

**Ministry of Economic Development of Ukraine  
National Scientific Center “Institute of Metrology”**

**TYPE EXAMINATION CERTIFICATE**

**Registered in the Record of conformity assessment body under** **No. UA.TR.113-0297-19**

**Term of validity** from January 28, 2019 to January 27, 2029

**Certificate issued:** Private Enterprise “SPPE “Sparing-Vist Center”,  
33 Volodymyra Velykoho Str., Lviv, 79026, Ukraine;  
USREOU code 22362867.

**Produce** *DKS-02PN “CADMIUM” Search Alarm Dosimeter* SCGS (State Classifier of Goods and Services) 26.51.41  
(Product’s full name, type, brand, model, trademark) (UKTZED code (s), SCGS)

**Comply with the requirements** *Technical regulation of legally regulated measuring instruments approved by the Resolution of the Cabinet of Ministers of Ukraine No. 94 of January 13, 2016*  
(Name and designation of regulatory documents)

**Producer (s)** Private Enterprise “SPPE “Sparing-Vist Center”,  
33 Volodymyra Velykoho Str., Lviv, 79026, Ukraine;  
USREOU code 22362867

**Place(s) of production** Private Enterprise “SPPE “Sparing-Vist Center”,  
33 Volodymyra Velykoho Str., Lviv, 79026, Ukraine;  
USREOU code 22362867

**Additional information** Description of the measuring instrument is given in Annex No.1 to the Type Examination Certificate.

**Certificate is issued by the conformity assessment body** Certification and conformity assessment body “Metrology” of the National Scientific Center (NSC) “Institute of Metrology”, Kharkiv, 42 Myronosytska Str., 61002, Ukraine

**On the grounds of** Reports, provided in Annex No.2 to the Type Examination Certificate

**Head of the conformity assessment body”** /Signature/  
(Signature) **P.I. Neiezhmakov**  
(Initials, surname)

*Seal: Ministry of Economic Development and Trade of Ukraine \* NSC “Institute of Metrology” \* Kharkiv \* Conformity assessment body No.02568325*

**Validity of the Certificate of Compliance can be checked in the database of the conformity assessment body, which is hosted by** [www.metrology.kharkov.ua](http://www.metrology.kharkov.ua)  
(Website name)

**Type Examination Certificate (Annex No1)**Certificate No UA.TR.113-0297-19**TYPE DESCRIPTION OF MEASURING INSTRUMENT**

DKS-02PN “CADMIUM” search alarm dosimeter

**Purpose of use and application area**

DKS-02PN “CADMIUM” search alarm dosimeter (hereinafter – device) is designed to:

- Search for (detect and localize) radioactive and nuclear materials by the external gamma and neutron radiation;
- Measure ambient dose equivalent rate of gamma and X-ray radiation (hereinafter – DER of photon-ionizing radiation);
- Measure ambient dose equivalent of gamma and X-ray radiation (hereinafter – DE of photon-ionizing radiation);
- Indicate DER of neutron radiation;
- Identify intensity of photon-ionizing and X-ray radiation.

DKS-02PN “CADMIUM” device can be manufactured without the installed detector of neutron radiation and be implemented in DKS-02PN “CADMIUM” modification.

The device can be used in the following areas:

- Customs and Border Guard
- Law enforcement agencies (Ministry of Internal Affairs, Security Service off Ukraine, protective services)
- Metallurgy and scrap metal landfills
- Monitoring of vehicles, seaports, and airports
- Environmental inspections
- Radio waste disposals

The device is designed in accordance with the state standards DSTU 7216, GOST 27451.

**Description of measuring instrument**

The device consists of the following main parts: a scintillation gamma radiation detecting unit (SGDU), a low-sensitivity gamma radiation detector (GDUI), a neutron detecting unit (NDU), supply voltage formers (SVFs), bias voltage drivers (BVF), GPS/GNSS receiver, display and processing module (DPM), graphical color display (GCD), battery (B), and a thermal detector (TD).

The SGDU consists of CsI(Tl) scintillator type detector with a silicon photomultiplier together with an amplifier, and the NDU of LiI(Eu) scintillator type detector with a silicon photomultiplier together with an amplifier. The GDUI is represented as a Geiger-Muller counter (GMC).

