MKS-05 “TERRA-P”
DOSIMETER-RADIOMETER

Operating manual

Dear users,

You had chosen well if purchased a device of "ECOTEST" trademark manufactured by "Sparing-Vist Center". Your device is easy to use and can be applied for household purposes without special training of the user. Should any questions arise, please contact our managers by telephone **(+38 032) 242-15-15**, fax (+38 032) 242-20-15 or e-mail **sales@ecotest.ua.**

We would greatly appreciate to receive your comments and suggestions on its operation. The device is under 18-months (free of charge) warranty maintenance.

Best regards, International Sales Department.

Contents

Ionizing radiation is a natural phenomenon permanently existing in the environment. Radiation background of the Earth and the space adversely affects us on the regular basis. We are constantly influenced by natural radioactive materials stored in soil and construction materials of the buildings we live and work in. It also happens that more and more frequently we are exposed to the radioactive influence of specific life activities, for example, certain medical procedures, smoking etc. To say nothing of the impact of radioactive sources of artificial origin produced by Chernobyl Fallout that caused contamination of the vast territories. Therefore not only natural ionizing radiation but also Chernobyl Atomic Power-Station Disaster component that gets into human organism with agricultural products, grown on the polluted territories, berries and mushrooms, makes a great impact on people.

Ionizing radiation is primarily X-ray, gamma, beta, alpha and neutron radiation.

X-ray and gamma radiation is transmitted as energy waves, similar to the transmission of sunlight and sun warmth. X-ray and gamma radiation have similar nature. They differ only in their origin and wavelength.

Normally, humans are influenced by X-rays emanated by electronic apparatuses used in hospitals.

Gamma rays are radiated by unstable radioactive isotopes.

X-ray and gamma radiation is characterized by deep permeability into human organism, which is dependent on the energy of the rays. Gamma radiation permeability is so high that it can be hindered only by the thick lead or concrete plates.

Alpha radiation is a flow of nucleuses of helium. It has small permeability and can be hindered, for example, simply by a piece of paper. Therefore it is not hazardous until radioactive materials emanating alpha particles get into human organism either through open wound, or with food and air.

Beta radiation is a flow of electrons. Beta radiation obtains higher permeability and penetrates organism tissues at the depth of 1-2 cm.

Neutron radiation is a flow of neutrons originating from the process of nuclear fission in the reactors, or as a result of spontaneous division in the nuclear materials. Since neutrons are electroneutral particles they deeply penetrate any substance, including living tissues.

However, because people are more often exposed to gamma and beta radiation in everyday life, the majority of radiation monitoring devices measure exactly these kinds of radiation. As a matter of fact, the MKS-05 “TERRA–P” dosimeter-radiometer, designed on the base of the modern professional dosimeter-radiometer MKS-O5 “TERRA” exported into different countries and remaining an equipment choice for the Ukrainian force structures, serves to prevent gamma and beta radiation hazard.

Preface

This operating manual (hereinafter referred to as the OM) is intended to inform the user about the principles of operation of the MKS-05 “TERRA-P” dosimeter-radiometer and its operation procedure. The OM contains all information necessary for proper use of the dosimeter and full realization of its technical possibilities.

The MKS-05 “TERRA-P” dosimeter-radiometer is a household device, and can not be used as an instrument for formal (professional) measurements.

The MKS-05 “TERRA-P” dosimeter-radiometer is calibrated according to the standard sources of ionizing radiation after manufacture and is not subject to verification.

The OM contains the following abbreviations and symbols:

DE	- ambient dose equivalent;
DER	- ambient dose equivalent rate;
MODE	- on/off button and switch between the corresponding modes of indication (gamma radiation DER, gamma radiation DE, real time (clock) and alarm clock);
THRESHOLD	- button of threshold levels programming and correction of clock and alarm clock time.

