AT2533 & AT2533/1 Dosimeters

Burn-up life:	Ambient dose equivalent rate measurement range:	Immersion depth:
25 000 Sv	1 µSv/h – 1000 Sv/h	≤40 м

Delivery set

1) **PU-33 Processing unit**
2) **BDKG-33 Gamma radiation detection unit**
3) **Radiation resistant cable**
4) **Case** (storage and transportation of PU-33 and BDKG-33)

Application

- Emergency and post-accident situations
- Control of radioactive waste recycling and storage in waste disposal sites
- Radiation monitoring of environment, areas and facilities
- Nuclear industry and nuclear power plants
- Radiation control of linear accelerators (LINACs) and other pulsed-radiation facilities.
- Safety control in the process of radiation treatment of agricultural raw materials, medicinal materials, pharmaceutical products

The dosimeter is designed for measurement of ambient dose equivalent rate and ambient dose equivalent of continuous X-ray and gamma radiation in an extremely wide range and under harsh operating conditions, including emergency response.

The dosimeter can be used for measurement of dose and average dose rate of pulsed X-ray and gamma radiation at linear accelerators (LINACs) and other pulsed radiation facilities.

Features

- Extremely wide range of gamma radiation dose and dose rate measurement (9 orders) of magnitude
- High burn-up life, rugged construction and integrity of detection unit
- Measurement in liquids at depths up to 40 m
- Can be used in robotic equipment
- User friendly and easy to operate, can be quickly prepared for operation, ready for use in gloves
- Sound and visual alarm when the threshold level is exceeded for dose and dose rate
- PC data exchange over interface

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Operation principle

The dosimeter consists of an external BDKG-33 Gamma radiation detection unit and a PU-33 Processing unit wired together with a radiation resistant cable from 20 to 50 meters long.

The PU-33 processes electrical signals coming from BDKG-33, calculates, stores in memory and displays the results of measurements. The PU-33 also has an integrated Geiger-Mueller counter for monitoring radiation conditions at operator position when the BDKG-33 is disconnected.

The BDKG-33 has two measuring channels: counting and photovoltaic. The counting channel is based on an energy-compensated Geiger-Mueller counter and operates at low loads from 1 μSv/h to 100 mSv/h. The photovoltaic channel is based on an energy-compensated silicon solid-state detector operating in the current mode at high loads from 100 mSv/h to 1000 Sv/h.

High radiation durability of the BDKG-33 and cable is possible because all radiation sensitive electronics are located inside the PU-33, allowing the BDKG-33 to be located close to high gamma-radiation intensity objects or even inside them.

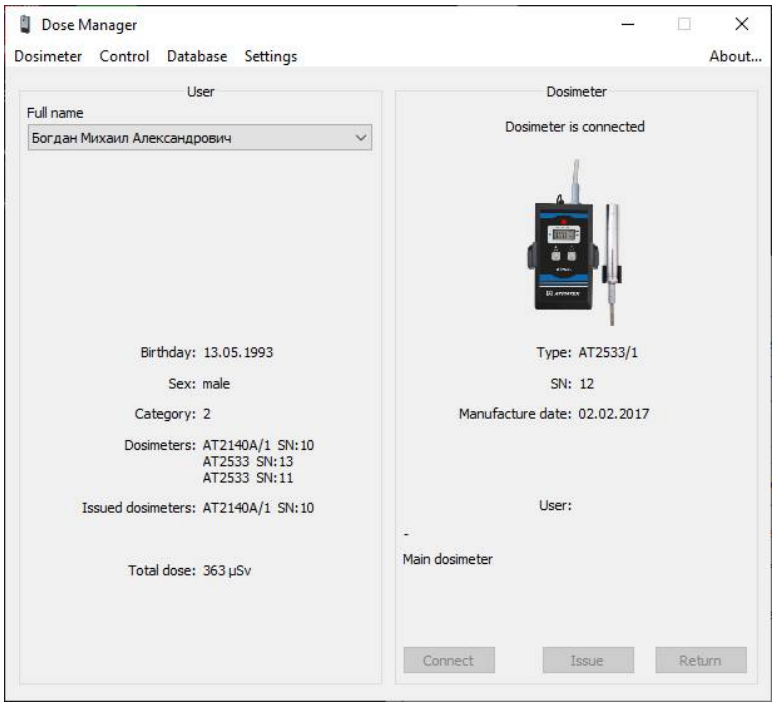
The design of BDKG-33 detection unit has a compact sealed stainless steel case (IP68 protection) making it suitable for use in tough mechanical and environmental conditions, even in remote areas. The BDKG-33 is also effective in water depths up to 40 m.