The principle of operation of the detecting unit relies on the conversion of those scintillations in the semiconductor photomultiplier that are caused by photon-ionizing radiation or neutron radiation in the scintillator into voltage pulses. These pulses are emanated at the input of the amplifier, where they undergo amplification and are delivered to the output as positive polarity pulses. The number of these pulses is proportional to the photon-ionizing DER or neutron radiation, and the amplitude – to energy.

For the stability of high temperature of the detectors that accommodate silicon photomultipliers, DPM constantly compensates temperature by measuring exact values of temperature in the detectors and precisely correcting their bias voltage.

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The DPM performs the processing of a pulse stream emanated from the outputs of SGDU, GDUI, NDU, estimates a value that is relevant to this flow, taking into account the multichannel amplitude analysis of the value of photon-ionizing radiation DER, as well as a pulse count rate from SGDU, GDUI, NDU. Depending on the operating mode of the device, the readings of photon-ionizing DER, flow intensity, histograms of flow intensity, and statistical errors of gamma and neutron channels appear on the GCD.

On exceeding DER referenced to a gamma channel of  $50\mu\text{Sv/h}$ , the SGDU is automatically switched off, and the DER value is calculated from the GDUI which is continuously in operation.

The DPM incorporates a nonvolatile memory that stores event log entries.

The device is structurally designed in the shape derivative of a rectangular parallelepiped whose planes are replaced by surfaces of large radii of curvature with rounded edges. The housing is plastic, dustproof and waterproof. The device has the upright operating position.

The ingress protection rating is IP67. The housing consists of two covers (1) and (2) fixed by screws. The front cover (1) contains a graphic color display (3), a multifunctional manipulator (joystick) (4), indicators—GAMMA (7), NEUTRON (8), BATTERY (9)—and a light sensor “ABC” (10). In the upper part of this cover there is a light display (5) for alarm triggering when a radioactive source is detected.

A spring clip retainer (11) is secured with one screw to the back cover, with the help of which the dosimeter is securely fastened to the operator’s clothes, and which can be easily removed, if necessary. The back cover and the clip are marked with "+" symbols (12), which stand for the mechanical centers of gamma and neutron radiation detectors.

On the right lateral surface of the dosimeter’s body under the protective flexible plug (6) there is a USB connector for connecting the peripheral devices and charging the built-in battery.

The dosimeter is powered from a lithium-polymer battery of 3.7 V rated voltage.

The dosimeter is sealed with a paste in the recesses (13) of the bottom cover.

**Software**

The device uses a microcontroller that allows the access to firmware to be blocked irreversibly by destroying security bits when it is programmed. This ensures protection of the firmware from unauthorized access.

A software version – 2.03. A functional checksum – 0x1D.

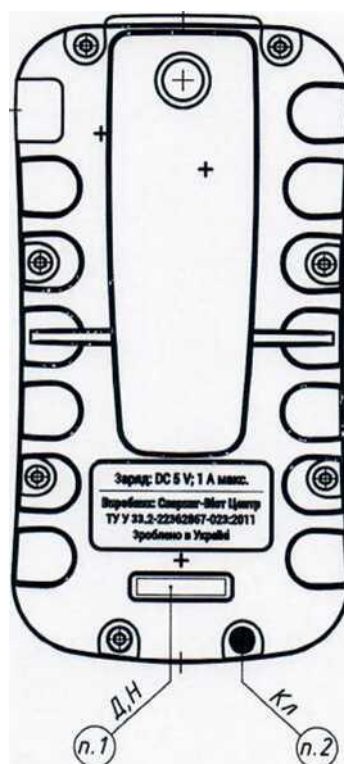
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Appearance



Fig.1 – Appearance of the device



1. Manufacture date and serial number of the alarm dosimeter.
2. Paste stamp No.1 GOST 18680-73 (QCD's stamp)

Fig. 2 – Sealing of the device

**Type Examination Certificate (Annex No1)**Certificate No UA.TR.113-0297-19**Delivery kit**

The delivery kit shall be in consistency with Table 2.

Table 2 – Delivery kit

Type	Name	Quantity	Note
BICT.412139.005	DKS-02PN “CADMIUM” search alarm dosimeter	1	–
–	Charging device	1	Model is not specified
–	Shielded USB cable	1	Model is not specified
BICT.412139.005 HE	Operating Manual		–
–	“Spectra Reader” Software	1	On a mini-CD
–	Case	1	Model is not specified

**Metrological characteristics and specifications of the measuring instrument**

The main metrological characteristics and specifications of the DKS-02PN “CADMIUM” search alarm dosimeter are provided in Table 3.

