjusted limit of radon concentration by switching of alarm relay. Setting of limit value is possible to do by UART interface or by USB<->UART cable converter (see in "Accessories") with usbRADONview application from producer. Application available for free on <http://www.tesla.cz>. Default value of limit is set to 200 Bq/m³.

These interfaces are used for easy implementation into third party system. Suitable for integration into smart buildings, industrial systems and systems of air quality. Coupled with sensor is delivered description of serial interface UART and protocol for easy development and implementation of processor program. It is available on company website <http://www.tesla.cz>.

3 Scope of Delivery

- TSRS Radon Sensor
- 2 opposite cable connectors for sensor connector
- Install cover
- Install holder of probe
- Operation Manual

4 Product Specification

| | |
|--|--|
| Product | TSRS Radon Sensor |
| Type symbol | 042 127 193 000 |
| 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 dm ³ |
| 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 |
| Current result changing interval of Rn | every 4 min |
| Records saving interval | 1- 255 minutes, default 1 hour |
| Results internal memory capacity | 4096 (150 days of 1 hours records) |
| Powering | 5-12VDC/max. 5mA |
| Switching load of alarm relay | 250W DC/ 500W AC |
| Serial interface | UART (3V CMOS) |
| 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:

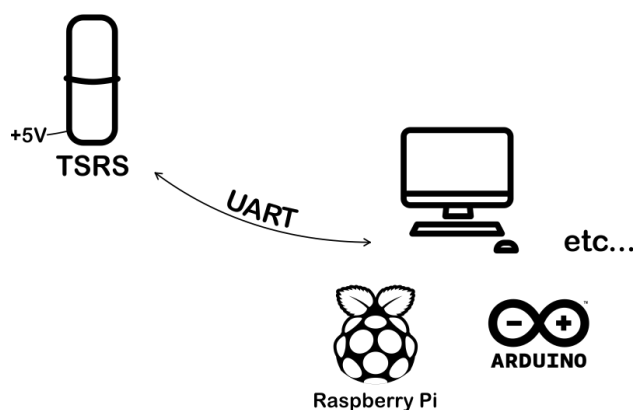
The probe measures radon concentration autonomously only if the power supply from 5VDC to 12VDC is connected. The switching on is signaled by LED diode „STAT“ according chart below. If the probe is switched off the adjusted real time in probe is lost.

LED diode „STAT“:

It signalizes status radon probe according to following chart:

