

TERA Radon Program

TCR4A Terminal  
Technical Specifications & Operation Manual



v.1 – Jan 2017

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Manual also available on [www.tesla.cz](http://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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[www.tesla.cz](http://www.tesla.cz)

## 1 Introduction

This document describes technical specifications and user operation of the TCR4A terminal.

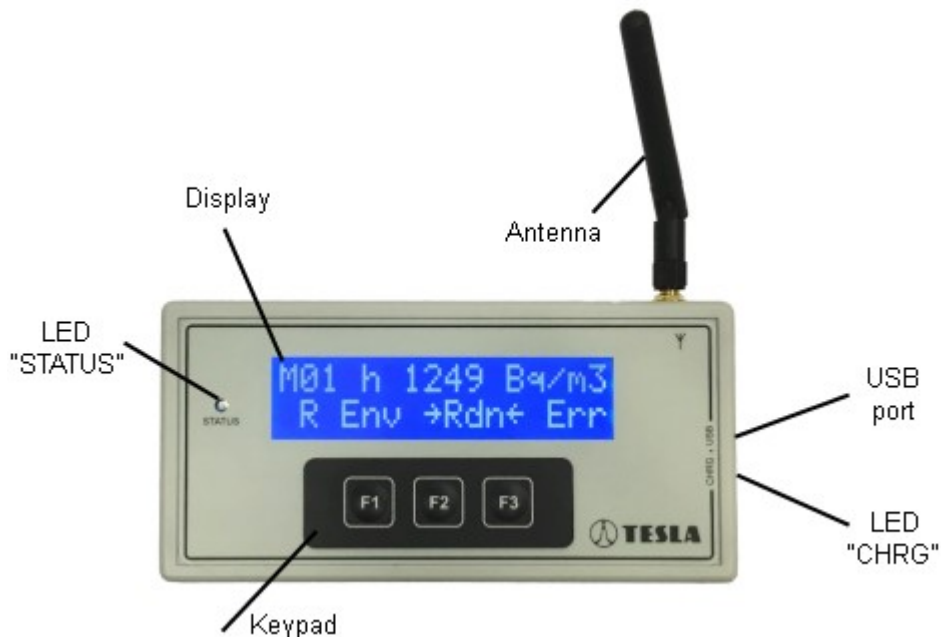
Product was developed and manufactured in the Czech Republic. All rights reserved TESLA. Offer or delivery of products or services related to the product does not include transfer of ownership rights.

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



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

The portable terminal controls operation of a wireless network, collects data from individual measuring elements and also operates actuating units (if used). The measuring elements are radon probes from TERA system made by TESLA; see <http://www.tesla.cz/> and actuating units are Wireless Actuators from TERA system made by TESLA; see <http://www.tesla.cz/>.

The terminal is provided with two-line alphanumerical 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 the terminal itself (temperature, pressure, humidity). Shown data are selected via the keypad.

The terminal supports simultaneous data downloads from up to 16 elements. All values are saved in the terminal memory. The terminal can be connected with a computer via USB. By the TERAvIEW application on PC it is possible to download and process all the data from the system. Resulting values can be downloaded continuously during measurement or at once at the end of measurement.

Setting and configuration of the terminal and the whole system is also managed by the TERAvIEW application on a connected computer. The TERAvIEW application, drivers and user manual with detail description of building and configuration network can be free downloaded on the website: <http://www.tesla.cz/>.

USB port of the terminal is also used for charging of the internal accumulator, either from a computer USB port or an USB power adapter. USB cable and the USB power adapter are included in package. Another possibility of powering is 12VDC over connector in back. This possibility is design for static installation.

The terminal has internal actuating unit (memory alarm relay) by which it is possible to switch low power input load, for example small fan, if the set limit of radon concentration is exceeded. On the output connector of relay which is in back it is also possible to connect control signals of 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 the terminal and wireless network; see the 'Operating Instructions' paragraph.

Terminal 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 the terminal wirelessly. The terminal analyzes this information and on the basis of measured (set) concentration level value 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 a building.