Note. Ambient dose equivalent (expressed in “Sieverts” (“Sv”)) characterizes the influence of ionizing gamma radiation on the biological object (human), as opposed to exposure dose (expressed in “Roentgens (“R”)”) that characterizes the capacity of gamma radiation to ionize the air. Generally, to make it simple, use the coefficient circa 100 to covert ambient dose equivalent units into exposure dose units: 1.0 μSv ≈ 100.0 μR.

Dose rate conversion, correspondingly: 1.0 μSv/h ≈ 100.0 μR /h.

Natural radiation background normally equals circa 0.1 μSv/h (≈10 μR /h).

1 Purpose of use

The MKS-05 “TERRA-P” dosimeter-radiometer (hereinafter called the dosimeter) is designed to measure ambient dose equivalent (DE) and ambient dose equivalent rate (DER) of gamma radiation and to evaluate surface contamination by beta radionuclides. Additionally, the dosimeter performs the functions of clock and alarm clock.

The dosimeter is used in everyday life for apartment, building and construction monitoring, ground surface of infields and vehicles monitoring, for products and clothes monitoring, for evaluation of radioactive contamination of wild berries and mushrooms, as well as visual aids for educational establishments.

2 Technical specifications

2.1 Key specifications are presented in Table 2.1.

Table 2.1 – Key specifications

Name	Unit of measurement	Standardized value according to the technical specifications
1	2	3
1 Measurement range of gamma radiation DER	μSv/h	0.1 – 999.9
2 Main relative permissible error limit of gamma radiation DER measurement with confidence probability of 0.95 (calibrated relative to ^{137}Cs)	%	$\pm(25+2/\dot{H}^{*}(10))$, where $\dot{H}^{*}(10)$ is a numeric value of the measured DER in μSv/h

Table 2.1 (continued)

1	2	3
3 Measurement range of gamma radiation DE	mSv	0.001 - 9999
4 Main relative permissible error limit of gamma radiation DE measurement with confidence probability of 0.95	%	±25
5 Energy range of registered gamma radiation	MeV	0.05 – 3.00
6 Energy dependence of the dosimeter readings at gamma radiation DER and DE measurement in the energy range of 0.05 to 1.25 MeV	%	±25

Table 2.1 (continued)

1	2	3
7 Beta-particles flux density range with possible evaluation of surface contamination by beta radionuclides	part./(cm^2·min)	10 - 10^5
8 Energy range of registered beta-particles	MeV	0.5 – 3.0
9 Battery life (ENERGIZER AAAx2 of 1280 mA·h capacity) under natural background radiation, not less than	hour	6000

Table 2.1 (continued)

1	2	3
10 General operating supply voltage of the dosimeter from two AAA size batteries	V	3.0
11 Mean time to failure, not less than	hour	6000
12 Average service life, not less than	year	6
13 Average shelf life, not less than	year	6
14 Dimensions, not more than	mm	55×26×120
15 Weight, not more than	kg	0.2

2.2 Threshold level values of gamma radiation DER in the range of 0.01 to 9.99 μSv/h with discreetness of 0.01 μSv/h are programmed in the dosimeter.

Threshold level value is set automatically after the dosimeter is switched on and equals 0.30 μSv/h. It corresponds to the maximum permissible level of gamma background for premises in compliance with the regulatory documents of Ukraine.

2.3 The dosimeter sends audio signals of different periodicity and keys if the programmed DER level is exceeded, the alarm clock goes off, or the battery is discharged.

2.4 The dosimeter provides four level indication of battery discharge.

2.5 Values of DER and DER threshold levels, real time and preset time of the alarm clock alternately appear on the digital liquid crystal display (hereinafter LCD), which depends on the chosen mode indicating the correspondence of information.

2.6 The dosimeter performs measurements under the following conditions:

- temperature from – 10 to + 50 ^{o}C;
- relative humidity up to (95±3) % at + 35 ^{o}C;
- atmospheric pressure from 84 to 106.7 kPa.

