

«I4Technology» OOO (Ltd.)

Radiation meter EcoLife Pro1

Instruction manual INTC.412113.001 RE



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This manual is to get you acquainted with the **Radiation meter EcoLife Pro1** internal design, working principles and rules of operation (correct use, maintenance, storage and transportation).

In production the device construction and electrical scheme can be modified. It does not impact the technical and metrological features of the product, - that's why the modifications are not mentioned in this manual.

The **Radiation meter EcoLife Pro1** is a hand-held device, produced to control the background radiation indoors and outdoors by measuring:

- the ambient dose of photon and gamma radiation and the ambient dose rate;
- the activity concentration of beta and gamma radioactive nucleus in substances.

Note: the ambient dose is the amount of radiation received by a person staying at the measuring point.

The **Appendix** is to get you acquainted with the general information about the radiation nature and the material-radiation interaction.

Attention! Read this manual carefully in order to use the product efficiently and safety for a long time.

Follow the rules, restrictions and instructions contained in the manual to increase the lifespan of the equipment and to use it most effectively.

The manufacturer's warranty will become invalid prematurely if the operator of the equipment does not follow the storage and transportation **instructions**.

Attention! While measuring the natural background radiation the readings of even two equal radiation meters may differ because the natural background is characterized by the low density of particle flow and electromagnetic energy. The lower density of the flow, the fewer particles is detected by the sensor per unit of time, that's why you may take the major variety of different readings. This situation is similar to the rain in everyday life. When there is a bit of rain it's difficult to detect how many drops drip per second by hand (there may be 2 drops, more or no one). When the rain is heavy, there will be a constant number of drops per second.

Attention! The device is intended for domestic use only. The readings taken by it can't be used for making official reports on the radiation situation or pollution rate.

Warning! After storing the product in a cold place or transporting it in winter you should keep the device at the room temperature for 2 hours before operating.

Warning! Demand to perform a functional test before purchase. Also ensure that the warranty sticker placed into the battery compartment is not damaged. Control the contents of the box according to the 1.3.1 article of this manual. Ensure the warranty card is signed, dated and stamped.

1. Specification and operation

1.1. Correct use and application area

The **Radiation meter EcoLife Pro1** is produced to control the radiation environment and can be used

- as an individual detector of the ambient dose and the ambient dose rate of gamma and X radiation, including beta-particle flow;
- as an exploratory detector of the ambient dose and the ambient dose rate of gamma and X radiation, including beta-particle flow, that's used to search for the objects polluted and the radiation sources;
- to control the radioactive pollution of currency notes, goods, freights, foods, toys, materials and the packaging of them.

1.1.2 The software of the equipment provides:

- the special measuring algorithm. According to this algorithm the unit estimates and corrects the measured data every 10 seconds repeatedly. In constant ionization radiation field the readings taken by the unit are being continuously corrected and averaged to reduce the statistical error.

Software allows to display:

- the ambient dose and the ambient dose rate;
- the radiation environment time based historical graphs;
- the current time and environment temperature;
- the battery charge level;
- the measurement cycle dynamic graph;
- the dose accumulated during the current measurement or the summarized value of the dose accumulated for all the measuring times).

The software also gives the opportunity of:

- non-volatile storing of the accumulated dose;
- selecting the unit measures (roentgen, Sievert);
- setting and changing the alarm sound of the ambient dose rate threshold;
- audiovisual warning of the ambient dose rate threshold excess;
- setting the data display language (Russian, English);
- performing the audiovisual signals at defined frequency that helps to find out the sources of the radiation quickly;
- setting the screen options (color skin of the menu, brightness and the screen lighting off time to spin out the energy);
- setting the sound options (switching on and off the whole sound, the sound of touching buttons, alarm sound of the ambient dose rate threshold, the particle detection sound).

1.1.3. The device is intended to use at the temperature ranging from -5°C to $+40^{\circ}\text{C}$, the relative moisture below 98% at the temperature of $+25^{\circ}\text{C}$ and at the atmosphere pressure of 84-106,7 kPa.