Table 3 – Main metrological characteristics and specifications of the device

Specification	Unit of measurement	Value
1	2	3
Measurement and display range of photon-ionizing radiation DER from SGDU	Sv/h	from $1 \times 10^{-8}$ to $5 \times 10^{-5}$ (inclusive)
Main relative permissible error limit in measuring photon-ionizing radiation DER from SGDU when calibrated by $^{137}\text{Cs}$ in the range from $1 \times 10^{-7}$ Sv/h to $5 \times 10^{-5}$ Sv/h (inclusive) at 0.95 confidence probability	%	$15 + \frac{1}{\dot{H}^*(10)}$ , where $\dot{H}^*(10)$ is a numeric value of measured DER in $\mu\text{Sv/h}$
Measurement range of photon-ionizing radiation DER from GMC	Sv/h	from $5 \times 10^{-5}$ to 1
Measurement and display range of photon-ionizing radiation DE from GMC	Sv	from $1 \times 10^{-7}$ to 9.999
Main relative permissible error limit in measuring photon-ionizing radiation DER in the range from $5 \times 10^{-5}$ Sv/h to 1 Sv/h altogether with DE in the range from $1 \times 10^{-6}$ Sv to 9.999 when calibrated by $^{137}\text{Cs}$ at 0.95 confidence probability	%	15
Display range of neutron radiation DER	Sv/h	from $1 \times 10^{-8}$ to $1 \times 10^{-2}$
Energy range of registered photon-ionizing radiation	MeV	from 0.02 to 3.00

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Table 3 (continued)

1		2
Energy dependence in measuring photon-ionizing DER and DE in the energy range from 0.05 MeV to 1.25 MeV relative to 0.662 MeV, not more than,	%	±25
Energy range of registered neutron radiation	MeV	from $2.5 \times 10^{-8}$ to 14
Anisotropy at the angle of incidence of gamma radiation from $-60^\circ$ to $+60^\circ$ horizontally and vertically relative to the main direction of measurement that is marked with “+”: - for radionuclides $^{137}\text{Cs}$ and $^{60}\text{Co}$ , not more than - for radionuclide $^{241}\text{Am}$ , not more than		±30 ± 75
Complementary relative permissible error limit of photon-ionizing radiation DER and DE measurement result caused by ambient temperature deviation from $20^\circ\text{C}$ , in the temperature range from $-20^\circ\text{C}$ to $+50^\circ\text{C}$	% per each $10^\circ\text{C}$ of deviation from $20^\circ\text{C}$	5
Operating supply voltage of the dosimeter from Li-Po battery with capacity of at least 400 mAh	V	3.7
Time of continuous operation under normal climatic conditions when powered from a fully-charged battery: - under gamma background not more than $0.5 \mu\text{Sv/h}$ , with the switched-off LCD backlight and no alarm actuation: - when a navigation receiver is off, not less than - when a navigation receiver is on, not less than	h	200 55
Unstable readings during a continuous 8-hour operation, not more than	%	5
Mean time to failure, not less than	h	6000
Mean time to repair, not less than	h	10000
Mean lifespan (with the battery replacement in each 5 years years), not less than	year	10
Mean shelf life (with the battery replacement in each 5 years years), not less than	year	10
Mean time to recovery without reference to time for delivery of spare parts	h	3
Dimensions with a clip, not more than	mm	$67 \times 128 \times 45$
Weight, not more than	kg	0.28

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During operation and after repair, the device is subject to verification. Verification is carried out according to the technique described in the operating manual BICT.412139.005 HE, or other documents as provided by the current legislation of Ukraine.

A verification interval is no more than 1 year.

**Regulatory and technical documents laying down the requirements for the device**

DSTU 7216:2011 “Dosimeters and radiometers of radiation control. Classification and general technical requirements.”

GOST 27451-87 “Ionizing radiation measuring means. General specifications.”

DSTU EN 61326-1:2016 “Electrical equipment for measurement, control, and laboratory use. EMC requirements. Part 1. General requirements (EN 61326-1:2013, IDT)”.

GOST 14254-96 (IEC 529-89) “Degrees of protection provided by enclosures (IP code)”.

**Manufacturer:**

Private Enterprise “SPPE “Sparing-Vist Center”  
Ukraine, 79026, Lviv, 33 Volodymyra Velykoho Str.  
USREOU code 22362867

**Applicant:**

Private Enterprise “SPPE “Sparing-Vist Center”  
Ukraine, 79026, Lviv, 33 Volodymyra Velykoho Str.  
USREOU code 22362867.