3 Delivery kit

3.1 The delivery kit consists of the items and maintenance documentation presented in Table 3.1.

Table 3.1 – Delivery kit of the dosimeter

Type	Item	Quantity	Note
BICT.412129.012-02	MKS-05 “TERRA-P” dosimeter-radiometer	1 pc.	
BICT.412129.012-02 KE	Operating manual	1 copy	
BICT.412915.001	Package	1 pc.	
ENERGIZER	AAA size battery of 1.5 V	2 pcs.	Other AAA batteries of 1.5 V voltage are permissible. Supplied at customer’s request.

4 Design and principle of operation

4.1 General information

The dosimeter is a mono block construction with a built-in detector of gamma and beta radiation (Geiger-Muller counter), a printed-circuit board equipped with electronic components, and batteries.

The operation principle of the dosimeter is based on transformation of radiation by Geiger-Muller counter into the sequence of voltage pulses; the number of pulses is proportional to the registered radiation intensity.

The power for operation is supplied by two AAA batteries.

4.2 Design description

The dosimeter is designed as a flat square plastic body with rounded corners.

The body (Figure A.1, A.2) consists of the upper (1) and the lower (2) covers. The indication panel (3) is located in the middle of the upper cover (1); two keys (4) of control are located to the left and to the right above the panel, and a loudspeaker (5) in the upper part of the cover (1).

The battery compartment and the window (7) for registration of surface contamination by beta radionuclides are located in the lower cover (2). The battery compartment (6) and the window (7) have covers (8) and (9) correspondingly, fixed due to the elastic capacities of the material.

The printed-circuit board (10) is located inside the unit, where all elements of the electric circuit, except for the loudspeaker, are located (5). The loudspeaker is fixed to the upper cover (1) and electrically connected with the circuit board (10) with the help of the spring contacts. The latter (10) is screwed to the upper cover (1) of the body.

The lower and the upper covers are connected with the help of a special coupling of the constructs and two screws. The screws are also used to fasten the contacts (11) for batteries connection.

Control and indication keys of the dosimeter contain the corresponding inscriptions. The information table is drawn on the lower cover (2) of the device. The polarity signs are indicated at the bottom of the battery compartment (6) for proper insertion of batteries.

5 Preparation for operation and testing

5.1 Operating limitations

Operating limitations are presented in Table 5.1.

Table 5.1 – Operating limitations

Operating limitations	Limitation parameters
1 Ambient air temperature	from - 10 to + 50 °C
2 Relative humidity	up to (95±3) % at + 35 °C, non-condensing
3 Gamma radiation influence	DER up to 100.0 mSv/h during 5 minutes

Note. If operating in dusty environment or during atmospheric precipitations, the dosimeter should be placed into a plastic bag or a special case used to wear the device on a waist-belt.

5.2 Preparation for operation and guidelines on switching on and testing the dosimeter

5.2.1 Examine the location and purpose of use of the controls before using the dosimeter.

5.2.2 Prepare the dosimeter for operation by doing the following:

- unpack the dosimeter;
- open the battery compartment and make sure the batteries are inserted;
- insert two AAA type batteries, observing the polarity, if there are none.

Note. The dosimeter turns on automatically if the batteries are inserted for the first time.

5.2.3 Press shortly the MODE button if the batteries are already inserted into the battery compartment. The dosimeter should enter the mode of gamma radiation DER measurement at once, which is shown by DER measurement units expressed in "μSv/h" that appear on the digital LCD, and by brief audio signals that follow the detection of every gamma quantum. All the digits of the LCD will be blinking until the completion of measurement interval.

The readings of gamma background measurement will appear on the LCD after the measurement interval is completed.

5.2.4 Press shortly the MODE button and make sure the dosimeter has entered the mode of gamma radiation DE indication. DE units of measurement expressed in "mSv" should appear on the LCD.

5.2.5 Press shortly the MODE button and make sure the dosimeter has entered the mode of real time indication. Two dots between the two pairs of digits on the LCD that blink with one-second interval should appear on the LCD.

5.2.6 Press shortly the MODE button and make sure the dosimeter has entered the mode of indication of the alarm clock settings, which is displayed by two unblinking dots between the two pairs of digits on the LCD.