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

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

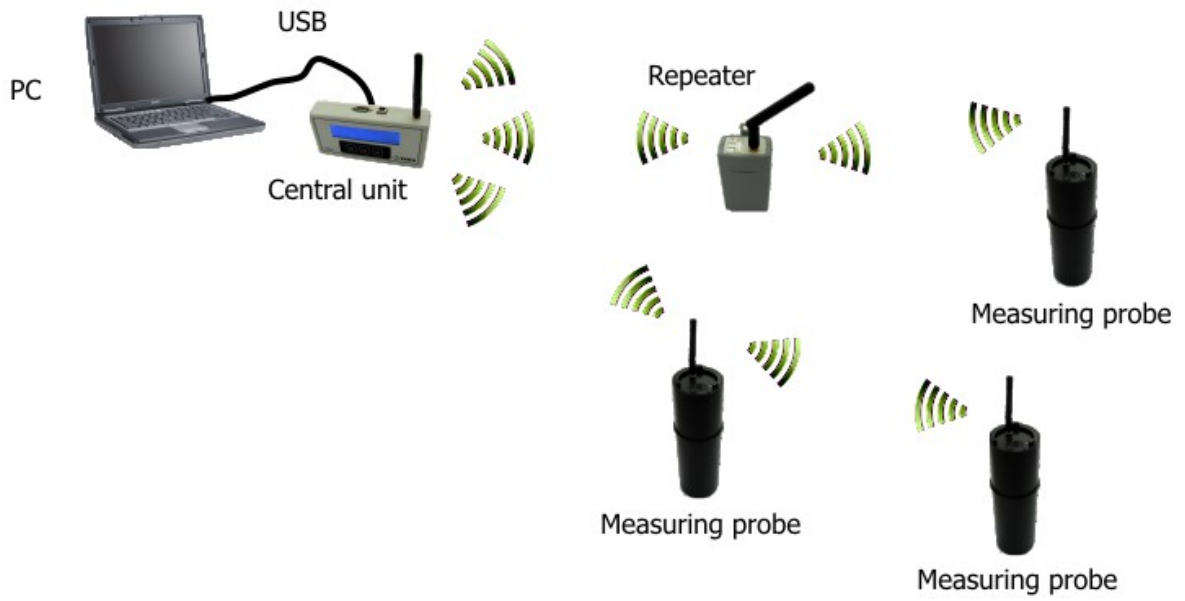


Figure 1 - Terminal in TERA System for Radon Concentration Measurement

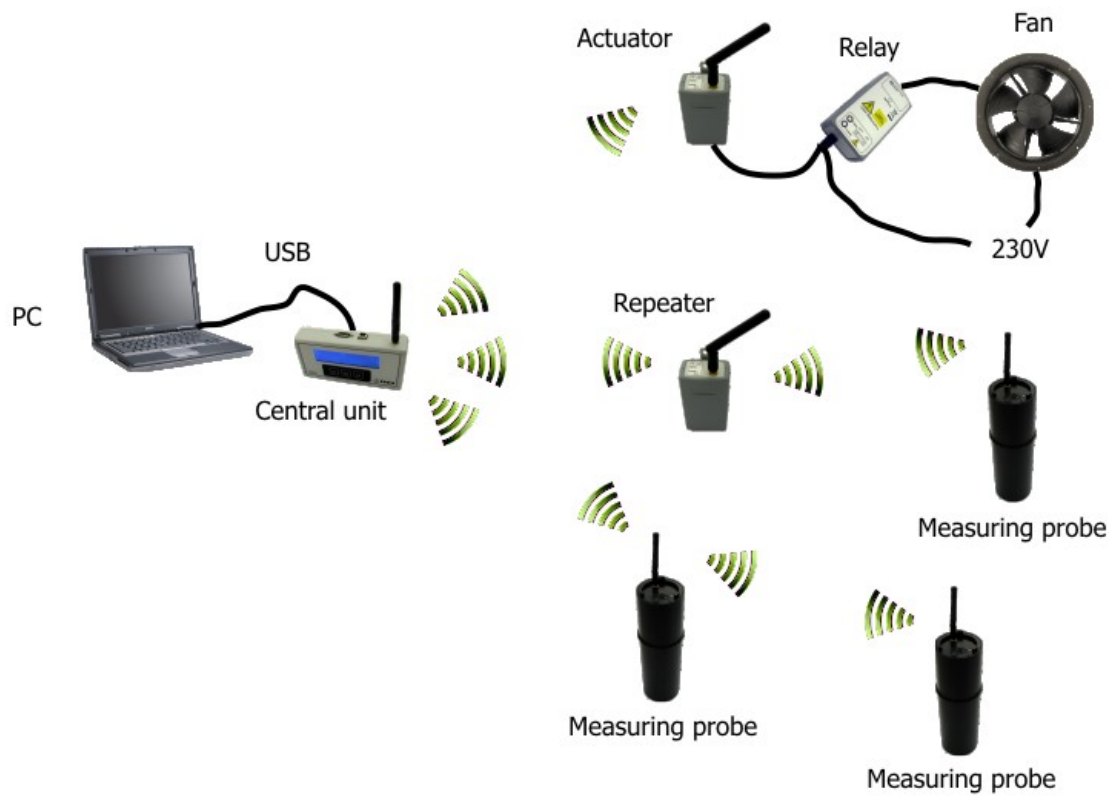


Figure 2 - Terminal in TERA System for Regulating Radon Concentrations

## Version comparison

| version        | wireless | USB | diag. LED | rela y | ext. power supply 12V | enhanced FW/SW | compatibility (newer) | compatibility (older) |
|----------------|----------|-----|-----------|--------|-----------------------|----------------|-----------------------|-----------------------|
| TCR4A          | x        | x   | x         | x      | x                     | x              | x                     |                       |
| TCR4–OS3.08NP* | x        | x   | x         | x      |                       | x              | x                     |                       |
| TCR4           | x        | x   | x         | x      |                       |                |                       | x                     |
| TCR3–OS3.08NP* | x        | x   |           |        |                       | x              | x                     |                       |
| TCR3           | x        | x   |           |        |                       |                |                       | x                     |

\* TCR4/TCR3–OS3.08NP – terminals TCR4/TCR3 with company upgraded FW/SW

\* Enhanced FW/SW:

Measuring algorithm selection –RaA only or RaA+RaC measurement

Automatic data download and storage in preselected intervals

Selecting of spectra recording intervals

Date and time of storing a spectrum is also recorded

Faster data download when downloaded directly from probes

