

Ministry of Economy of Ukraine
Certification and Conformity Assessment Body "Metrology"
NNC "INSTITUTE OF METROLOGY"
Accredited by the National Accreditation Agency of Ukraine,
Accreditation certificate No. 1O251 dated 15 June 2021

TYPE EXAMINATION CERTIFICATE

Issued to: Private Enterprise "Scientific and Production Private Enterprise "Sparing-Vist Center", 33 Volodymyra Velykoho Str., Lviv, 79026, Ukraine;
USREOU code 22362867

In accordance with: Annex 3, Section "Conformity Assessment Procedures", Module B (type examination) of Technical regulation of legally regulated measuring instruments approved by the CMU Resolution No. 94 of 13 January 2016

Type of measuring instruments: Search Gamma, Beta Radiation Dosimeter-Radiometer

Type designation: MKS-07 "POSHUK"

Date issued: 31 December 2021 **Valid until:** 28 December 2027

Number of pages: 12

Reference Number: 113-0095-17 version 2

Number of Designated body: UA.TR.113

This certificate was issued based on the research results of a technical design of a measuring instrument. This certificate confirms that the type of measuring instrument complies with the applicable requirements of the Technical Regulation. The conformity of measuring instruments, which are made available on the market of Ukraine and/or put into service, with the type described in this certificate and the applicable requirements of the Technical Regulation must be confirmed through one of the conformity assessment procedures under the module, following module B, in accordance with the requirements of the Technical Regulation.

Director of the conformity assessment body */Signature/*
(signature)

P.I. NEIEZHMAKOV
(initials, family name)

*Stamp: Ministry for Development of Economy, Trade and Agriculture of Ukraine * National Scientific Center "Institute of Metrology" * Kharkiv * Conformity assessment body No.02568325*

This certificate can only be reproduced in full. Any publication or partial reproduction of the contents of the certificate is only possible with the written consent of the issuing Designated Authority. The certificate is void without a signature and a seal.

Address: 42 Myronosytska Str., Kharkiv, Ukraine, 61002

Phone: +38 057 704-98-49 Fax: +38 057 700-34-47 e-mail: os_096@metrology.kharkov.ua website: <http://www.metrology.kharkov.ua>

Certificate history

Certificate version number	Date	Substantial changes
1	29.12.2027	Primary certificate
2	30.12.2021	1. Pursuant to General Assembly Resolution IAF No. 2018-13 2. Modifications to the software version.

Requirements

The approved type of the measuring instrument meets the requirements of the following documents:
Essential requirements of the Technical regulation of legally regulated measuring instruments, approved by the CMU Resolution No. 94 of 13 January 2016.

Applicable standards:

DSTU 7216:2011 "Devices for environmental radiation monitoring. Radiation monitoring dosimeters and radiometers. Classification and general technical requirements".
GOST 27451-87 "Ionizing radiation measuring instruments. General specifications";
DSTU OIML D 11:2018 (OIML D 11:2013, IDT) "General requirements for measuring instruments. Environmental conditions";
DSTU EN 61326-1:2016 "Electrical equipment for measurement, control and laboratory use. Requirements for electromagnetic compatibility (EMC). Part 1. General requirements (EN 61326-1:2013, IDT);
DSTU EN 60529:2014 "Degrees of protection provided by enclosures (IP Code)" (EN 60529:1991; EN 60529:1991/A1:2000; EN 60529:1991/A2:2013; EN 60529:1991/AC:1993, IDT);
DSTU 7363:2013 "Metrology. Measuring equipment software. General specifications";
DSTU EN 61010-1:2014 (EN 61010-1:2014, IDT) "Safety Requirements for Control-And-Measuring and Laboratory Electrical Equipment. Part 1. General requirements".

1 Description of the Measuring Instrument Type

MKS-07 "POSHUK" Search Gamma, Beta Dosimeter-Radiometer (hereinafter referred to as the dosimeter) is designed to measure ambient dose equivalent (DE) and ambient dose equivalent rate (DER) of gamma and X-ray radiation (hereinafter referred to as photon-ionizing radiation), and surface beta-particles flux density. The dosimeter is intended for dosimetry and radiometry monitoring at industrial enterprises, nuclear power plants, and at research organizations; for monitoring the radiation purity of residential premises, buildings and structures, the territory adjacent to them, household items, clothing, the surface of the soil on private plots, and vehicles.

