



# TERA Radon Program

## TCR4 Central Unit Technical Specifications & Operation Manual



v.2 – 2016

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## 1 Introduction

This document describes technical specifications and user operation of the TCR4 Central Unit.

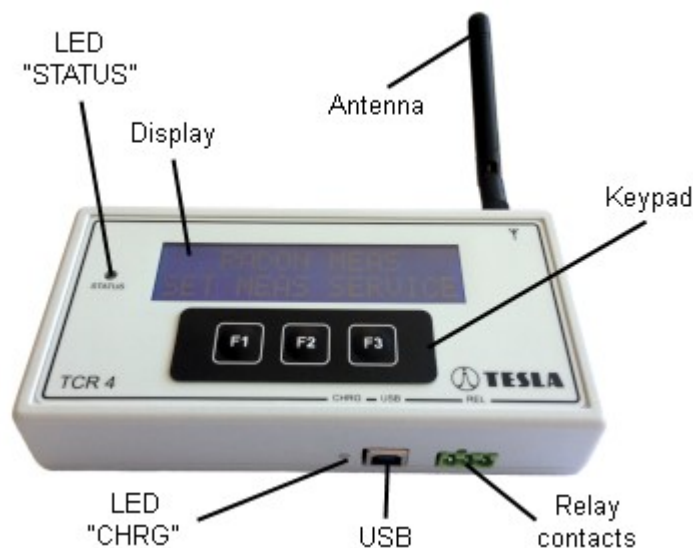
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**Attention! This formatted text indicates the operating and safety instructions.**

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



This product is designed to control and analyze wireless system measurements of radon volume activity in buildings.

Portable central unit controls the operation of wireless network, it collects data from individual measuring elements and it eventually operates actuating units. The measuring elements are TSR2 Wireless radon probes from TERA program made by TESLA; see <http://www.tesla.cz/> and actuating units are TAR2 Wireless Actuator from TERA program made by TESLA; see <http://www.tesla.cz/>.

Central Unit is provided with two-line alphanumeric display and with three-key keyboard for operating. Display shows basic measuring values of a selected probe (short and long-term radon concentrations, temperature, humidity) and values of central unit itself (temperature, pressure, humidity). Via the keypad it is possible to select type of shown data.

Central Unit supports simultaneous data downloads from up to 16 probes. All values are saved again into central unit memory. Via connected computer over USB to Central Unit and TERAvie application on PC it is possible to download and process all data from system and configure whole system. Resulting values can be download continuously during measurement or at once at the end of measurement.

Setting and configuration of Central Unit and whole system is also managed by connected computer to Central Unit and TERAvie application on PC. TERAvie application, drivers and user manual with detail description of building and configuration network is free downloaded on website: <http://www.tesla.cz/>.

USB port of Central Unit is also used for charging the internal unit accumulator, either from computer, USB port or USB power adapter. USB cable and the USB power adapter are included in package.

Central Unit has wire switching actuating unit (memory alarm relay) by which it is possible to switch low power input load, for example small fan, if limit of radon concentrations is overran. On output connector of relay it is also possible to connect control signals of TPS2 Power Relay from TERA program made by TESLA; see <http://www.tesla.cz/> or to connect other higher power switching element by wire.

LED diode 'STATUS' indicates general status of Central Unit and wireless network; see 'Operating Instructions' paragraph.

Central Unit can be used in these systems:

- A) TERA System for Radon Concentration Measurement (Figure 1)
- B) TERA System for Regulating Radon Concentrations (Figure 2)

*Regulating system diagram description* - 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 wireless command to actuator 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.

Thanks to its independent accumulator power, portable Central Unit supports flexible placing options within monitored structures. In case of time continuous radon concentration measurement or in case of setting in regulation system Central Unit must be placed in radio range of other wireless elements of network. Distance (radio range) between elements and central unit is up to 600 m in open space. In buildings it depends on number of walls, building material, etc. Strength of radio signals (RSSI) with all elements is monitored by Central Unit.