1.2. Technical features

1.2.1. The Figure below illustrates the physical configuration of the product (Fig.1).



Fig.1 – Physical configuration

1.2.2. The table below gives the information about the **Radiation meter EcoLife Pro1** technical features (Table 1).

| Name of the feature | Value |
|---|--------------------------------------|
| Ambient dose scale range - μSv - μR^1 | from 0 to 10000 from 0 to 1000000 |
| Ambient dose rate scale range: - $\mu\text{Sv/h}$ - $\mu\text{R/h}$ | from 0 to 1000 from 0 to 100000 |
| Detecting gamma-ray energy, MeV | from 0,05 to 3,0 |
| Low limit for the detecting beta-radiation energy, MeV , not more than | 0,5 |
| Measuring error for all modes, % | ± 25 |
| The radiation field of the product, $\mu\text{Sv/h}$, not more than | 0,05 |
| Time of setting the operation mode, s, not more than | 1 |
| Ambient dose rate measurement time, s | 10 |
| Time of continuous operation (for factory setting), hours, up to | 72 |
| Dimensions, mm, not more than | 105×58×18,5 |
| Mass with batteries, grams, not more than | 110 |

1.3. Contents of the box

1.3.1. The table below gives the information about parts of the product and the delivery set (Table 2).

| № | Name | number | note |
|----------|--|---------------|-------------------|
| 1 | Radiation meter EcoLife Pro1 TC 4362-007-64062607-2015 | 1 | |
| 2 | Battery type AAA | 2 | Already installed |
| 3 | Charging unit | 1 | |
| 4 | Cable | 1 | |
| 5 | Package box | 1 | |
| 6 | Operating Instructions INTC.412113.001RE | 1 | |

1.4. Internal design and operating

1.4.1. The Radiation meter EcoLife Pro1 is a portable device with the self-contained power supply. The case (no. 1) made of the impact-resistant plastic has a unit for batteries (no. 2) with a cover (no. 3). There are also membrane keyboard with 9 push-buttons (no. 4), OLED-display (no. 5) and micro-USB connector (no. 6) for charging unit placed in the case. Figure 2 illustrates the main parts scheme.

¹ **Note:** “ μSv ” and “ μR ” and “ mcSv ” and “ mcR ” are used as the same.

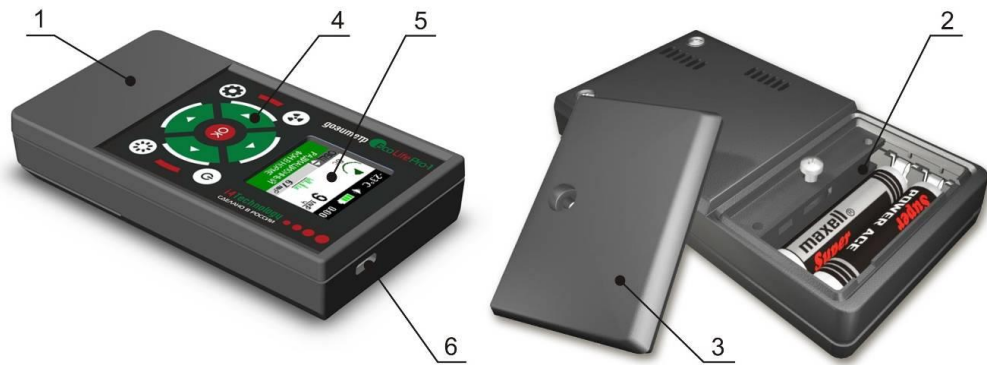


Fig. 2 –Main parts scheme

1.4.2. The radiation detector used in the device is a gas-discharge meter. By it the photon flux is transformed into the sequence of electrical signals by the radiation detector. These signals are processed by the smart detection circuit that provides the automatic processing of the ambient dose and the ambient dose rate measured data and the display indication.

1.4.3. Figure 3 illustrates the display in the Measurement mode



Fig. 3 – Measurement mode on the display

During the measuring averaged values of the ambient dose rate is being continuously displayed (no.1) in the units defined by user ($\mu\text{Sv/h}$ or $\mu\text{R/h}$). When the radiation level is constant, the measuring time is ranging from 10 to 80 seconds depending on the radiation rate. The displayed values are automatically changing and being averaged by the microprocessor. This averaging process is displayed by the measurement cycle dynamic graph (no. 5).

The additional information shown on the display includes also:

- radiation environment time base diagram (no. 2);
- environment temperature (no. 6);
- sound mode pictograph (no. 7);
- pictograph informing about the chosen power type (no. 8);
- battery charge level (no. 9);
- current time (no. 10);
- textual information about the exceedance/nonexceedance of the ambient dose rate threshold defined by user (no.11).

Note. The environment temperature is measured by the inbuilt sensor. For this reason displayed value of the environment temperature may depend on the heating of the unit's parts while operating a device.

In the line (no. 3) below the radiation environment time base diagram (no. 2) you can see

the value of the dose accumulated since the last switching on or the total summarized value for all the periods of working according to your choice made by the push-buttons «^» or «v».

Note. The human body accumulates the radiation dose that's why while staying at the locations with the elevated levels of radiation for a long time it's necessary to summarize the continuous readings taken from an individual detector. The Radiation meter EcoLife Pro1 automatically summarizes the accumulated dose from the moment of switching on and for all the periods of working. 3 millisieverts per hour is the normal annual background radiation dose considered safe. During the life the accumulated dose value must be below 100-700 millisieverts summarized (according to the local radiation background).