1.1 Design

MKS-07 "POSHUK" dosimeter is a portable measuring instrument, the design of which is implemented based on specialized large-scale integrated circuits (hereinafter LSIC) and is patented in Ukraine (patent No. 3947 for the invention "Digital Intensimeter").

Features of the dosimeter include:

- two independent measuring channels with an option of alternate output of results on a liquid crystal display;
- the possibility of selective measurement of gamma and beta radiation in powerful mixed (gamma + beta) fields due to the use of two specialized remote detecting units for gamma radiation and beta particles;
- sound alarm of the detected gamma quanta or beta particles and exceeding the programmed threshold level of photon-ionizing radiation DER or the surface beta-particles flux density;
- short time (no more than 5 s) of measuring the photon ionizing radiation DER or the surface beta-particles flux density in the search mode of measurement;

009023

- the possibility of displaying the averaged measurement result on the digital display.

The dosimeter consists of a remote control panel and remote detecting units of gamma radiation and beta particles. The dosimeter control panel is made of impact-resistant polystyrene, which houses:

- built-in gamma radiation detector;
- digital data processing circuit with controls;
- four-digit liquid crystal display;
- battery.

The remote gamma radiation detecting unit consists of two sections (high-sensitivity and low-sensitivity) of gas-discharge detectors, anode voltage formers, and a digital compensation circuit of the detector's dynamic characteristics.

The remote beta-particle detecting unit consists of a low-background gas-discharge beta detector, an anode voltage former, and a digital compensation circuit of the detector's dynamic characteristics.

The circuit of the dosimeter panel consists of two scaling devices of an intensity-symmetric channel with a circuit of threshold level programming and a scaling device of the accumulation channel, implemented on a specialized LSIC, supply voltage stabilizers of the device, an anode voltage former of the built-in detector, a digital display and controls.

A battery consisting of six nickel-cadmium batteries of "A-316" type powers the dosimeter. The battery is charged using a purchased charger.

The dosimeter in its intensity-symmetric channel measures the average rate of pulse advance formed in one of the remote detecting units during their irradiation. Then it is scaled and displayed on the digital display in the units of " $\mu\text{Sv/h}$ ", " mSv/h " or " Sv/h " (when measuring photon-ionizing radiation DER), or in " $10^3\text{-part./cm}^2\text{-min}$ " (when measuring surface beta-particles flux density).

In the accumulation channel, pulses from the built-in gamma radiation detector are continuously counted and the scaled measurement result in units of equivalent dose " mSv " is displayed on the digital display.

The appearance of the dosimeter is shown in Figure 1.

The dimensions of the dosimeter components are shown in Figures 2-4.