5.2.7 Hold the MODE button pressed for four seconds to switch the dosimeter off.

Note. The batteries should be replaced if the dosimeter is switched on, and irrespective of the chosen mode, the batteries discharge is observed (blinking of all four segments of the battery symbol on the display, and periodic brief two tone audio signals).

5.3 List of possible troubles and troubleshooting

5.3.1 The list of possible troubles and troubleshooting is presented in Table 5.2.

Table 5.2 – List of possible troubles and troubleshooting

Trouble	Probable cause	Troubleshooting
1 The dosimeter does not switch on after the MODE button is pressed	1 The battery is discharged 2 No contact between the batteries and the battery compartment clamps 3 One of the batteries is out of order	1 Replace the batteries 2 Restore the contact between the batteries and the clamps 3 Replace the defected battery

Table 5.2 (continued)

Trouble	Probable cause	Troubleshooting
2 Low battery symbol is displayed after the batteries have been replaced when the dosimeter is switched on	1 Poor contact between the batteries and the battery compartment clamps 2 One of the batteries is out of order	1 Clean out the contacts on the clamps and the batteries 2 Replace the defected battery

5.3.2 At failure to eliminate the troubles presented in Table 5.2, or at detection of more complicated troubles, the dosimeter should be sent for repair to the repair services or to the manufacturer (see Repair section).

6 Use of the dosimeter

6.1 Safety measures during use of the dosimeter

The dosimeter contains no external parts exposed to voltages hazardous for life.

Direct use of the dosimeter is not dangerous for the service personnel, and is environmentally friendly.

A special protective jacket is used to prevent accidental contact with conductive parts.

Ingress protection rating is IP20.

The dosimeter belongs to fire safety equipment.

Note. Caution! Do not open or charge the batteries!

6.2 List of operating modes

The dosimeter uses the following indications and operates within the following modes:

- measurement and indication of gamma radiation DER;
- programming of audio alarm threshold levels of gamma radiation DER and switching on/off audio signaling of registered gamma quanta;
- indication of gamma radiation DE measurement value;
- evaluation of surface contamination by beta radionuclides;
- indication and correction of real time;
- indication and correction of the alarm clock settings, switching the alarm clock on/off.

6.3 Operation procedure of the dosimeter

6.3.1 Switching the dosimeter on/off

Press shortly the MODE button to switch the dosimeter on. The information displayed on the LCD shows that the dosimeter is on.

Press the MODE button once again and hold it pressed for four seconds to switch the dosimeter off.

6.3.2 Measurement of gamma radiation DER

The mode of gamma radiation DER measurement is entered automatically after the dosimeter is switched on. The mode is indicated by the "μSv/h" symbol that appears on the LCD and short-term audio signals following the registered gamma quanta. The results of measurement will appear on the LCD during the first few seconds, enabling efficient evaluation of the radiation level.

Since the dosimeter provides constant averaging of measurement results, every next value update on the LCD is followed by a process of its averaging. Therefore, it is possible to receive the readings approximately in a minute with a precision within the limits of rated error. The time needed to get a reliable result depends on the radiation intensity. During that time the digits on the LCD will be blinking.

To measure gamma radiation DER, direct the dosimeter with its metrological mark "+" towards an examined object.

Consider the arithmetic mean of five last measurements in 10 seconds after the beginning of measurement, or any obtained value when the LCD has stopped blinking, as a result of gamma radiation DER measurement. The units of measurement are expressed in μSv/h.

Measurement of gamma radiation DER and comparison of the results with the programmed audio alarm threshold level is performed continually and irrespective of the chosen mode of indication and operation from the moment the dosimeter is on.

Note 1. The process of data averaging can be stopped forcibly to provide effective evaluation of the radiation level. To do this, change the object of examination and press shortly the THRESHOLD button. Rough evaluation of gamma background level of every new object may be performed within 10 seconds.