An identification string can be stored in the probe's memory

## Compatibility

TCR4A terminal is communication compatible only with the following equipment:

TSR2- OS 3.08 NP (company's FW/SW upgrade),

TSR3,

TCR3 - OS 3.08 NP (company's FW/SW upgrade),

TCR4 - OS 3.08 NP,

TRR2 - OS 3.08 NP (company's FW/SW upgrade),

TAR2 - OS 3.08 NP ( company's FW/SW upgrade).

TCR4A terminal is not compatible with:

TSR2, TCR3, TCR4, TRR2, TAR2.

## 3 Scope of Delivery

- TCR4 terminal
- USB adapter 230V including USB-B cable
- Antenna
- Operation Manual

## 4 Product Specification

|  |   |
|--|---|
| Product  | TCR4A terminal  |
| Type symbol  | 042 127 190 000   |
| 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 the terminal              | 100 days (1 probe, 1 hour records)  |
| Terminal power supply                                | Rechargeable battery (USB charged) or 12VDC (back connector)                  |
| Radon concentration results display                  | short-term (1 hour average)<br>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:

The terminal is by default delivered in a standby mode. To switch the terminal display on, press any of the three buttons (F1, F2, or F3). The terminal display switches off automatically after 1 minute. However, you can set display to be permanently on (see 'Hand Operation'). If the terminal display doesn't switch on after pressing any of the buttons the internal accumulator can be discharged (for example due to long storing without any external power) and it is necessary to charge the accumulator, see 'Basic Maintenance/Accumulator charging'. The terminal cannot be switched off completely.

Before connecting the terminal to a PC, install drivers, see paragraph 'Configuration'.

