Ministry of Economic Development and Trade of Ukraine
National Scientific Center "Institute of Metrology"

# TYPE EXAMINATION CERTIFICATE

**Registered under** No UA.TR.113-0113-17 **in the Register of Conformity Assessment Body**

| | |
|---|---|
| **Term of validity** | **from September 18, 2017 to September 17, 2027** |
| **Certificate is issued to** | Private Enterprise "SPPE "Sparing-Vist Center",<br>33 Volodymyra Velykoho Str., Lviv City, 79026, Ukraine;<br>EDRPOU code 22362867. |
| **Product** | ***BDBG-09 detecting unit*** (product's full name, type, brand, model, merchandise mark (trademark)) **DKPP 26.51**.41 (UKTZED and DKPP code(s)) |
| **Conforms to requirements of** | *Technical regulation of legally regulated measuring instruments, approved by the Decree of Cabinet of Ministers of Ukraine No. 94 as of January 13, 2016* (regulatory documents' name and designation) |
| **Manufacturer(s)** | Private Enterprise "SPPE "Sparing-Vist Center",<br>33 Volodymyra Velykoho Str., Lviv City, 79026, Ukraine;<br>EDRPOU code 22362867. |
| **Place(s) of manufacture** | Private Enterprise "SPPE "Sparing-Vist Center",<br>33 Volodymyra Velykoho Str., Lviv City, 79026, Ukraine;<br>EDRPOU code 22362867 |
| **Additional information** | Description type of the measuring instrument is provided in No 1 Annex of the type examination certificate |
| **Certificate is issued by the Conformity Assessment Body** | Certification and Conformity Assessment Body "Metrology" of the National Scientific Center "Institute of Metrology"<br>Kharkiv City, 42 Myronosytska Str., 61002, Ukraine |
| **On grounds of** | Test Reports stipulated in No 2 Annex of the type examination certificate |
| **Head of the Conformity Assessment Body** | /Signature/ (signature) **P.I. Neiezhmakov** (initials, surname) |
| **Validity of the Certificate of Compliance can be checked in the Conformity Assessment Body Database hosted by** | *Official seal:* MINISTRY OF ECONOMIC DEVELOPMENT AND TADE OF UKRAINE * NSC "INSTITUTE OF METROLOGY" * KHARKIV CITY, CONFORMITY ASSESSMENT BODY NO 02568325<br>**www.metrology.kharkov.ua** (name of the website) |

## DESCRIPTION OF THE MEASURING INSTRUMENT TYPE

BDBG-09 detecting unit of gamma radiation

**Purpose of use and application area**

The BDBG-09 detecting unit of gamma radiation (hereinafter – the detecting unit) is intended to measure ambient dose equivalent rate $\dot{H}^*(10)$ (hereinafter - DER) of gamma radiation.

The detecting unit can be used as a part of computer-aided systems of radiation control.

According to the classification according to GOST 29074-91 standard, the detecting unit belongs to fixed instruments of measuring equipment intended for continuous local direct control of regular and emergency radiation environment, which allows its servicing by qualified personnel.

The detecting unit belongs to the automation equipment (AE) of safety class 3 information systems of regular use (classified designation 3H (ZN)), seismic category II, installation height up to 70 m.

**Description of the measuring equipment instrument**

The detecting unit consists of a microcontroller, a high sensitivity detector, a low sensitivity detector, a supply voltage former, and an RS-485 interface node.

Operation of the detecting unit is based on the method of gamma radiation transformation into voltage pulse train on the detectors' outlet. The high sensitivity (СБМ-20) and low sensitivity (СИ 3БГ) Geiger-Muller counters are used in the detecting unit as its detectors.

The microcontroller processes the pulse flow from the detectors, and generates gamma radiation DER value, which corresponds to the flow, with the account of personal background of the detectors. The microcontroller determines the estimated limits of the expected statistical deviations for each measurement result. At the same time the microcontroller runs the power supply of the detectors and continuously controls their performance. If requested by the data display system, the microcontroller sends a protocol frame via RS-485 interface nod. The protocol frame contains gamma radiation DER measurement result, the estimated limits of the expected statistical deviations of this measurement result, as well as the results of the performance control of the detectors.