Figure 1 – Appearance of the component parts of the dosimeter delivery kit

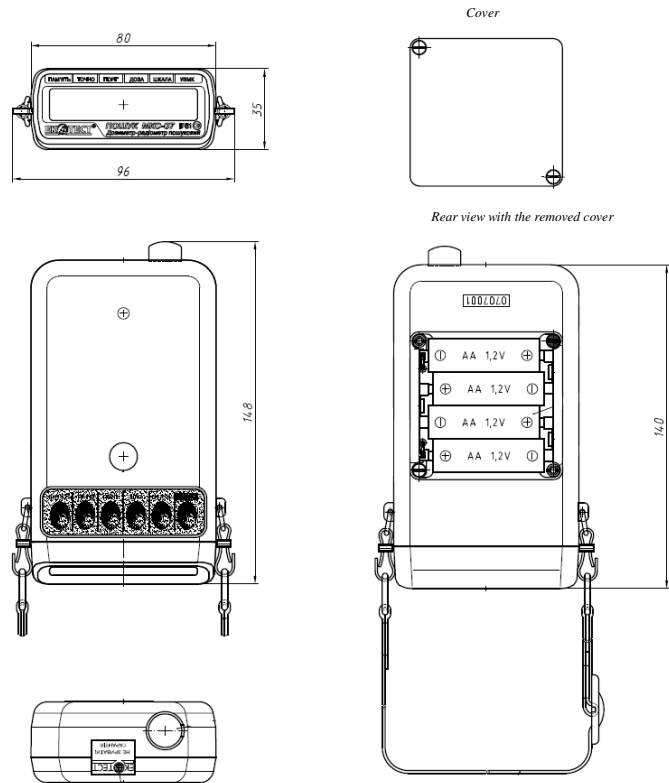


Figure 2 – Dimensions of the dosimeter control panel

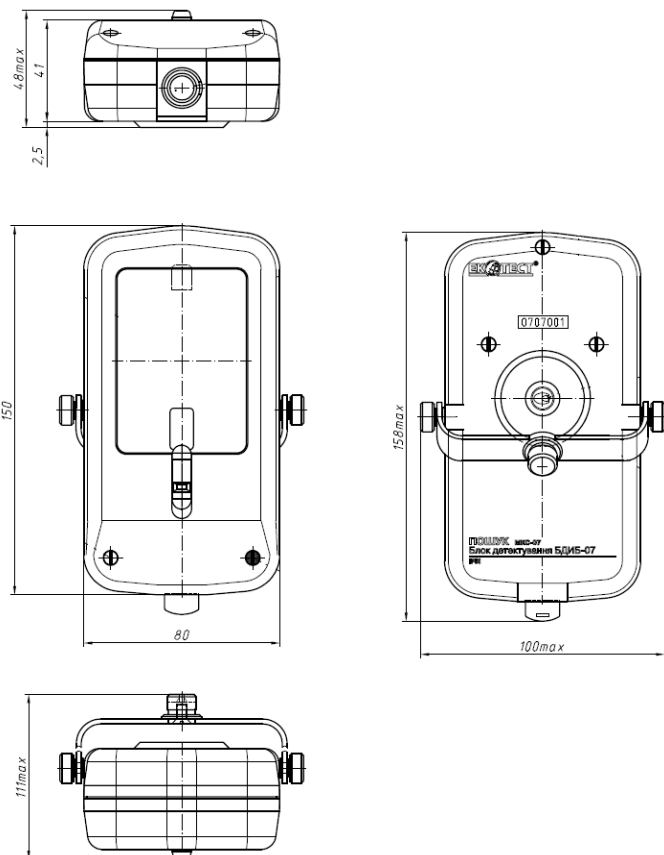


Figure 3 – Dimensions of the BDIB-07 beta particles detecting unit

009025

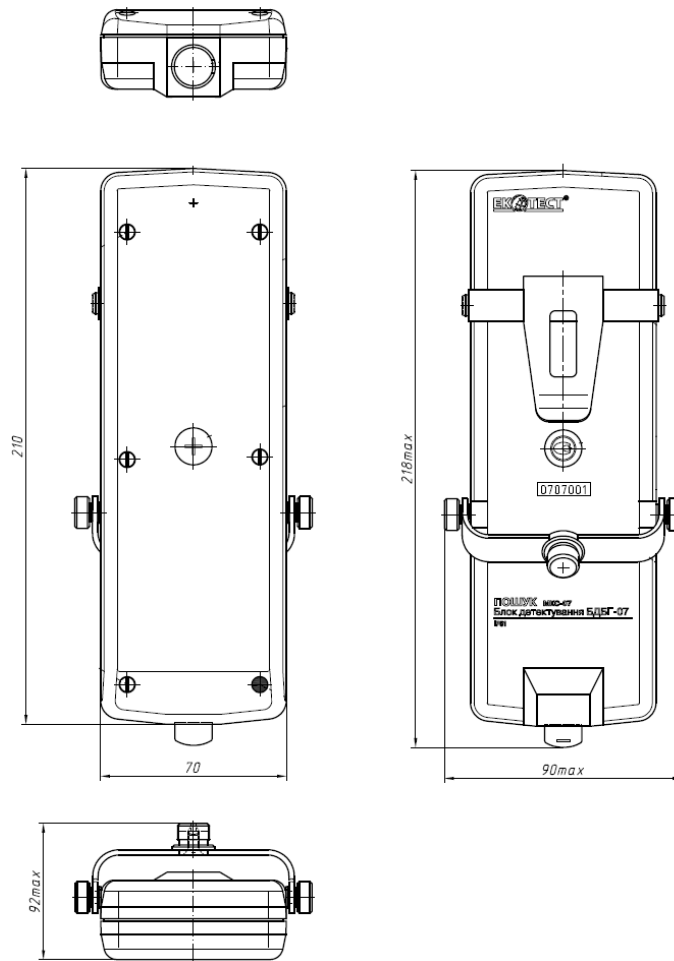


Figure 4 – Dimensions of the BDBG-07 gamma radiation detecting unit

1.2 Primary transducer

The principle of operation of the primary transducer is based on the interaction of gamma quanta with the electric field in the gas-discharge Geiger-Muller counter, at the output of which pulses appear, the number of which is proportional to the intensity of the detected gamma radiation.

1.3 Processing of measurement results

1.3.1 Technical means

Management of the process of measurement, calculation, output of data is carried out with the help of a built-in microcontroller.

1.3.2 Software

Embedded software (SW) is programmed into the dosimeter once, at the stage of manufacture. Upon completion of programming, access to the embedded software is blocked irreversibly by destroying the protection bits of the microcontroller. This guarantees the protection of the embedded SW from tampering.

The version of the embedded SW is displayed on the LCD of the dosimeter for a few seconds when the dosimeter is switched on. The checksum of the embedded SW is not displayed on the LCD of the dosimeter, but is calculated and checked with the standard one each time the dosimeter is switched on during its self-test. In the event of a mismatch, the dosimeter is blocked. This makes it impossible for the dosimeter to function with damaged SW.

To transfer measurement results from the dosimeter's memory, the manufacturer's PDC ECOMONITOR software is used.