Note 2. The dosimeter automatically switches off the LCD and audio signaling of registered gamma quanta to preserve battery energy. The LCD turns off in 5 minutes after the last pressing of any control button if the DER value does not exceed the preset threshold level, and the alarm clock does not go off. The digital LCD and audio signaling of registered gamma quanta turn on immediately after pressing any control button or at audio alarming (of the threshold device or the alarm clock).

Remember to turn off the power supply after you finished working with the dosimeter, since the switched off indication does not mean the dosimeter is off!

6.3.3 Programming of audio alarm threshold levels of gamma radiation DER and switching on/off audio signaling of registered gamma quanta

The DER threshold level value of 0.30 μSv/h, which is the maximum permissible level for premises in compliance with the regulatory documents of Ukraine, is set automatically when the dosimeter is switched on.

Programming (change) of audio alarm threshold levels of DER is performed in the mode of gamma radiation DER measurement, if necessary. To start programming, press and hold the THRESHOLD button. The low-order digit should start blinking on the digital LCD.

Successive short presses and releases of the THRESHOLD button set the necessary value of the low-order digit. Press shortly the MODE button to program the next digit, which will start blinking at that.

Other digits are programmed likewise.

To fix a new value of the threshold level, set all digits of the LCD by pressing the MODE button, even if the values of the high-order digits are not changed.

Press shortly the MODE button after you have programmed the last digit. A blinking sound symbol ")))" should appear on the digital LCD. Press shortly the THRESHOLD button to switch off audio signaling of registered gamma quanta. The sound symbol disappears at that. Press the THRESHOLD button once again to enable audio signaling of registered gamma quanta; the sound symbol appears on the LCD.

Next short press of the MODE button fixes a new value of the threshold level and the status of audio signaling system of registered gamma quanta.

Fourfold extinction of the LCD indicates that new settings have been fixed.

To check the value of the fixed DER threshold level, press the THRESHOLD button and hold it pressed for not longer than two seconds after the threshold level value appears.

If the THRESHOLD button is pressed for more than two seconds, the low-order digit starts blinking, indicating that a new threshold level value can be programmed.

A two-tone audio signal indicates that the programmed DER threshold level has been exceeded.

Note 1. Audio signaling of registered gamma quanta is switched on automatically along with the dosimeter. Extinction of the digital LCD automatically switches off audio signaling of registered gamma quanta.

Note 2. Audio alarm of exceeded programmed DER threshold level is independent of the status of audio signaling system of registered gamma quanta.

6.3.4 Indication of gamma radiation DE measurement value

Press shortly the MODE button to enter the mode of DE measurement value indication. This mode follows the mode of gamma radiation DER measurement (switched on automatically along with the dosimeter). A “mSv” symbol that appears on the LCD indicates you have entered the appropriate mode. The measurement units of gamma radiation DE are expressed in mSv. A comma after the first left digit will appear on the LCD when the dosimeter is switched on. The comma will automatically shift to the right until full completion of the DE scale of the dosimeter as the gamma radiation DE value increases.

Note. Under natural gamma radiation background (c 0.1 μSv/h) a change by one low-order digit of the DE scale will take place approximately in 10 hours, and the LCD will display the result of “0,001” mSv equal to 1.0 μSv.

6.3.5 Evaluation of surface contamination by beta radionuclides

Enter the mode of gamma radiation DER measurement to evaluate surface contamination by beta radionuclides. Direct the dosimeter with its window, located opposite the detector (hereinafter the window of the detector), in parallel to the examined surface and place it as close as possible.

To evaluate surface contamination by beta radionuclides perform two measurements: the first one should be done with an open window; the second one with a closed window by a filter-cover. The difference between the first and the second measurement will be taken as the result of measurement. The difference between the first and the second measurement is the sign of surface contamination of the examined object by beta radionuclides. Consider the arithmetic mean of five measurements in 10 seconds after the beginning of measurement, or any obtained value when the LCD has stopped blinking, as a result of evaluation of surface contamination by beta radionuclides. The result will be displayed in μSv/h.