The nonvolatile memory is a part of the microcontroller and serves for storage of calibration factors. These factors allow considering and compensating the detector sensitivity dispersion within the measurement range, i.e. linearizing the counting feature of the detectors. If requested by the data display system, the microcontroller sends a frame with current calibration factors via RS-485 interface nod, or receives a frame with new calibration factors for storage in the nonvolatile memory.

**Software**

The detecting unit makes use of a microcontroller that can irreversibly, by eliminating bits of protection during programming, block access to the embedded software. This guarantees protection of the embedded software from unauthorized interference.

The manufacturing firms' technological software is used for calibration and repair of the detecting units. Bdbg.exe SW, version 1.5.0.2. Protection against unauthorized interference in bdbg.exe is carried out by checking its checksum (MD5-hash).

MD5-hash (checksum) of the BDBG.EXE file version 1.5.0.2 is equal to:
17 15 d4 12 ae 27 d1 b9 39 80 21 22 46 de e8 54

MD5-hash of BDBG.EXE file can be calculated any time using Windows command line: certutil -hashfile <bootdrive>: \Program Files\SVC\bdbg.exe MD5.

If calculated MD5-hash does not match with the above, BDBG.EXE program has been damaged and it needs to be reinstalled.

**Delivery kit**

The delivery kit of the counters includes:
- BDBG-09 detecting unit of gamma radiation - 1 pc.;
- Corbel- 1 p .;
- Operating manual - 1 copy;
- Logbook - 1 pc.;
- Consumer package - 1 pc.

**Appearance**


Fig.1 – Appearance of the detecting unit

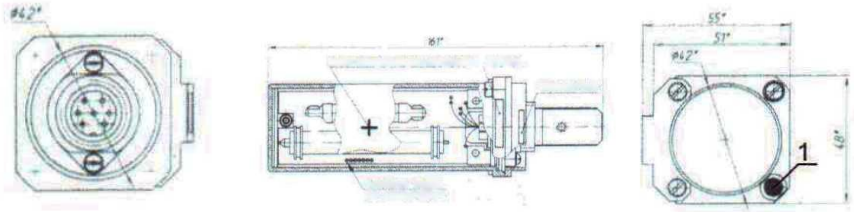


Fig. 2 - Dimensions of the detecting unit and a point of sealing, the point is marked 1

## Metrological and technical specifications of measuring instruments

Main metrological and technical specifications of measuring instruments are given in Table 1.

Table 1

| Name | Unit of measurement | Value |
|---|---|---|
| 1 | 2 | 3 |
| 1 Measurement range of gamma radiation DER (dose equivalent rate) | μSv/h | from 0.04 to $10^7$ |
| 2 Main relative permissible error limit of gamma radiation DER measurement with confidence probability of 0.95 | % | $15+2/\dot{H}^*(10)$, where $\dot{H}^*(10)$ is a numeric value of gamma radiation DER in μSv/h |
| 3 Energy range of registered gamma radiation | MeV | from 0.05 to 3.00 |
| 4 Energy dependence of measurement results of the detecting unit during gamma radiation DER measurement in the energy range of 0.05 MeV to 1.25 MeV | % | ±25 |
| 5 Anisotropy of the detecting unit at gamma quanta incidence at angles from +60° to - 60° horizontally and vertically relative to the main measurement direction, marked by a "+" symbol , does not exceed:<br>- for $^{137}$Cs and $^{60}$Co isotopes<br>- for $^{241}$Am isotope | % | <br><br><br>25<br>60 |
| 6 Operating supply voltage range of the detecting unit from external regulated power supply | V | from 7 to 13.5 |
| 7 Useful current of the detecting unit, not more than:<br>- without the use of PI-09 interface converter<br>- with the use of PI-09 interface converter | mA | <br>30<br>155 |
| 8 Setup time and measurement time of the detecting unit, not more than | min | 3 |
| 9 Unstable readings of the detecting unit during 24-hour continuous operation, not more than | % | 5 |