The identification data of the software (SW) are listed in Table 1.

Table 1 – Identification data of dosimeter SW

Software of measuring instrument (name)	Software version number	Functional checksum (for software identification)
“Poshuk N” embedded SW	2.1	-
PDC ECOMONITOR application PDCEcomonitor.exe	13.7.10.3031	ba 3e 2b f0 f8 a6 1b ed e9 2e b2 9f 53 86 f5 97

1.4 Measurement results display

The measurement results are displayed using a liquid crystal display on the dosimeter control panel.

1.5 Additional equipment and functions that are not subject to the requirements of the Technical Regulations

Not available.

1.6 Technical documentation

- TY Y 22362867.003-99 “MKS-07 “POSHUK” Search Gamma, Beta Radiation Dosimeter-Radiometer”;
- BICT.412129.003 TO “MKS-07 “POSHUK” Search Gamma, Beta Radiation Dosimeter-Radiometer”. Technical description and operating manual”;
- BICT. 412129.003 ФО “MKS-07 “POSHUK” Search Gamma, Beta Radiation Dosimeter-Radiometer”. Logbook”.

Technical documentation is stored in hard copy in the file 113-0095-17 version 2.

2 Technical data

2.1 Technical parameters

The main metrological and technical characteristics of the detecting units are provided in Table 2.

Table 2 – Main metrological and technical characteristics of the detecting units

Name	Unit of measurement	Value
1	2	3
Measurement range of photon-ionizing radiation DER	μSv/h	0.1 – 2.0·10 ⁶
Main relative permissible error limit of DER measurement with 0.95 % confidence probability: - in precise measurement mode - in search mode	%	$15 + \frac{2}{\dot{H}^*(10)},$ $25 + \frac{2}{\dot{H}^*(10)},$ <p>where $\dot{H}^*(10)$ – is a numeric value of measured DER in μSv/h</p>
Measurement range of photon-ionizing radiation DE	mSv	0.001 - 9999

009028

Table 2 (continued)