6.3.6 Indication and correction of real time

Press shortly the MODE button to initiate the mode of real time indication. This mode follows the mode of indication of gamma radiation DE measurement value.

It is indicated by a one-second blinking double point between the two pairs of the LCD digits.

The digits from the right to the left show the following: the first digit indicates minutes; the second one - tens of minutes; the third one - hours; the fourth one - tens of hours.

Press the THRESHOLD button and hold it pressed until two digits to the right from double point start blinking to correct the value of real time, and then release the button. The proper values of units and tens of minutes are fixed by further pressing and holding the THRESHOLD button. Press shortly the THRESHOLD button to correct the value of minutes. Each pressing will change the value per unit. Press shortly the MODE button to correct the value of hours. Two digits on the left of double point start blinking at that. The hour value correction is performed likewise. Press shortly the MODE button once again to exit the mode of real time correction.

6.3.7 Indication and correction of alarm clock settings, switching the alarm clock on/off.

Press shortly the MODE button to initiate the mode of indication of the alarm clock time. This mode follows the mode of real time indication. A non-blinking double point between the two pairs of digits on the LCD indicates you have entered the appropriate mode.

Press the THRESHOLD button and hold it pressed until two digits to the right from double point start blinking to correct the alarm clock setting and to switch it on/off. Then release the button. The proper values of units and tens of minutes are fixed by further pressing and holding the THRESHOLD button. Press shortly the THRESHOLD button to correct the value of minutes. Each pressing will change the value per unit. Press shortly the MODE button to correct the value of hours. Two digits on the left of double point start blinking at that. The hour value correction is performed likewise.

Press shortly the MODE button to switch the alarm clock on/off after correction of hour values of the alarm clock. A blinking sound symbol ")))" should appear on the LCD. Press shortly the THRESHOLD button to switch the alarm clock off, the sound symbol should extinct. To switch the alarm clock on, press the THRESHOLD button once again. The sound symbol appears at that on the digital LCD. Next short presses of the MODE button fix the alarm clock settings. If the alarm clock is on, the sound symbol will be displayed on the LCD irrespective of the chosen operating mode.

Note. The alarm clock will continue to work even after the power supply of the dosimeter is off (provided that the batteries are inserted). The dosimeter will automatically enter the mode of real time indication when the alarm clock goes off. Press any control button to switch off audio signal of the alarm clock. Otherwise, audio signal will be disabled automatically in a minute after the alarm clock rings.

7 **Technical maintenance**

7.1 General instructions

Technical maintenance includes the following operations:

- external examination;
- operability check of the dosimeter;
- power supply switch off.

7.1.1 Safety measures

Safety measures during technical maintenance fully comply with safety measures stated in item 6.1 of the present OM.

7.1.2 External examination

External examination of the dosimeter should be performed in the following order:

a) check the technical condition of surface, inspect for integrity of seals, absence of scratches, traces of corrosion, surface damages of the dosimeter;

b) check the condition of clamps in the battery compartment.

7.1.3 Operability check of the dosimeter

Operability check of the dosimeter is performed according to item 5.2 of the present OM.

7.1.4 Power supply switch off

Power supply should be switched off each time the dosimeter is not in use for a long time. Do the following:

- switch the dosimeter off;
- open the lid of the battery compartment;
- remove the batteries;
- examine the battery compartment, check the contact clamps accuracy, clean the battery compartment from contamination and contact clamps from oxides;
- make sure there is no humidity, no salt spots on the surface of the batteries, and no damages of the insulated coating.

8 Certificate of acceptance

The MKS-05 “TERRA-P” dosimeter-radiometer of BICT.412129.012-02 type with _____ serial number meets the ТУ У 33.2-22362867-006-2001 BICT.412129.006 ТУ technical requirements, is calibrated and accepted for use.

Manufacture date _____

Stamp here QCD representative:_____

(signature)

9 Packing certificate

The MKS-05 “TERRA-P” dosimeter-radiometer of BICT.412129.012-02 type with _____ serial number is packed by the enterprise PE “SPPE “Sparing-Vist Center” in accordance with the requirements specified in TU U 33.2-22362867-006-2001 BICT.412129.006 TU.