Table 1 (continued)

| 1 | 2 | 3 |
|---|---|---|
| 10 Complementary permissible error limit during measurement caused by ambient temperature change from - 40 °C to 75 °C | % | 5 per each 10 °C deviation from 20 °C |
| 11 Interface | - | RS-485 |
| 12 Weight, not more than:<br>- detecting unit without fastening elements;<br>- PI-09 interface converter without fastening elements | kg | 0.5<br>2.4 |
| 13 Ingress protection rating | | IP67 |

**Verification**

When operated and after repair, the detecting unit shall be subject to verification. It is carried out according to the procedure given in the operating manual VIST.418266.006 NE, or other documents as stipulated by the current legislation of Ukraine.

Verification interval – not more than 1 year.

**Regulatory and technical documents that set requirements for the device**

BDBG-09 detecting unit of gamma radiation. Specifications.
TU |U 33.2-22362867-009:2004.

BDBG-09 detecting unit of gamma radiation. Operating Manual VIST.418266.006 NE.

GOST 14254-96 (IEC 529-89). Degrees of protection provided by enclosure (IP Code).

**Manufacturer:**

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

**Applicant:**

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

**Head of the Conformity Assessment Body** /Signature/ (signature) **P.I. Neiezhmakov** (initials, surname)

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## LIST OF TEST REPORTS BASED ON WHICH THE CERTIFICATES IS ISSUED

1. Protocol of Conformity Assessment to the technical regulation of legally regulated measuring instruments of the CAB "Metrology" of the NSC "Institute of Metrology" 6/1205.P.2.V/08-17 dated August 7, 2017 with the accreditation certificate No. 2N524 dated August 1, 2016 and valid till January 29, 2020.

2. Test Report SPA-20060710-Rl BICON EMC-laboratories, 5700 AC Helmond The Netherlands, dated January 1, 2014.

3. Test Report No 01/12 dated July 31, 2017 on conformance inspection of the BDBG-09 detecting units of gamma radiation for resistance to mechanical effects in accordance with the requirements of items 1.3.11, 1.3.12 of the technical specifications TU U 33.2-22362867-009:2004 of the Separated Subdivision “LORTA Testing Center” residing at 1 Patona Str., Lviv City, 79061, Ukraine with the accreditation certificate No 2N042 dated September 14, 2014 and valid till July 13, 2019.

4. Test Report No 02/12 dated August 1, 2017 on conformance inspection of the BDBG-09 detecting units of gamma radiation for immunity to magnetic fields of 400A/m strength according to the requirements of 1.3.14 of the technical specifications TU U 33.2-22362867-009:2004 of the Separated Subdivision “LORTA Testing Center” residing at 1 Patona Str., Lviv City, 79061, Ukraine with the accreditation certificate No 2N042 dated September 14, 2014 and valid till July 13, 2019.

5. Test Report No 04/12 dated September 03, 2017 on conformance inspection of the BDBG-09 detecting units of gamma radiation for the safety requirements under DSTU EN 61010-1:2014 of the Separated Subdivision “LORTA Testing Center” residing at 1 Patona Str., Lviv City, 79061, Ukraine with the accreditation certificate No 2N042 dated September 14, 2014 and valid till July 13, 2019.

6. Test Report No 04/12 dated September 03, 2017 on conformance inspection of the BDBG-09 detecting units of gamma radiation for the safety requirements under DSTU EN 61010-1:2014 of the Separated Subdivision “LORTA Testing Center” residing at 1 Patona Str., Lviv City, 79061, Ukraine with the accreditation certificate No 2N042 dated September 14, 2014 and valid till July 13, 2019.

7. Test Report No 03/12 dated September 02, 2017 on conformance inspection of the BDBG-09 detecting unit of gamma radiation for ingress protection rating of the Separated Subdivision “LORTA Testing Center” residing at 1 Patona Str., Lviv City, 79061, Ukraine with the accreditation certificate No 2N042 dated September 14, 2014 and valid till July 13, 2019.

**Head of the Conformity Assessment Body** _____ **P.I. Neiezhmakov**
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