1.4.4. Control buttons are used to:



- switch the device on and off;



- switch to the Option menu;



- navigate through the Option menu and choose the values;



- switch to the Measurement mode;



- switch the screen off when the device in work (Power economy mode).

1.4.5. The power supply is carried out by two AAA batteries or by the accumulators of the same type. How to install batteries into the case you can see on the battery compartment's bottom or at the Figure 4.



Fig. 4 –Batteries installation scheme

2. Correct use

2.1 Use Limits

2.1.1. Keep the battery compartment and the power supply contacts clean.

2.1.2. Timely change the discharged batteries or charge the accumulators.

2.1.3. Ensure before charging the accumulators as part of the product (installed into the product's case) that there are the accumulators not galvanical batteries installed into the battery compartment. It's prohibited to charge the galvanical batteries, you must renew them.

2.1.4. If radioactive substances contact with the product's case the background readings may be raised. Check it by measuring the background readings in over room or location.

2.1.5. Prevent the product from the intrusion of foreign bodies through perforation.

2.2. Pre-starting procedure

To prepare the product for working you should:

- loosen the screw and remove the battery compartment cover no.3 (Fig. 2);
- install the batteries respecting polarities (Fig.4);
- place back the battery compartment cover and tighten the screw.

2.3. Using the product


To switch the product on push the button  and keep it pushed down for 2 seconds. After doing it you'll hear the short audio signal and see the screen saver (Fig.5).



Fig. 5 – Screen saver


After it, the product goes to the Measurement mode and the display looks like in Figure 6.



Figure 6 – The display in Measurement Mode

2.3.1. User settings

2.3.1.1. Setting the interface language:

- push the button , to open the main menu (Fig. 7);

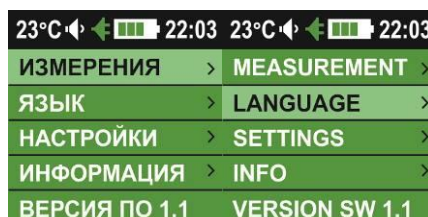



Figure 7 – Main menu

- by pushing the buttons «^» и «v» choose the line «ЯЗЫК (LANGUAGE)» and confirm

the choice by pushing the «OK» or «>» button;

- choose the language «РУССКИЙ» or «ENGLISH» in the opened submenu and confirm the language by pushing the «OK» button. You'll see the check mark opposite the chosen language;

- by pushing the buttons «<» or  come back to the Main menu for further settings.

2.3.1.2. Measurement mode settings

When you are in the Main menu (Fig. 7) chose the line «ИЗМЕРЕНИЕ (MEASUREMENT)» by pushing the buttons «^» and «v» and confirm your choice by pushing the buttons «OK» or «>». You'll see the Measurement settings menu on the display (Fig. 8).

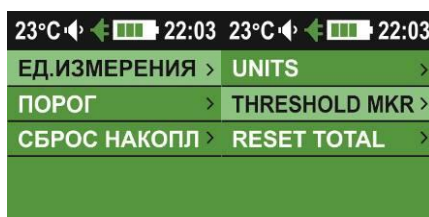


Figure 8 – Measurement mode settings

2.3.1.3 Selecting the units of measurement

- in the opened submenu (Fig. 8) chose the line «ЕД.ИЗМЕРЕНИЯ (UNITS)» and confirm your choice by pushing the buttons «OK» or «>»;

- choose the units of measurement «РЕНТГЕН (ROENTGEN)» or «ЗИБЕРТ (SIEVERT)», confirm your choice by pushing the button «OK». You'll see the check mark opposite the chosen unit;

- by pushing the button «<» come back to the Measurement settings menu (Fig. 8) for further settings.

2.3.1.4 Setting the threshold of the ambient dose rate (above which the device sounds because the radiation level is high)

- when you are in the Measurement settings menu (Fig. 8), by pushing the buttons «^» and «v» choose the line «ПОРОГ МКР/Ч (МКЗВ) (THRESHOLD MKR(MKS))» and confirm your choice by pushing the buttons «OK» or «>»;

- choose one of the available threshold values by pushing the buttons «^» and «v». Confirm your choice by pushing the «OK» button; you'll see the check mark opposite the chosen value;

- by pushing the button «<» come back to the Measurement settings menu (Fig. 8) for further settings.