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

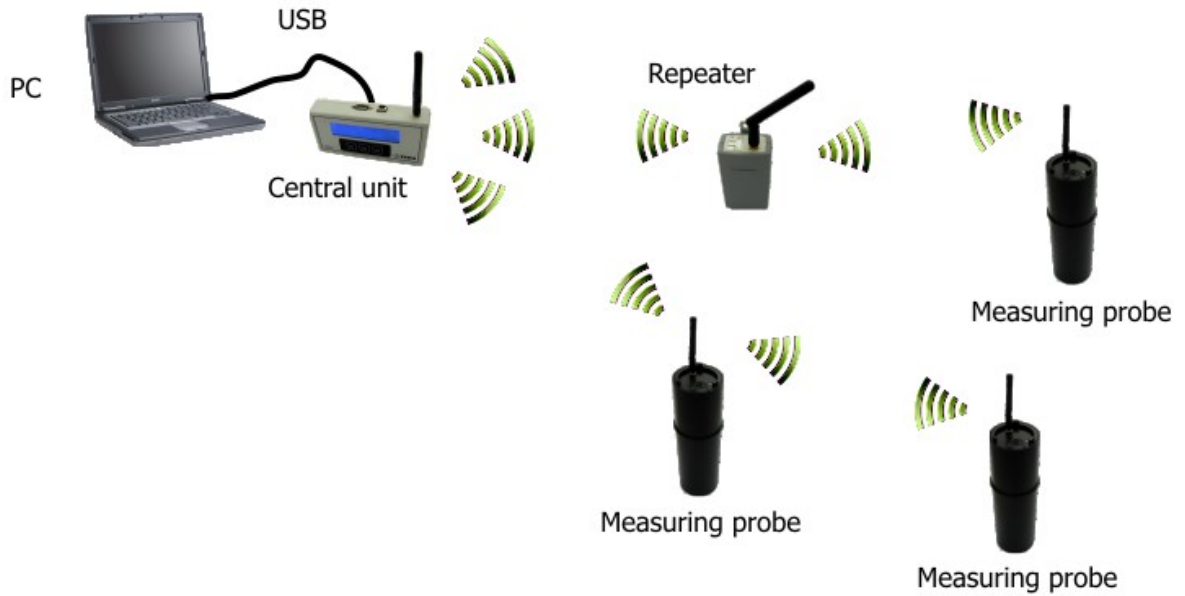


Figure 1 - TCR4 Central Unit in TERA System for Radon Concentration Measurement

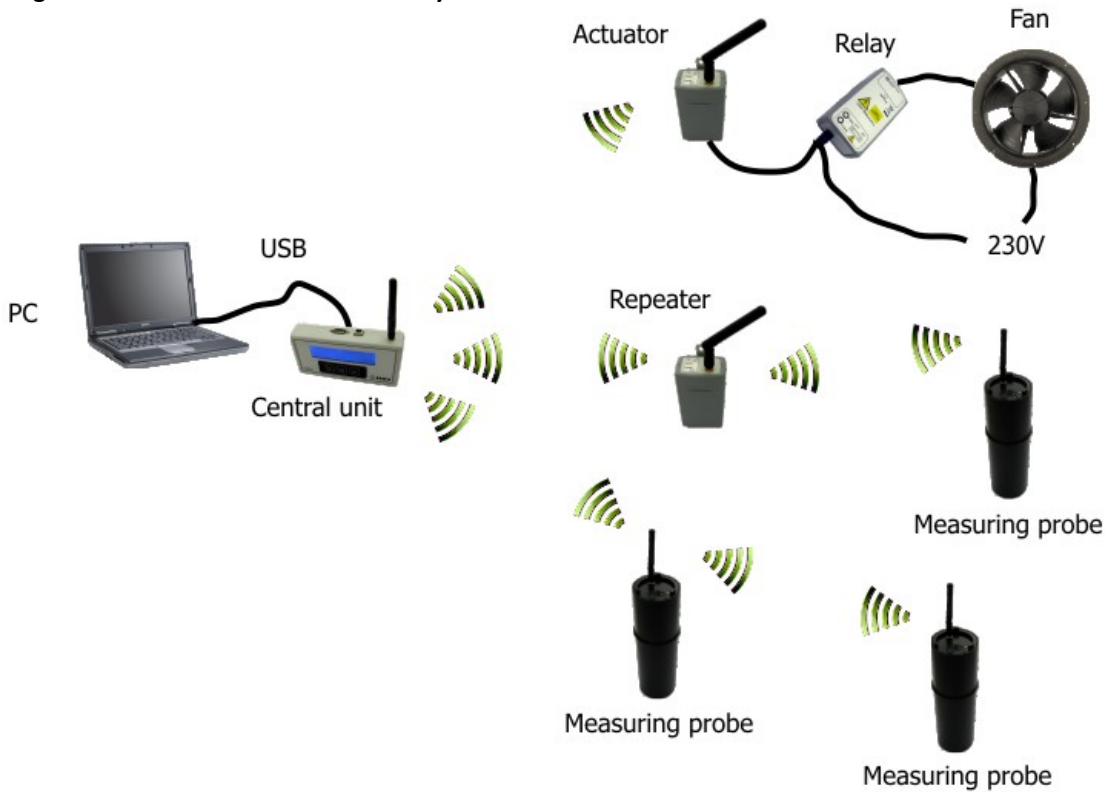


Figure 2 - TCR4 Central Unit in TERA System for Regulating Radon Concentrations

### 3 Scope of Delivery

- TSR2 Wireless Radon Probe
- USB adapter 230V including USB-B cable
- Antenna
- Cable connector – output relay
- Operation Manual

## 4 Product Specification

Product	TCR4 Central Unit
Type symbol	042 127 178 000
Measuring temperature range	-20 to + 60 °C
Measuring barometric pressure range	150 – 1150 hPa
Radio interface	868 MHz
PC interface	USB B
Max number of radio network elements	16
Probe to terminal unit distance (RF range)	Dependent on number of walls and building material, up to 600 m in open space
Possibility of using repeater for RF range extending	yes
Measurement reading interval	240-65535 sec (4 min - 18.2 hours)
Results memory capacity in terminal unit	100 days (1 probe, 1 hour records)
Terminal unit power supply	Rechargeable battery (USB charged)
Radon concentration results display	short-term (1 hour average) long-term (24 hours average)
Maximum relay switching power	30W DC (1A/30V)
Dimensions	165 x 85 x 35 mm
Accumulator Panasonic NCR 18650B 3.7V 3400mAh - Li-ion MH12210 (or equivalent)	