1	2	3
Main relative permissible error limit of DE measurement (DER from 0.1 to 1.0·10 ⁴ μSv/h) with 0.95 % confidence probability	%	±15
Energy range of detected photon-ionizing radiation	MeV	0.05 – 3.00
Anisotropy of gamma radiation detecting units at 0.66 MeV for: - remote detecting unit (gamma-quantum incidence at 30 to 150° angles relative to the main area of the detectors location), not more than - built-in detecting unit, not more than	%	±80 ±40
Energy dependence of the dosimeter readings at photon-ionizing radiation DER and DE measurement within the preset energy range, not more than	%	±25
Measurement range of surface beta particles flux density	part./cm ² ·min)	5 – 10 ⁵
Ingress protection rating of the dosimeter case and its components		IP51
Main relative permissible error limit of surface beta particles flux density measurement with 0.95 % confidence probability: - in precise measurement mode; - in search mode	%	$15 + \frac{200}{\phi_{\beta}}$, $25 + \frac{200}{\phi_{\beta}}$, where ϕ_{β} is a numeric value of measured surface flux density in part./cm ² ·min)
Energy range of detected beta particles	MeV	0.15 – 3.00
Operating supply voltage of the dosimeter from the storage battery (four AA batteries)	V	4.8
Additional relative permissible error limit during measurement caused by supply voltage variations from 5.2 to 4.2 V	%	±5
Additional relative permissible error limit during measurement caused by ambient air temperature variations from -25 to +55 °C	% per each 10 °C deviation from 20 °C	±5
Time of operating mode setting, not more than	min	2
Battery lifetime (storage battery of 2700 mAh capacity) at natural background radiation and switched off display backlight, not less than	hours	400
Unstable readings of the dosimeter during 6 hours of continuous operation, not more than	%	±10

009029

Table 2 (continued)

1	2	3
Communications interface with the detecting units		RS-485
Dimensions of the dosimeter's control panel, not more than	mm	96×35×148
Dimensions of the remote detecting unit of gamma radiation, not more than	mm	90×46×218
Dimensions of the remote detecting unit of beta particles, not more than	mm	100×58×158
Weight of the dosimeter's control panel, not more than	kg	0.4
Weight of gamma radiation remote detecting unit, not more than	kg	0.5
Weight of beta radiation remote detecting unit, not more than	kg	0.5
Ingress protection rating	-	IP51
Average life till the first major repair, not less than	hours	10000
Average service life (with battery replacement), not than	year	6
Average shelf life (with battery replacement), not less than	year	10
Climatic conditions of the environment: – temperature; – relative humidity at a temperature of 30 °C – atmospheric pressure	°C % kPa	from minus 25 to +55 100 from 66 to 106.7
Class of external electromagnetic conditions according to DSTU OIML D 11	--	E2
Class of external mechanical conditions according to DSTU OIML D 11	--	M1

The meter delivery kit includes:

- Control panel – 1 pc;
- BDBG-07 gamma radiation detecting unit – 1 pc;
- BDIB-07 beta particles detecting unit – 1 pc;
- Telescopic tube – 1 pc;
- Connecting cable – 1 pc;
- Technical description and operating manual – 1 pc;
- Logbook – 1 pc;
- Packaging – 1 pc;
- AA type NiMH battery of 2700 mA·h capacity (Varta) – 4 pcs;
- Purchased charger – 1 pc;
- Swivel holders for detecting units – 2 pcs.

3 Interfaces and compatible external devices

3.1 Interfaces

An infrared port is used in the detector.

3.2 Compatible external devices

Personal computer.

4 Requirements for production, commissioning and use**4.1 Production requirements**

There are no additional production requirements.

4.2 Commissioning requirements

The requirements that ensure the proper commissioning of dosimeters are given in BICT.412129.003 TO "MKS-07 "POSHUK" Search Gamma, Beta Radiation Dosimeter-Radiometer". Technical description and operating manual" (File No. 113-0095-17 version 2)

4.3 Operating requirements

The dosimeters must be operated with the account of local climatic conditions in accordance with clause 2.1 of this certificate, the requirements given in BICT.412129.003 TO "MKS-07 "POSHUK" Search Gamma, Beta Radiation Dosimeter-Radiometer". Technical description and operating manual", as well as the whether the intended place of use is inside or outside (File No. 113-0095-17 version 2).