2.3.1.5 Reset the dose summarized during the previous measurements

- when you are in the Measurement settings menu (fig. 8), by pushing the buttons «^» and «v» choose the line «СБРОС НАКОПЛ (RESET TOTAL)» and confirm your choice by pushing the buttons «OK» or «>»;

- choose «OK», if you want to reset the readings of the dose summarized for all the time of working to start recording a new value of the dose accumulated, or choose «ОТМЕНА (CANCEL)» if you want to reject the reset.

- by pushing the button «<» or the button  come back to the Main menu for further settings.

2.3.1.6. Setting the screen

When you are in the Main menu (fig. 7), by pushing the buttons «^» and «v» choose the line «**НАСТРОЙКИ (SETTINGS)**» and confirm your choice by pushing the button «OK» or «>»; in the opened submenu by pushing the buttons «^» and «v» choose the line «**ЭКРАН (DISPLAY)**» and confirm your choice by pushing the button «OK» or «>», after that the Screen settings menu will open (fig. 9).



Figure 9 – Screen settings menu


2.3.1.7. Setting the screen brightness

- when you are in the Screen settings menu (fig. 9), by pushing the buttons «^» and «v» choose the line «**ЯРКОСТЬ (BRIGHTNESS)**» and confirm your choice by pushing the button «OK» or «>»;

- by pushing the buttons «^» and «v» choose the brightness you want from available values (20%, 40%, 60%, 80%, 100%) and confirm your choice by pushing the button «OK». You'll see the check mark opposite the chosen brightness, and the screen brightness will be changed according to your choice;

- by pushing the button «<» come back to the Screen settings menu (fig. 9) for further settings.

2.3.1.8 Setting the screen lighting off time

This mode makes it possible to light off the screen in a time-lag chosen by user to spin out the energy. Working in the Measurement mode is not terminated by this. To light on the screen and take the reading it's enough to push the button .

For settings you should:

- in the Screen settings menu (fig. 9), by pushing the buttons «^» and «v» choose the line «**ВКЛЮЧЕН, МИН (TURN ON, MIN)**» and confirm your choice by pushing the button «OK» or «>»;


- by pushing the buttons «^» and «v» choose from available time periods the one you want (ВСЕГДА ВКЛ (ALWAYS ON), 1, 2, 3, 4, 5, 6, 7, 8, 9, 10), at the end of which the screen lights off automatically. Confirm your choice by pushing the button «OK», you'll see the check mark opposite the chosen time value;

- by pushing the button «<» come back to the Screen settings menu (fig. 9) for further settings.

2.3.1.9. Setting the Menu skin:

- in the Screen settings menu (fig. 9), by pushing the buttons «^» and «v» choose the line «ТЕМА (SKIN)» and confirm your choice by pushing the button «OK» or «>»;

- in the opened submenu choose one from available colors БЕЛЫЙ (WHITE), or КРАСНЫЙ (RED), or ЗЕЛЕНЫЙ (GREEN), or СИНИЙ (BLUE), by pushing the buttons «^» and «v» and confirm your choice by pushing the button «OK». You'll see the check mark opposite the chosen color, and the screen color will be changed according to your choice.

- by triple pushing of the «<» button or by pushing the button  come back to the Main menu for further settings.

2.3.1.10. Setting the sounds

In the Main menu (fig. 7), by pushing the buttons «^» and «v» choose the line «НАСТРОЙКИ (SETTINGS)» and confirm your choice by pushing the button «OK» or «>». Next, in the opened submenu by pushing the buttons «^» и «v» choose the line «ЗВУК (SOUND)» and confirm your choice by pushing the button «OK» or «>». After doing so the Sound settings menu will be opened (fig. 10).

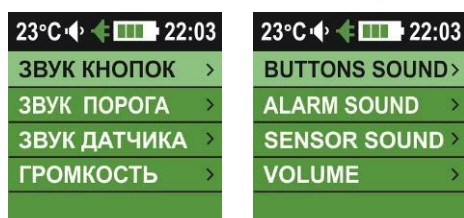


Figure 10 – Sound settings menu

2.3.1.11 Switching on and off the sound of touching buttons

- in the Sound settings menu (fig. 10), by pushing the buttons «^» и «v», choose the line «ЗВУК КНОПОК (BUTTONS SOUND)» and confirm your choice by pushing the button «OK» or «>»;

- by pushing the buttons «^» and «v» choose the value **ВКЛ(ON)** or **ВЫКЛ(OFF)** to switch the buttons sound on and off, and confirm your choice by pushing the button «OK», and opposite the chosen value you'll see the check mark;

- by pushing the button «<», come back to the Sound settings menu (fig. 10).