## 5 Operating Instructions

### Switching on:

Central Unit is delivered standardly in standby mode. To switch Central Unit display on, press any of three buttons (F1, F2, or F3). Central Unit display switches off automatically after 1 minute. However, you can set display to be permanently on (see 'Hand Operation'). If Central Unit display doesn't switch on after press any buttons the internal accumulator can be discharged (for example by reason of longer storing without external power) and it is necessary to charge the accumulator see 'Basic Maintenance/Accumulator charging'. Central Unit is impossible to switch off completely. Before connecting Central Unit to PC, install drivers see paragraph 'Configuration'.

### Antenna installation:

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



### Power supply:

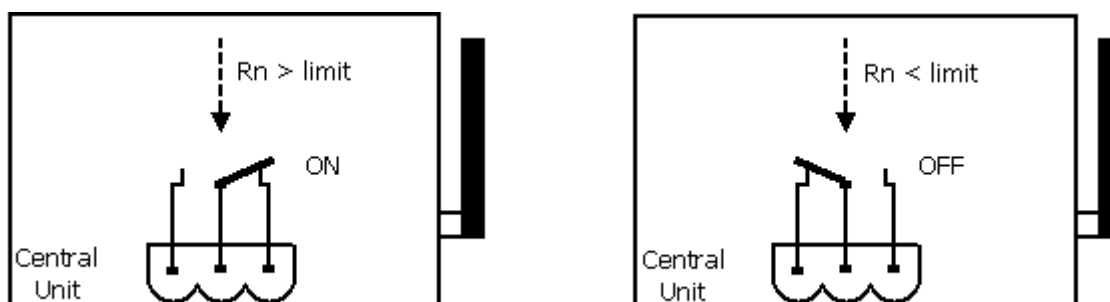
According to operation method Central Unit can be supplied:

- 1) By internal accumulator for portable use – Central Unit includes internal accumulator which is able to ensure autonomous operation of Central Unit for 2-8 months according to frequency of downloading and operation mode of display. 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 – Central Unit is permanently supplied by delivered power adapter. Power adapter is connected to Central Unit via provided USB cable. In case of blackout internal accumulator ensures UPS function.