### Antenna installation:

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

### Power supply:

According to the operation method, terminal can be supplied:

- 1) By internal accumulator for portable use – terminal includes an internal accumulator which is able to ensure autonomous operation of the terminal for 2-8 months according to the frequency of downloading and operation mode of the display. The Accumulator is charged via the USB port and provided USB cable. The USB cable can be connected to a PC or to the delivered power adapter. Status of the accumulator and charging process are described in the paragraph 'Basic Maintenance/Accumulator charging'
- 2) By mains power supply 230V/50Hz for stationary use – the terminal is permanently supplied by the delivered power adapter. This power adapter is connected to the terminal via provided USB cable. In case of blackout the internal accumulator ensures UPS function.
- 3) By 12V DC for stationary use – the terminal is permanently supplied from back connector (12V, GND). In case of blackout the internal accumulator ensures UPS function.

### Alarm relay:

Automatic switching off and switching on of relay contacts is controlled by crossing of an adjusted radon concentration limit with 10% hysteresis at least in one radon probe in the mesh. The limit is adjusted in the radon probes via the terminal (see paragraph 'Configuration'). Contacts can also be switched into different permanent positions by manual setting in the terminal. Relay Contacts connection is depicted in figure 3.

**Attention ! Relay of the terminal is not designed for switching mains 230V / 50Hz!**

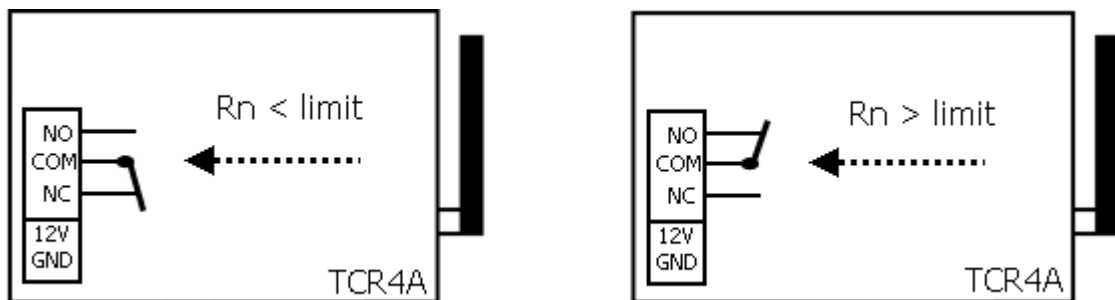


Figure 3 - Relay contacts connection

### LED diode „STATUS“:

signalizes status of a measuring (regulating) system according to the 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 – some element in the network is out of radio range (no communication) or has a low battery voltage. Type and location of error is possible to see on display see paragraph 'Manual control'. LED is updated every query time. |
| No light, no blinking    | Measurement is off or accumulator is empty or equipment is broken.  |

### Configuration:

Setting and configuration of the terminal and a whole system is managed by a PC connected r via USB interface to the terminal and a running PC application TERAview. The TERAview application, drivers and a user manual with detail description of building and configuration network is free to download on the website: <http://www.tesla.cz/>.

For successful terminal configuration in a measuring system it is essential to know its radio channel number (communication wireless channel) and P2P address (identification in wireless net). Both parameters are printed out on the terminal serial number plate. A radio channel number can be changed by software. Every P2P address is permanent and in one wireless network can be used only once. Terminal P2P address can be identical to P2P address of other elements in a network.

### Manual control:

For manual control terminals are equipped with a two-line display and three function keys F1, F2 and F3. An inactive display is activated to the last state by pressing any key.

Display menus are set in 3 levels. The upper row is informational (with the exception of data displaying) and it displays the description of the activity determined by the selection F2 in the lower row (middle position with inward arrows). The lower row information can be left/right rotated by the keys F1/F3. The description in the upper row is changed accordingly.

Three leftmost positions in the lower row do not rotate and display status information. Its description is in Tab. 4.

By pressing of the F2 key is the appropriate command executed. The command is either executive or has the meaning of passing one level lower in the display menu (one level higher in the case of the **Ret** command).