2.3.1.12. Switching on and off the alarm sound of the ambient dose rate threshold

- in the Sound settings menu (Рис. 10), by pushing the buttons «^» and «v», choose the line «ЗВУК ПОРОГА (ALARM SOUND)» and confirm your choice by pushing the button «OK» or «>»;

- choose the value **ВКЛ(ON)** or **ВЫКЛ(OFF)** by pushing the buttons «^» и «v» to switch the threshold alarm sound on and off, and confirm your choice by pushing the button «OK», and opposite the chosen value you'll see the check mark;

- by pushing the button «<», come back to the Sound settings menu (fig. 10).

2.3.1.13. Switching on and off the sensor sound

- when you are in the Sound settings menu (Рис.10), by pushing the buttons «^» and «v» choose the line «ЗВУК ДАТЧИКА (SENSOR SOUND)» and confirm your choice by pushing the button «OK» or «>»;

- switch the sensor sound on and off by pushing the buttons «^» and «v» to choose the value **ВКЛ(ON)** or **ВЫКЛ(OFF)**, and confirm your choice by pushing the button «OK», and

opposite the chosen value you'll see the check mark;

- by pushing the button «<», come back to the Sound settings menu (fig. 10).

2.3.1.14. Setting the sound volume

- in the Sound settings menu (Рис. 10), by pushing the buttons «^» and «v» choose the line «ГРОМКОСТЬ (VOLUME)» and confirm your choice by pushing the button «OK» or «>»;

- by pushing the buttons «^» and «v» choose one from available values of the sound volume «ВЫКЛЮЧЕН (OFF)», or «ТИХО (LOW)», or «ГРОМКО (HIGH)», and confirm your choice by pushing the button «OK», you'll see the check mark opposite the chosen value, and the sound mode pictograph on the top of the display will be changed like it's illustrated below depending on what you have chosen:




- sound is switched off;



- quiet;



- loud.

- by triple pushing of the «<» button or by pushing the button  come back to the Main menu for further settings.

2.3.1.15. Setting the time of automatic switching off


This option is to save energy of the batteries when user forgets to switch off the device.

For settings you should:

- when you are in the Main menu (Рис. 7), by pushing the buttons «^» и «v» choose the line «НАСТРОЙКИ (SETTINGS)» and confirm your choice by pushing the button «OK» or «>»;

- in the opened submenu by pushing the buttons «^» and «v» choose the line «АВТОВЫКЛЮЧ-Е (AUTO TURN OFF)» and confirm your choice by pushing the button «OK» or «>»;

- choose the time of automatic switching off from available by pushing the buttons «^» и «v» (1, 2... 10 minutes), or choose the value «ВСЕГДА ВКЛ. (ALWAYS ON)», and confirm your choice by pushing the button «OK». You'll see the check mark opposite the chosen value.

- by double pushing of the «<» button or by pushing the button  come back to the Main menu for further settings.

2.3.1.16. Setting the current time

- when you are in the Main menu (Fig.7), by pushing the buttons «^» and «v» choose the line «НАСТРОЙКИ (SETTINGS)» and confirm your choice by pushing the button «OK» or «>»;


- in the opened submenu by pushing the buttons «^» and «v» choose the line «ВРЕМЯ (TIME)» and confirm your choice by pushing the button «OK» or «>»;

- you'll see the Current time setting menu on the display (Fig.11)



Figure 11 – Current time setting menu

- navigating through the Current time setting menu by pushing the buttons «>» and «<», set the current time (can be altered by pushing the buttons «^» and «v»), and after it remove the mark in the icon «OK», and confirm your choice by pushing the button «OK». You can cancel the settings by pushing the button «OK» after removing the mark into the icon «ОТМЕНА(CANCEL)»

- by pushing the button  come back to the main menu for further settings.

2.3.1.17. The power type input



It's necessary to input the power type to remind of the batteries type installed into the product (AAA batteries or AAA accumulators).


This information is needed to decide if it's allowed to charge the batteries as the part of the device or it's prohibited to hook up the device to the charging unit because the galvanical batteries are installed into it.


- when you are in the Main menu (Fig. 7), by pushing the buttons «^» and «v» choose the line «НАСТРОЙКИ (SETTINGS)» and confirm your choice by pushing the button «OK» or «>»;

- in the opened submenu by pushing the buttons «^» and «v» choose the line «АККУМУЛЯТОР (ACCUMULATOR)» and confirm your choice by pushing the button «OK» or «>»;

- by pushing the buttons «^» и «v» choose the value «ДА(YES)» or «НЕТ(NO)», and confirm your choice by pushing the button «OK». You'll see the check mark opposite the chosen value, and the pictograph informing of the chosen power type on the top of the display will be changed according to the chosen value:

 - accumulators are used, it's allowed to charge (the plug lights green, while charging the pictograph is changed to  - you'll see the lightning pictograph on the top);

 - batteries are used, it's prohibited to charge; the plug lights white and crossed).