### Alarm relay:

Automatic switching off and switching on of relay contacts is controled by crossing of adjusted radon concentration limit with 10% hysteresis at least in one radon probe into wireless net. Limit is adjusted in radon probe via Central Unit (see paragraph 'Configuration'). Contacts can also be switched into different permanent positions by manual setting in Central Unit. Relay Contacts connection is in figure 3.

**Attention ! Switching relay of central unit is not designed for switching mains 230V / 50Hz!**



**Figure 3 - Relay contacts connection**

### LED diode „STATUS“:

It signalizes status of measuring (regulating) system according to following chart:

Color	Description
Green blink after 4sec	Data acquisition is running - measuring system works correctly
Yellow blink after 4 sec	Data acquisition is running - measuring system does not work correctly – Any element in network is out of radio range (not communicates) or it has low battery voltage
No light, no blinking	Measurement is off or accumulator is empty or equipment is broken.

### Configuration:

Setting and configuration of Central Unit and whole system is managed by connected computer via USB interface to Central Unit and TERAvue application on PC. TERAvue application, drivers and user manual with detail description of building and configuration network is free downloaded on website: <http://www.tesla.cz/>.

For successful actuator configuration in measuring system it is essential to know actuator radio channel number (communication wireless channel) and P2P address (identification in wireless net). Both parameters are printed out on actuator serial number plate. Actuator radio channel number is possible to change by TERAvue 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. Central Unit P2P address can be identical to P2P address of other elements in network.

**Manual control:**

For hand operation Central Unit is equipped with two-line display and three function keys F1, F2 and F3. To activate inactive display to last active state, press any key.

Basic screen is in figure 4. In this display function mode, the first row is for information only. It displays **RADON MEAS** and, in the right-hand corner, 'R' or 'Q' if measuring is on. R indicates that measuring is on, Q indicates that data is being transmitted. Use the F1, F2, or F3 keys based on data displayed in the second row. From basic display you can select any of three modes **SET** (F1), **MEAS** (F2), **SERVICE** (F3).



**Figure 4 - Central Unit display basic screen**

Hand operation of Central Unit only allows the following functionality:

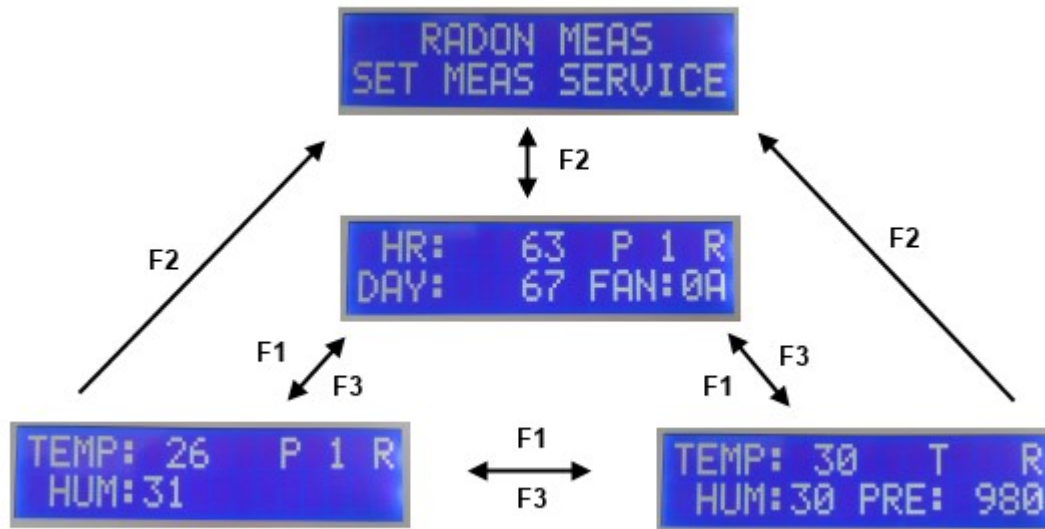
- 1) **SET** – Basic setup options
- 2) **MEAS** - Showing measurement results
- 3) **SERV** – Service setup

**SET – Basic setup options**

Generally, F3 button changes parameter and F2 button confirms value and moves forward.