5 Supervision over of the devices in operation**5.1 Supervision documentation**

Metrological supervision of the legislatively regulated measuring equipment in use is carried out by inspections in accordance with the Law of Ukraine "On the basic principles of state supervision (control) in the field of economic activity".

State market supervision for compliance of legislatively regulated measuring instruments with the requirements of technical regulations is carried out in accordance with the Law of Ukraine "On State Market Supervision and Control of Non-Food Products".

The verification of legislatively regulated measuring instruments in use is performed according to verification methods, which are determined by regulatory acts of the central executive body, which ensures the formation of state policy in the field of metrology and metrological activity, or national standards.

The procedure for supervision during use in accordance with the "Procedure for verification of legislatively regulated measuring instruments in use and registration of its results", approved by the Order of the Ministry of Economic Development and Trade of Ukraine No.193 dated 08 February 2016.

5.2 Identification (of hardware and software)

Identification of hardware – in accordance with clause 1.1 and Figures 1-3 hereof. Identification of software – in accordance with clause 1.3.2 hereof when the dosimeter is switched on and PDCEcomonitor.exe program is launched.

6 Protection facilities (hardware and software)

Protection against interference is carried out by sealing the components of the dosimeter with a special film (Figure 5).

009030



Figure 5 – Example of dosimeter sealing, place marked 1

009031

7 Labeling and inscriptions

Dosimeter labeling contains:

- the trademark of the manufacturer;
- conventional designation and type of dosimeter;
- serial number of the dosimeter according to the numbering system of the manufacturer;
- the ingress protection rating of the housing – IP51;
- month and year of manufacture according to the manufacturer's system;
- conformity mark and additional metrological labeling.

An example of dosimeter labeling is shown in Figure 6.

Information on the accuracy characteristics is given in BICT.412129.003 TO "MKS-07 "POSHUK" Search Gamma, Beta Radiation Dosimeter-Radiometer". Technical description and operating manual" and BICT.412129.003 Φ O "MKS-07 "POSHUK" Search Gamma, Beta Radiation Dosimeter-Radiometer. Logbook".