Manual control of the terminal allows by pressing of the F2 key in the level 1 selection of the following functions:

- 1) **Set (System adjusting)**
- 2) **Dat (Actual data view)**
- 3) **Srv (Service action)** – This menu is not accesible by the user and an access attempt invokes the message **Err: Unavailable** and a forced return by pressing F2.



### Set (System adjusting )

In this menu the display parameters, an external actuator (if used) and the terminal actuator are set-up. All the possibilities are summarized in Tab. 1.

| Level2 (F2) selection | Level 3 (F2) selection     | Description  |
|-----------------------|----------------------------|--|
| LCD (LCD adjusting)   | Dsp (Display:)             | Periodically switches between <b>Fixed On</b> display is on permanently and <b>Auto Off</b> (display is switched off automatically after cca 1 minute) |
|                       | Inc (Contrast setting)     | Contrast is increased  |
|                       | Dec (Contrast setting)     | Contrast is decreased  |
|                       | Ret (Return)               | Return to the level 2  |
| Act (Actuator relay)  |                            | If there is no actuator–<br><b>Err: No Device</b><br>OK – return   |
|                       | Red (Read Actuator Status) | Actuator state is read and displayed on the upper row  |
|                       | Set (Act Relay: 1=1Aut)    | Periodically changes setting of an actuator relay. By entering the menu the upper row displays actual state (e.g. 1=1Aut)                              |
|                       | Wr0 (WriteOneAddress)      | The preset state of the relay is written to the external actuator (one address in case of several actuators)   |
|                       | Adm (AddressMesh)          | Periodically changes actuator addresses in case of more actuators, otherwise of no effect  |
|                       | Ret (Return)               | Return to the level 2  |
| Ter (Terminal relay)  | Set (Ter Relay: 0=0Aut)    | Periodically changes setting of the relay according to the Tab. 2. By entering the menu the upper row displays actual state (e.g. 0=0Aut)              |
|                       | Wrt (Write: Terminal)      | The preset state of the relay is written to the terminal   |
|                       | Ret (Return)               | Return to the level 2  |
| Ret (Return)          |                            | Return to the basic level 1  |

Tab. 1 Menu **Set** - control options

| Setting | Description   |
|---------|---|
| 0 Man   | Forced switching off of the relay contacts  |
| 1 Man   | Forced switching on of the relay contacts   |
| 0 Aut   | Automatic mode setting initial state of the relay contacts is off<br>Relay is set according to the preset radon concentration limit after the first measurement results reading |
| 1 Aut   | Automatic mode setting initial state of the relay contacts is on<br>Relay is set according to the preset radon concentration limit after the first measurement results reading  |

Tab.2 Relay contacts setting

### Dat (Actual data view)

All the results and measurement parameters are displayed in this menu. Possibilities are summarized in Tab. 3. An attempt for access into the menu Dat in case the measurement is not running invokes the message **Err: Unavailable** and a forced return by pressing F2.

*Rem: Starting/stopping of the measurement can not be performed from the terminal*

| Level 2 (F2) selection | Level 2 (F2) selection   | Description  |
|------------------------|--|--|
| <b>Rdn</b>             | In case of several probes switches periodically between them, otherwise of no effect                               | Sliding hourly and daily values of radon concentration in ( <b>h</b> – hour) ( <b>d</b> – day) Bq/m <sup>3</sup> are displayed. The displayed result has maximum of 5 digits, from the value 32768 the engineering notation is used e.g. 47k12 (47120) or 120k1 (120100).<br>On the leftmost position the probe's number is displayed ( <b>MXX</b> ) |
| <b>Err</b>             | In case of more errors switches periodically between the list items, otherwise of no effect                        | All the current errors are displayed.<br>More detailed description – chapter Error messages  |
| <b>RhT</b>             | N/A  | It displays a temperature in Celsius degrees (°C) and a relative humidity ( <b>RH</b> ) measured in the terminal ( <b>Ter</b> )  |
| <b>Prs</b>             | N/A  | It displays an atmospheric pressure in hectopascals ( <b>hPa</b> ) measured in the terminal ( <b>Ter</b> )   |
| <b>Ret (Return)</b>    |  | Return to the basic level 1  |
| <b>Act (Relay:)</b>    | <b>Act</b> – In case of several actuators in the system switches periodically between them, otherwise of no effect | Current status and setting of the relay in an external actuator is displayed, according to the Tab. 2. Changes are possible in the basic menu <b>Set</b> .<br>On the leftmost position the actuator's number is displayed ( <b>MXX</b> )   |
| <b>Ter (Relay:)</b>    | N/A  | Current status and setting of the relay in the terminal is displayed, according to the Tab. 2. Changes are possible in the basic menu <b>Set</b> .   |
| <b>Env</b>             | In case of several probes switches periodically between them, otherwise of no effect                               | It displays a temperature in Celsius degrees (°C) and a relative humidity ( <b>RH</b> ) measured in the selected probe<br>On the leftmost position the probe's number is displayed ( <b>MXX</b> )  |