**Head of the conformity assessment  
body**

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(initials, surname)

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**Type examination Certificate (Annex No2)**Certificate No **UA.TR.113-0297-19****LIST OF REPORTS PURSUANT TO WHICH THE CERTIFICATE IS ISSUED**

1. Evaluation report for conformity with the technical regulation of legally regulated measurement instruments of the State Testing Center (STC) "Metrology", NSC "Institute of Metrology" No 6/4304.П.495.B/01-19 dated January 17, 2019, the accreditation certificate No.2H524 of August 1, 2016 and valid till January 29, 2020.
2. Report of January 4, 2019 on the compliance test for DKS-02PN "CADMIUM" search alarm dosimeter for immunity to operational temperature limits according to paragraphs 1.2.15, 1.2.29, and 1.2.38 of technical specifications TU U 33.2-22362867-023:2011 of the Separated Subdivision (SS) "Testing Center LORTA", the accreditation certificate issued by National Accreditation Agency of Ukraine (NAAU) No 2H042 dated September 14, 2014 and valid till July 13, 2019.
3. Report of January 8, 2019 on the compliance test for DKS-02PN "CADMIUM" search alarm dosimeter for resistance to humidity according to the paragraph 1.2.29 of technical specifications TU U 33.2-22362867-023:2011 at the SS "Testing Center LORTA", the accreditation certificate issued by NAAU No 2H042 as of October 14, 2014 and valid till July 13, 2019.
4. Report dated January 11, 2019 on the compliance test for DKS-02PN "CADMIUM" search alarm dosimeter for immunity to sinusoidal vibrations according to the paragraph 1.2.30 of technical specifications TU U 33.2-22362867-023:2011 of the SS "Testing Center LORTA", the accreditation certificate issued by NAAU No 2H042 as of October 14, 2014 and valid till July 13, 2019.
5. Report dated January 11, 2019 on the compliance test for "CADMIUM" DKS-02PN search alarm dosimeter for resistance to shocks according to the paragraph 1.2.31 of technical specifications TU U 33.2-22362867-023:2011 of the SS "Testing Center LORTA", the accreditation certificate issued by NAAU No 2H042 as of October 14, 2014 and valid till July 13, 2019.
6. Report dated January 14, 2019 on the compliance test for DKS-02PN "CADMIUM" search alarm dosimeter for immunity to drops under the paragraph 1.2.32 of technical specifications TU U 33.2-22362867-023:2011 of the SS "Testing Center LORTA", the accreditation certificate issued by NAAU No 2H042 as of October 14, 2014 and valid till July 13, 2019.
7. Report dated January 14, 2019 on the compliance test for "CADMIUM" DKS-02PN search alarm dosimeter for the immunity to constant and alternating magnetic fields under the paragraph 1.2.33 of technical specifications TU U 33.2-22362867-023:2011 SS "Testing Center LORTA", the accreditation certificate issued by NAAU No 2H042 as of October 14, 2014 and valid till July 13, 2019.
8. Report dated January 15, 2019 on the compliance test for "CADMIUM" DKS-02PN search alarm dosimeter for the resistance to environmental influences and mechanical impacts when transported according to the paragraph 1.2.39 of technical specifications TU U 33.2-22362867-023:2011 of the SS "Testing Center LORTA", the accreditation certificate issued by NAAU No 2H042 as of October 14, 2014 and valid till July 13, 2019.
9. Report No 19-08/08 dated January 17, 2019 on the compliance test for the ingress protection rating of DKS-02PN "CADMIUM" search alarm dosimeter with the requirements of the technical specifications TU U 33.2-22362867-023:2011, GOST14254-96 under normal conditions of the SS "Testing Center LORTA", the accreditation certificate issued by NAAU No 2H042 as of October 14, 2014 and valid till July 13, 2019.
10. Test report No 0024-5-2018 dated June 15, 2018 on DKS-02PN "CADMIUM" search alarm dosimeter for EMC compliance (DSTU EN 61326-1:2016 (EN 61326-1:2013, IDT)) of the testing service UkrTEST of the State Enterprise "Ukrmetrteststandart" (Scientific and Technical Testing Center UkrTEST), the accreditation certificate issued by NAAU No 2H635 of August 16, 2018 and valid till May 31, 2022.

**Head of the conformity assessment  
body"**

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