009032

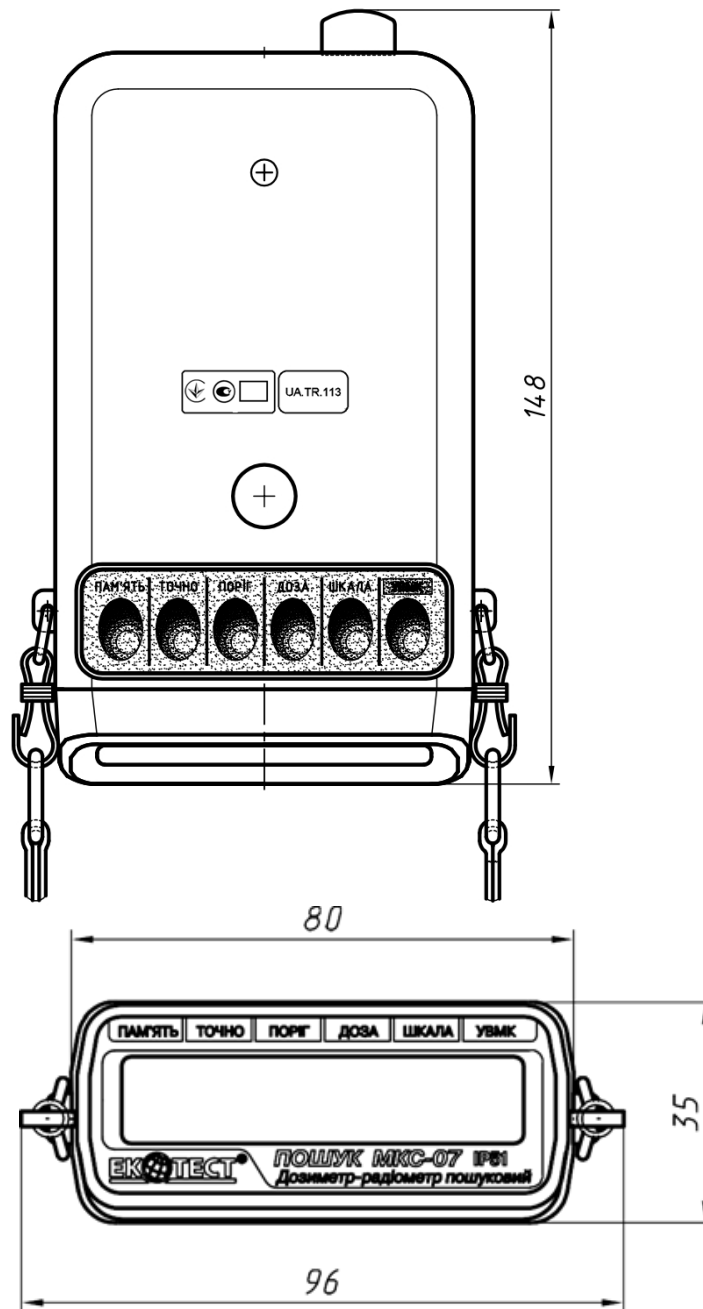


Figure 6 – Example of dosimeter labeling

8 Drawings

Design documentation is stored in hard copy in File 113-0095-17 version 2.

Additional Information:

Test reports:

1 Test report on conformity assessment of the technical regulation of the legislatively regulated measuring equipment of the CAB "Metrology", NNC "Institute of Metrology" 6/1205-17.П.2.В-F/08-17 dated 31 May 2017, accreditation certificate No. 2H524 dated 1 August 2016, expires 29 January 2020.

2 Report No. 17-01 on conformity verification of MKS-07 "POSHUK" search gamma, beta radiation dosimeters-radiometers for resistance to the influence of vibration according to the requirements of clause 1.3.19 of the technical specifications of TY Y 22362867.003-99 dated 24 October 2017 at the Separated Subdivision "Testing Center LORTA" (SS "TS LORTA"), 1 Patona St., Lviv, 79601, Ukraine, accreditation certificate No. 2H042 dated 14 September 2014, expires 13 July 2019.

009033

3 Report No. 17-02 on conformity verification of MKS-07 "POSHUK" search gamma, beta radiation dosimeters-radiometers for resistance to the influence of shocks according to the requirements of clause 1.3.20 of the technical specifications TY Y 22362867.003-99 dated 24 October 2017 at the SS "TS LORTA", 1 Patona St., Lviv, 79601, Ukraine, accreditation certificate No. 2H042 dated 14 September 2014, expires 13 July 2019.

4 Report No. 17-03 on conformity verification of MKS-07 "POSHUK" search gamma, beta radiation dosimeters-radiometers for resistance to the influence of constant and alternating magnetic fields with a voltage of 40 A/m according to the requirements of clause 1.3.21 of the technical specifications TY Y 22362867.003-99 dated 25 October 2017 at the SS "TS LORTA", 1 Patona St., Lviv, 79601, Ukraine, accreditation certificate No. 2H042 dated 14 September 2014, expires 13 July 2019.

5 Report No. 17-04 dated 31 October 2014 on conformity verification of MKS-07 dosimeters-radiometers with safety requirements according to DSTU EN 61010-1:2014 at the SS "TS LORTA", 1 Patona St., Lviv, 79601, Ukraine, accreditation certificate No. 2H042 dated 14 September 2014, expires 13 July 2019.

6 Test report No. 17-0219-01 of the MKS-07 "POSHUK" search gamma, beta radiation dosimeter-radiometer with the BDIB-07 detecting unit dated 2 October 2017, at the SS "TS LORTA", 1 Patona St., Lviv, 79601, Ukraine, accreditation certificate No. 2H042 dated 14 September 2014, expires 13 July 2019.

7 Test report of STC "Metrology", NNC "INSTITUTE OF METROLOGY" No. 6/6193.II.645-1.B./12-21 dated 30 December 2021, accreditation certificate registered in the Register on 16 November 2020 by No. 20524, expires 15 November 2025.

Customer – Private Enterprise "Scientific and Production Private Enterprise "Sparing-Vist Center"; 33 Volodymyra Velykoho Str., Lviv, Ukraine 79026; USREOU code 22362867.

State Classifier of Goods and Services code of the product – 26.51.41.