- by double pushing of the «<» button or by pushing the button  come back to the Main menu for further settings.

2.3.2. Browsing the information about the manufacturer

- when you are in the Main menu (Fig. 7), by pushing the buttons «^» и «v» choose the line «ИНФОРМАЦИЯ (INFO)» and confirm your choice by pushing the button «OK» or «>»;

- you'll see the picture with the manufacturer's site name on the screen (Fig.12).

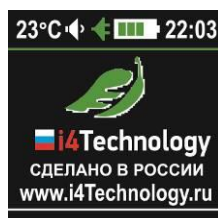


Figure 12 – Information about the manufacturer

- by pushing the button «<>» or the button  come back to the Main menu.


2.3.3. Browsing the software version

The current software version is displayed in the Main menu (Fig.7) (see the line «ВЕРСИЯ ПО (VERSION SW)»).

2.3.4. The operation procedure

2.3.4.1. Prepare the product for working and ensure it's in the Measurement mode (there should be the picture on the screen like in the Figure 6). After switching on, the product will start the assessment of the radiological situation.

2.3.4.2. Every quantum of radiation captured by sensor is accompanied by the audio signal if you have chosen the value «БКЛ» setting the option «ЗВУК ДАТЧИКА (SENSOR SOUND)». The audio-signals frequency is proportional to the ambient dose rate. After 10 seconds you'll see the first result on the display.

2.3.4.3. The short measuring cycle equals 10 seconds. It's intended to get the preliminary result of the ambient dose rate quickly. To get higher-precision result the product needs to collect statistics for 10-300 seconds of measuring. The measuring and averaging cycle can be started again by pushing the button  in the Measurement mode. By doing it the collected statistics will be reset. It may be useful if it's necessary to estimate the radioactive pollution of any things or foods, etc., quickly.

2.3.4.4. With increase of the ambient dose rate the proportional increase of the audio signal passing frequency occur. At the same time the ambient dose value is raising in the upper right corner of the screen and the columns at the radiation environment time based historical graphs are going up.

2.3.4.5. When the measured values of the ambient dose rate are small (at the natural radiation level) there may be the spread in values. The reason for this is that the natural radiation level has the low density of particle flux and electromagnetic energy. The lower the density of the flow, the fewer particles are detected by the sensor per unit of time.

Note. The natural photon radiation background in Russia is usually ranging from 5 to 60 $\mu\text{R/h}$ (from 0,05 to 0,6 $\mu\text{Sv/h}$), so there is a wide range of values.

2.3.4.6 If the ambient dose rate value is near-critical (10000 $\mu\text{R/h}$ or 100 $\mu\text{Sv/h}$) you must leave contaminated ground immediately and report its position to the corresponding public service.

2.3.4.7. Radiation safety audit of residential and public places.

According to the «Radiation safety standards (RSS-99)» protective measures should be taken in buildings then the ambient dose rate of gamma-radiation indoors exceeds the ambient dose rate outdoors by more than 0,2 $\mu\text{Sv/h}$ (20 $\mu\text{R/h}$).

Outdoors the ambient dose rate should be measured at no less than 5 points located at the distance ranging from 30 to 100 meters from the buildings and not closer than 20 meters to each other. The points of measuring should be chosen at the location with natural bottom without any anthropogenic developments (road metal, sand, asphalt) and radioactive pollution. While

measuring the device should be placed at the height of 5 meters above the ground. The measuring time is about 20...30 minutes.

Note. If possible inspect the objects comprehensively in compliance with the requirements of the following statutory documents to receive the most meaningful measurements:

«Ionization radiation, radiation security and radiation safety standards (RSS-99). Sanitary Rules SR 2.6.1.758-99».

« Basic Sanitary Rules for Radiation Safety (BSRRS-99) SR 2.6.1.799-99».

«Radiation and hygienic inspection of inhabited and public buildings. Instrumental guidance IG 2.6.2.715-98». Ministry of Health of the Russian Federation.

2.3.4.8. Recommendations on the inspection.

During the assessment of the radiological situation it's should be taken into account that the ionization radiation has statistically stochastic nature that's why the readings taken by the product in same conditions but by different calculating may be slightly different.

To receive the most meaningful measurements of the ambient dose rate it's necessary to make at least 8 cycles of measuring without powering the product off.

Measuring the radioactive pollution of food, everyday items, etc., it's necessary to move the Radiation meter closer to the object inspecting and place it at the distance of 5- 10 millimeters from the perforated back of the device. Next you should switch on the device and investigate the object you want.

Investigating the radioactive pollution of liquids measure the ambient dose rate above the free surface of them. It's prohibited the ingress of liquids on the surface and inside the product.