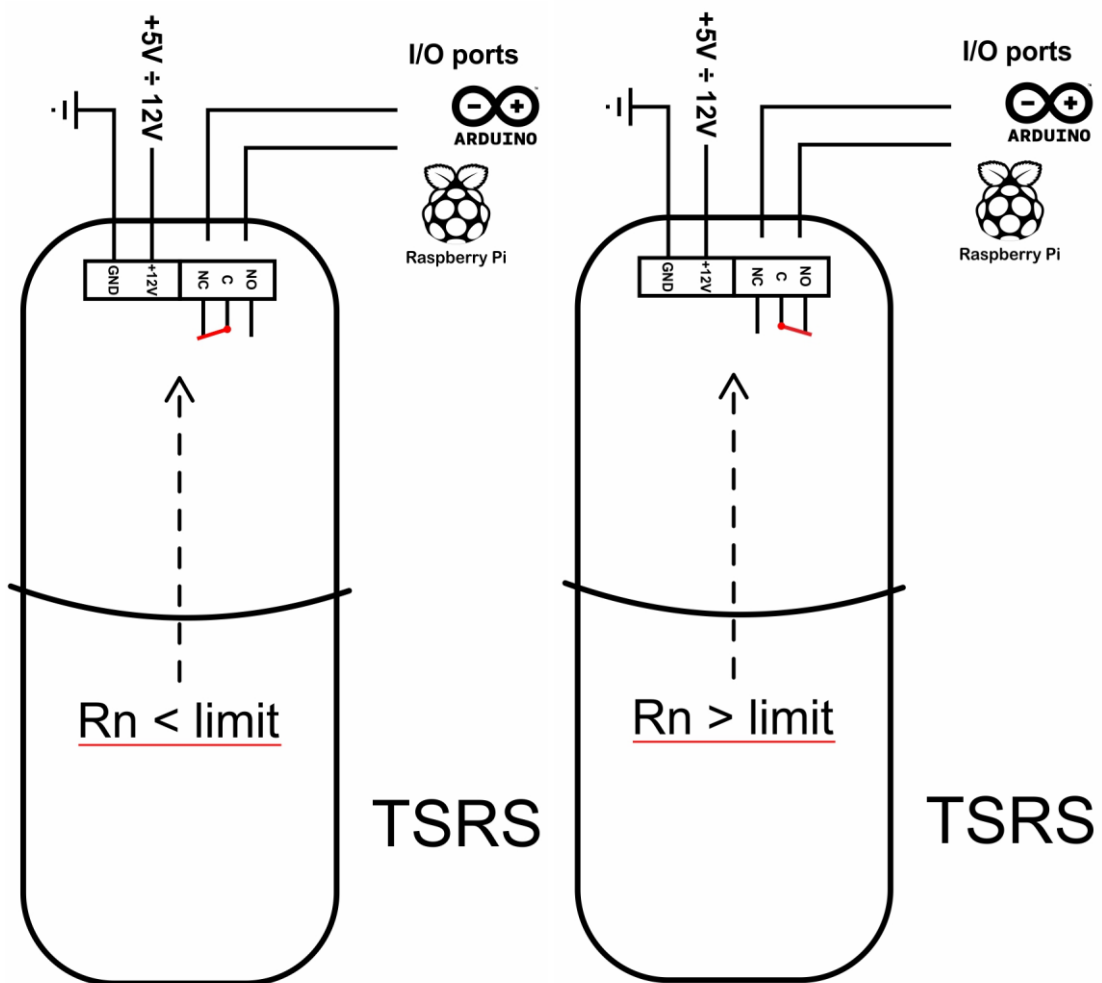
| Color | Description |
|------------------------|---|
| Green blinks after 5s | Radon probe measures and works correctly |
| Yellow blinks after 5s | Radon probe measures but troubles are occur. – especially low voltage of power supply or error of high voltage in chamber (high humidity in chamber or a few second after turning on of probe) |
| No light, No blinking | No power supply connected or device is damaged. |

UART connector is for 4 – wires, 2 wires are for serial half-duplex data (TxD, RxD) and 2 wires for DC powering (+5V, GND). TSRS sensor with wired serial interface UART is design for direct connection with processor unit for short distance (several meters). For powering is possible to use random pin „+5V“ or „+12V“ or both. On both of pin is possible to connect power supply from range 5VDC to 12VDC. Description of serial interface UART and protocol for easy development and implementation of processor program is available on company website <http://www.tesla.cz> . UART connector can operate no matter if the RELAY connector is used or not.



Schematic diagram of TSRS (UART) sensor connection

RELÉ konektor is for 5 - wires, 3 pins are for relay (C, NO, NC) and 2 pins are for DC (+12V, GND). For connection of sensor only 4-wires cable can be, when 2 wires are for powering, 1 wire is always connected to C (Contact) and the last is connected to NO (Normally Open) or NC (Normally Close) according of sense of using. The sensor with relay is design for remote alarm signalization of crossing radon limit. For powering is possible to use random pin „+5V“ or „+12V“ or both. On both of pins is possible to connect power supply from range 5VDC to 12VDC. On figure below is shown principle of switching of relay in probe when measured value of radon concentration (1 hours moving average) cross adjusted limit and back. Switching off and switching on are made with 10% hysteresis around alarm limit of radon concentration RELAY connector can operate no matter if the UART connector is used or not.



Schematic diagram of TSRS (RELAY) sensor connection

Installation

Delivered package include cover of cable connectors. After connection of cable the cover is possible to insert on top of the probe. Probe is possible to fix on wall for example by special holder which is in package too.



6 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.

7 Repairs

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

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8 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.

9 Accessories

Radon Probe accessories are available at producer www.tesla.cz or at distributor.

USB<->UART converter for TSRS



Cable for better SW debugging or possibility to try usbRADONview application on www.tesla.cz .

10 Revision History

| Revision | Date | Comments |
|----------|-----------|----------------------|
| Rev.1: | 31.1.2018 | Initial release |
| Rev.2: | 1.9.2019 | Relay and Status LED |