Mode	Parameter	Options– CHANGE(F3)	Description
<b>SET</b> (F1)	<b>LANGUAGE:</b> OK (F2)	<b>ENGL</b>	English language pack for display
		<b>CESTINA</b>	Czech language pack for display
	<b>DISPLAY:</b> OK (F2)	<b>AUTO</b>	Display turns off after 1 minute idle
		<b>ON</b>	Display permanently illuminates
	<b>FAN:</b> OK (F2)	<b>?</b>	Reads current setting of Central Unit relay contacts
		<b>AUTO</b>	Automatically switch on/off Central Unit relay contacts if radon concentration exceeds above/drops below limit
		<b>ON</b>	Central Unit relay contacts are permanently on
	<b>OFF</b>	Central Unit relay contacts are permanently off	
<b>PROBE NO:</b> OK (F2)	<b>1..16</b>	Number of radon probe which results are displayed in MEAS mode. If system contains one probe only, one number is displayed and you cannot change it.	

MEAS - Showing measurement results



Symbol	Description
HR:	Short-term radon concentrations (1 hour average) Bq/m3
DAY:	Long-term radon concentrations (24 hour average) Bq/m3
FAN:	Current state of relay contacts in Central Unit : 0 = permanently off 1 = permanently on 0A = automatically off 1A = automatically on (exceeded limit)
TEMP:	Temperature in °C
HUM:	Humidity in %
PRE:	Pressure in kPa
P,T	P X – Displayed results are from radon probe with MESH number X. T - Displayed results are from Central Unit
R,Q	R – Indicates that measuring is on Q - Indicates that data is being transmitted



### SERV – Service setup

SERV mode allows you to access password-protected maintenance environment of the program. While in SERV mode you can return to basic display by repeated pressing F2 button until “ESC” displays above F3 button. Then press F3 button to return to basic display.



Symbol	Description
c, #	c – Accumulator is being charged # - Accumulator voltage falls below 3.5V
R, Q	R – Indicates that measuring is on Q - Indicates that data is being transmitted
+, -, ?, (nic)	Current state of relay contacts in Central Unit : ? = No data available + = on - = on, control error nic = off ! = off, control error

### Error messages

In case of error, display shows an error code..

Error codes:

- 1 Low voltage of the CU battery,  $U < 3.2V$
- 2 No probe engaged in measurement
- 3 Ventilator status error
- 4 Ventilator communication error
- 10 Selected probe not engaged in measurement
- 11 Selected probe communication error
- 12 Low voltage of selected probe battery,  $U < 3.2V$
- 13 Measurement not activated

## 6 Basic Maintenance

### Accumulator charging:

During portable use of Central Unit it is essential to monitor state of internal accumulator and recharge it if necessary. If accumulator is discharged (accumulator voltage falls below 3.1V), Central Unit automatically turns off (display does not respond to any keys and it is still off). Central Unit is switched on again powering USB port.

Current state of Central Unit accumulator can be determined in three ways:

- 1) In TERAview PC application - where you can check current accumulator voltage. Battery voltage should not fall below 3.5 V, in limit conditions falls below 3.3V.
- 2) On Central Unit display - Symbol "#" on left edge of display second line in service mode 'SERV' (see paragraph 'Operation Manual / Hand operation') means that accumulator voltage fell below 3.5V.
- 3) By LED diode 'STATUS' - If LED starts blinking in yellow color it indicates that system is working incorrectly and you can find error message on display. One of error messages is that accumulator voltage fell below 3,5V (see paragraph 'Operation Manual / Hand operation')

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 Central Unit. LED diode 'CHRG' next to USB port on Central Unit 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.

## 7 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).

## 8 Repairs

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

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[www.tesla.cz](http://www.tesla.cz)

## 9 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 the product was undergoing warranty repairs.

After the end of its life, product must be handled as e-waste.

## 10 Accessories

TCR4 Central Unit accessories are available at producer [www.tesla.cz](http://www.tesla.cz) or distributor.

**Spare antenna**



**Spare cable connector - relay**



## 11 Revision history

Revision	Date	Comments
Rev.1:	22. 7. 2015	Initial release
Rev.2:	30. 4. 2016	Extended release