If the measurement results are above the natural radiation background normal for the location, it indicates that the object you investigate is polluted by radiation.

To define the ionization radiation source you should remove the working Radiation meter above the object's surface looking at the increase of audio signal frequency. Remember that the audio signal frequency is increasing on drawing near the radiation source and decreasing otherwise. To search for radiation sources with the help of audio signals you should switch on the option «ЗВУК ДАТЧИКА (SENSOR SOUND)» in the settings.

2.3.4.9. Switching off

To switch the product off push the button  and keep it pushed down before the picture disappears on the screen.

3. Technical service

3.1. Keep the product clean and remove the dust by dry and clean flannel at times.

3.2. Protect the product from strokes and mechanical damage.

3.3. After working in locations increasingly polluted by radionuclides or measuring the surfaces and samples with high pollution level the readings taken by the Radiation meter may be raised in the absence of ionizing radiation sources. If so, it's necessary to decontaminate the case of the product.

3.4. Decontamination procedure.

3.4.1. Prepare the decontamination fluid (1/2 liters of warm pure water and 1/3 tea-spoon of neutral washing powder without any alkaline additive).

3.4.2. Switch the product off and take the batteries out.

3.4.3. Using the sponge moistened with the prepared fluid clean the case and the battery compartment access cover carefully.


3.4.4. Using dry and clean flannel clean the decontaminating surfaces.

3.4.5. Install batteries and cover the battery compartment. Check the working ability of the product.

3.5. Using the product, check the batteries. If you see the runs of the battery acid, renew them. After doing it, you need to install the inner clock of the Radiation meter.

3.6. Charge batteries timely. It's required to control the state of charge by looking at the battery charge level in the top line of the display, the color of it and the degree of filling.

3.7. The correct way to charge batteries:

- connect the proper cable connector supplied to the charger supplied. Connect another cable connector to the charging cavity (no. 6 fig. 2). While charging, if the device is working the pictograph informing of the chosen power type takes the form of . If the device is switched off there is the static picture on the screen while charging (Fig. 13).

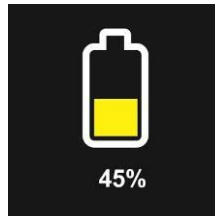


Figure 13 – Charging when switched off

4. Failure table

The Table 3 contains the troubleshooting information.

| FAILURE | CAUSE | REMEDY |
|--|--------------------------------|--|
| The Radiation meter is turned on but there is no picture on the screen | Batteries are fully discharged | Renew or charge the batteries |
| | Device is damaged | Repair should be carried out by the dealer |

5. Package and transportation

Every Product delivery set (see Table 2) is packaged in individual corrugated fiberboard box. The moving of contents of the box is not allowed. The packaged products are put into cargo corrugated containers according to the GOST 22637.

Packaged products can be transported by train or by trucks in covered trucks or containers or by air transport in pressurized modules.

While transporting the packaged products should be protected from the direct impact of atmospheric condensation and insolation.

Transportation terms and conditions:

- environment temperature: from -50 to 50°C;
- relative humidity: below 95 % at temperature 25°C;
- atmospheric pressure: from 84 to 107 kPa (from 630 to 800 millimeters of mercury);
- shock acceleration peak values below 147 m/s² (15 g), with shock acceleration duration 10-15 ms.

While shipping and transporting the requirements of the package warning labels should be performed rigorously.

6. Proof of acceptance

Radiation meter EcoLife Pro1 TC 4362-007-64062607-2015

manufacturing number _____

manufacture date _____

is manufactured and accepted according to the valid technological documents and considered exploitable.

QC stamp _____

7. Manufacturer's warranty

7.1. Manufacturer warrants that the Product satisfies the requirements of the TC 4362-007-64062607-2015 under observance of operation, storage and transportation regulations indicated on exploitative documents.

7.2. The service life of the Product is not less than 5 years (with the averaged operation rate 4 hours per day).

7.3. The guaranteed use period is 12 months from the date of sale. If the sale date and the vendor's stamp in the warranty card are absent the guaranteed use period will be calculated from the date of manufacture.

7.4. Manufacturer or the authorized Distributor shall replace or repair the products broken down during the guaranteed use period at the expense of them.

7.5. This warranty shall be void if

- guaranteed use period is over;
- operation, storage and transportation regulations are violated;
- the product put into service failed due to mechanical defects;
- the seal is broken.

7.6. When the guaranteed use period ends, the maintenance of the Product will be provided at the expense of a Consumer.



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8. Certification information

8.1. The Product satisfies the requirements of the Technical Regulation of Customs Union TR CU 020/2011 "Electromagnetic compatibility of technical equipment".