Tab. 3 Control options in menu **Dat**

Meaning of the three leftmost symbols in the lower row is described in the following Tab. 4

| Symbol position from the left<br>Meaning     | Symbol   | Description   |
|--|--|---|
| 1.<br>Accumulator state                      | <b>c</b><br><b>#</b><br><b>void</b>                                  | Accumulator is being charged<br>Accumulator voltage is lower than 3,5V<br>Accumulator is fully charged  |
| 2.<br>Measurement and RF communication state | <b>R</b><br><b>Q</b><br><b>void</b><br><b>q</b><br><b>e, x, E, X</b> | Measurement is running<br>Communication is in progress (data are downloaded)<br>Measurement is not running, no error is indicated<br>Measurement is not running, communication is in progress<br>Lasting appearance means an error – service action is needed |
| 3.<br>Local relay state                      | <b>*</b><br><b>#</b><br><b>=</b><br><b>void</b>                      | relay contacts are on, control error<br>relay contacts are off, control error<br>relay cotacts are on<br>relay contacts are off   |

Tab. 4 Meaning of the status symbols

### Error messages

Errors, relating to the terminal itself are indicated by the status symbols, see Tab. 4.

If error/errors arise connected with operation of the measuring system (an element is out of the radio range, does not communicate or have a low supply voltage), this error is indicated by the LED STATUS shining yellow. More detailed information can be obtained in the menu **Dat**, item **Err**. The current error is displayed together with the appropriate element number (**MX**) on leftmost positions in the upper row. In case of more errors one can periodically switch between them by pressing the F2 key.

On the rightmost positions of the upper row the error type is indicated:

- **RF** radio communication error (an element does not respond or responds erroneously)
- **Bat** low supply voltage of an element (the battery must be replaced or the accumulator charged)

After error/errors removing the appropriate records from the error list disappear. If there are no errors, the message **No errors** is displayed.

## 6 Basic Maintenance

### **Accumulator charging:**

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

Current state of the terminal accumulator can be determined in three ways:

- 1) TERAview PC application - where the current accumulator voltage is displayed. Battery voltage should not fall below 3.5 V, in limit conditions below 3.3V.
- 2) On terminal display – Symbol "#" on the leftmost position of the lower row of display (see Tab. 4) means that accumulator voltage fell below 3.5V.
- 3) By LED diode 'STATUS' - If the LED starts blinking in yellow color it indicates that system is working incorrectly and you can find error message on the display. One of error messages is that accumulator voltage is low

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 Terminal. LED diode 'CHRG' next to USB port on Terminal indicates charging status according to the following table:

**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. The USB cable can be disconnected.

## 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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Rubeska 215/1  
190 00 Prague 9 - Vysocany  
[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

Terminal accessories are available at producer [www.tesla.cz](http://www.tesla.cz) or distributors.

### TCREX - Extended Memory and IP Access Point for TCR



TCREX is designed for radical extension of TCR terminal memory capacity and for possibility to connect TCR wireless terminal into LAN network or into internet for remote control.

Learn more: <http://www.tesla.cz>/<http://www.tesla.cz/>

### Spare antenna



## 11 Revision history

| <b>Revision</b> | <b>Date</b> | <b>Comments</b> |
|-----------------|-------------|-----------------|
| <b>Rev.1:</b>   | 31. 1. 2017 | Initial release |