Date of packing _____

Stamp here

Packed by _____ (signature)

Packed product accepted by _____ (signature)

10 Warranty

10.1 The warranty period of the dosimeter use shall terminate and be of no further effect in not less than 18 months after the date of putting it into operation, or after the end of the storage period.

10.2 The warranty period of storage of the dosimeter is 6 months after its manufacture date.

10.3 Free of charge repair or replacement during the warranty period of use is performed by the producer enterprise provided that:

10.3.1 The customer observed the guidelines on its use, shipping and storage;

10.3.2 The customer encloses a warranty certificate filled out accurately and clearly;

10.3.3 The customer encloses the failed dosimeter.

10.4 If the defect (according to the claim) is eliminated, the warranty period is prolonged for the time when the dosimeter was not used because of the detected defects.

10.5 The batteries failure is not a reason for claim, after their warranty period is finished.

10.6 Warranty is void in case of:

10.6.1 Any mechanical or thermal damage;

10.6.2 Any liquid remains;

10.6.3 Foreign objects detected inside the dosimeter;

10.6.4 The warranty stamps are violated, the body opened, repairs or any internal changes made;

10.6.5 The serial number of the dosimeter deleted or changed;

10.6.6 The accessories used other than allowed by the manufacturer.

11 Repair

11.1 In case of failure or troubles during the warranty period of the dosimeter, the user should contact the enterprise producer by e-mail (see below) to receive the address of the nearest service center:

PE "SPPE "Sparing-Vist Center"
Tel.: (+380 32) 242 15 15; Fax: (+380 32) 242 20 15
E-mail: sales@ ecotest.ua

11.2 Warranty and post warranty repair is performed if only the warranty certificate is available.

12 Storage

12.1 The dosimeters should be stored in a packing box in heated and ventilated storehouses with air-conditioning at the ambient temperature from + 5 to + 40 °C and relative humidity up to 80 % at + 25 °C temperature, non-condensing. The storehouse should be free of acids, gas, and alkali that may cause corrosion, and vapors of organic solvents.

12.2 The location of the dosimeters in storehouses should ensure their free movement and access to them.

12.3 The dosimeters should be stored on the shelves.

12.4 The distance between the walls, the floor and the dosimeters should not be less than 100 mm.

12.5 The distance between the heating gadgets of the storehouse and the dosimeters should not be less than 0.5 m.

12.6 The average shelf life is not less than 6 years.

13 Shipping

13.1 The packed dosimeters may be shipped by any kind of closed transport vehicles under the conditions with temperature limitation in the range of - 25 to + 55 ^{o}C, and according to rules and standards effective for each means of transport.

13.2 The dosimeters in shipping container should be placed and fixed in the vehicle to ensure their stable position and to avoid shocks (with each other and the sidewalls of the vehicle).

13.3 The dosimeters in shipping container endure:

- temperature from - 25 to + 55 ^{o}C;
- relative humidity of (95±3) % at + 35 ^{o}C temperature;
- shocks with acceleration of 98 m/s^{2}, a shock pulse duration of 16 ms (number of shocks - 1000 ± 10 in each direction).

13.4 Canting is forbidden.

APPENDIX A

Figure A.1 – Main view of the dosimeter

APPENDIX A

Figure A.2 – Rear view with the removed lid

WARRANTY CERTIFICATE

for MKS-05 “TERRA-P” dosimeter-radiometer

ТУ У 33.2-22362867-006-2001 ВІСТ.412129.006 ТУ

Serial number _____

Manufacture date _____

Primary calibration performed _____

Hereby I confirm the acceptance of the packed device applicable for use and the acceptance of the warranty terms

Sales date _____

Salesperson signature _____

Stamp here

Note. If any controversy arises, the parties should act in accordance with the Art. 14 of the Law of Ukraine on the Protection of Consumer Rights