Declaration of Conformity to Technical Regulations of the Custom Union № RU Д- RU.A301.B.00574.

Period of validity: through 16.03.2021.

8.2. The requirements of the Technical Regulation of Customs Union TR CU 004/2011 «On safety of low-voltage equipment» do not apply for the Product (paragraph 1, article 1 TR CU 004/2011).



Warranty Card

Product name: Radiation meter EcoLife Pro1

Manufacturing number

| | | | | | |
|--|--|--|--|--|--|
| | | | | | |
|--|--|--|--|--|--|

Manufacture date

| | | | | |
|--|--|---|--|--|
| | | ● | | |
|--|--|---|--|--|

QC stamp

Sale Date

Vendor's stamp and signature

The customer does not have any claims on quality of the Product and the contents of delivery. The equipment is in good repair.

(Customer's signature)

Appendix. General information about the nature of radiation and the material-radiation interaction

Radioactivity is the process of spontaneous nuclear decay by which an unstable atom (uranium, thorium, radium etc.) changes the atomic and mass number. Such elements are considered radioactive. The radioactive decay has a strictly defined constant speed measured by the half-life period (the time required for one half of the atoms to disintegrate). The radioactive decay cannot be stopped or speeded up.

Any radioactive substance produces three types of radiation:

- alpha-radiation (α -radiation) that is a positively charged particle flux (helium nucleus) moving at 20000 kilometers/second;
- beta-radiation (β -radiation) that is a negatively charged particle flux (helium nucleus) moving at 20000 kilometers/second;
- gamma-radiation (γ -radiation) that is a shortwave electromagnetic emission. Gamma-rays characteristics are close to the X-rays, but it has far more energy and speed (it travels at the speed of light).

Ionizing radiation can penetrate matters of dissimilar thickness and ionize air and living cells.

Radioactivity is the measure of the radioactive substance expressed by the number of radioactive transformations per unit of time. In the SI system the unit of radioactivity is one radioactive transformation, i.e. the number of atoms which, within a particular time frame, transform. This unit is called The Becquerel (Bq). The non-SI unit of radioactivity is curie (Ci).

$$1 \text{ Ci} = 3,7 \cdot 10^{10} \text{ Bq}$$

The extent and form of injuries caused to biological tissues by ionizing radiation exposure depend on the dose of absorbed radiation energy. To characterize it the term 'absorbed dose' is used, i.e. the energy absorbed by the unit of exposed material. In the SI system the unit of absorbed dose is Gray (Gy). 1 Gray (Gy) measures the absorbed dose, giving the energy of 1 joule transferred by ionizing radiations to the material of 1 kilogram.

$$1 \text{ Gy} = 1 \text{ J/kg}$$

To characterize the dose according to the ionization effect caused in the air it's used so-called 'exposure dose' of X-rays and gamma-radiation. This dose is based on the X-rays and gamma-radiation ionizing action and it's expressed by total electric charge of the ions charged equally and formed in the unit of air volume at the state of electronic equilibrium.

The non-SI unit of absorbed radiation dose is roentgen (R).

Absorbed dose and exposure radiation dose delivered over a time period are called absorbed dose rate and exposure radiation dose rate. They are expressed by the units Gy/s and R/s respectively.

Equivalent dose (H) is the main dosimetric quantity in the sphere of radiation safety introduced to estimate the stochastic health effects of any chronic ionizing radiation exposing when the H value is not more than five maximum permissible doses a year.

To obtain the equivalent dose the absorbed dose must be multiplied by a special multiplier called the relative biological effectiveness coefficient ("RBE") or the radiation quality factor (Q) in the elementary volume of the tissue.

The unit of the equivalent dose is Sievert (Sv). 1 Sievert is an equivalent dose of any radiation absorbed by 1 kg of tissue that produces the biological effect that equals the effect

produced by the absorbed dose of 1 Gy of photon radiation. The non-SI unit of the equivalent dose is roentgen-equivalent-man (rem).

$$1 \text{ Sv} = 100 \text{ Rem}$$

The equivalent dose rate (H) is defined by the formula:

$$H = dH/dT, \text{ where } dT \text{ is a period of time.}$$

In the SI system the equivalent dose rate (H) is measured by Sievert per second (Sv/s).

$$1 \text{ Sv/s} = 100 \text{ Rem/s}$$

$$1 \text{ Sv/s} = \text{R/s} \text{ or } 1 \mu\text{Sv/s} = 100 \mu\text{R/s} \text{ approximately.}$$

It's considered that the radiation level of 0,6 $\mu\text{Sv/h}$ (or 60 $\mu\text{R/h}$) detecting by modern methods is safe for human.