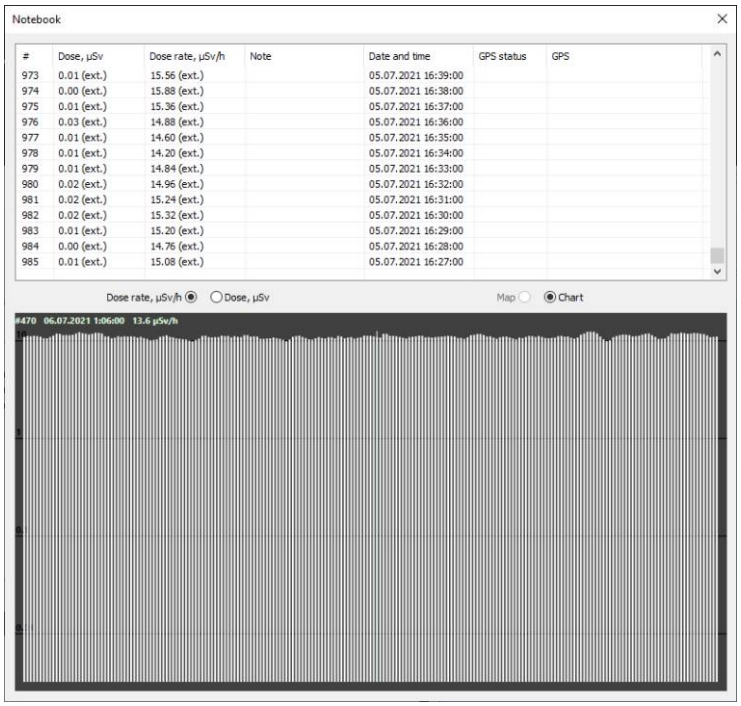
The dosimeter has a “measurement log”, when it records up to 1000 values of maximum dose rate into non-volatile memory at a pre-set time interval 1 to 255 minutes). The date and time of switching the dosimeter on/off, alarms and other service information is also recorded, and the dosimeter can transfer it to a personal computer via USB 2.0 interface using advanced software («Dose Manager»).

The AT2533/1 dosimeter version has a Bluetooth 5.0 wireless module in PU-33/1. The operator is then able to control the dosimeter from a greater, safer distance using the advanced software («DoseRemote»).

The delivery package may additionally include rechargeable batteries with a charger, brackets for mounting PU-33 and BDKG-33 on a wall, as well as a cable reel for convenient work with the dosimeters.

«Dose Manager» Software. *Main operation modes*





AT2533 & AT2533/1 Dosimeters

Delivery set of AT2533 (AT2533/1) Dosimeter	1) PU-33 (PU-33/1) Processing unit 2) BDKG-33 Gamma radiation detection unit 3) Cable, 20 - 50 m

Specifications	AT2533 (BDKG-33 connected)	PU-33
Detector	Silicon semiconductor detector; Geiger-Muller counter tube	Geiger-Muller counter tube
Energy range	50 keV – 10 MeV	
Measurement range of ambient dose equivalent rate $\dot{H}^*(10)$	1 μSv/h – 1000 Sv/h	0.1 μSv/h – 10 mSv/h
Measurement range of ambient dose equivalent $H^*(10)$	10 μSv – 5000 Sv	1 μSv – 2 Sv
Limits of variation of the response due to dose rate	±15% Coefficient of readout variation does not exceed: 15%, for dose rate $\dot{H}^*(10) = \dot{H}_0^*(10)$ $(16\text{-}\dot{H}^*(10)/\dot{H}_0^*(10))$%, for dose rate $\dot{H}_0^*(10) < \dot{H}^*(10) < 11\cdot\dot{H}_0^*(10)$ 5%, for dose rate $\dot{H}^*(10) = 11\cdot\dot{H}_0^*(10)$ Where $\dot{H}_0^*(10)$ is the lower limit of dose rate measurement range.	
Limits of variation of the response due to dose	±15% Coefficient of readout variation does not exceed: 15%, for dose $H^*(10) = H_0^*(10)$ $(16\text{-}\dot{H}^*(10)/\dot{H}_0^*(10))$%, for dose $H_0^*(10) < H^*(10) < 11\cdot H_0^*(10)$ 5%, for dose $H^*(10) = 11\cdot H_0^*(10)$ Where $H_0^*(10)$ is the lower limit of dose measurement range.	
Measurement range of average pulsed radiation dose rate	30 μSv/s – 0.3 Sv/s (100 mSv/h – 1000 Sv/h) *(pulse repetition rate is not less than 20 cps, duration not less than 1 μs)*	–
Measurement range of pulsed radiation dose	10 μSv – 5000 Sv	–
Limits of variation of the response due to dose and average dose rate of pulsed radiation	±20%	–
Limits of variation of relative response due to gamma radiation energy (50 keV to 3 MeV) and angle of incidence (0° to ±45°)	-29% to +67%	
Typical sensitivity to ^{137}Cs gamma radiation	0.15 cps/(μSv·h^{-1}), for $\dot{H}^*(10) \leq 0.1$ Sv/h 58 mV/(Sv·h^{-1}), for $\dot{H}^*(10) > 0.1$ Sv/h	2.6 cps/(μSv·h^{-1})
Response time for 10-fold dose rate change	≤10 s, for $\dot{H}^*(10) > 10$ μSv/h	
Burn-up life	≥25 000 Sv (BDKG-33 and cable)	≥100 Sv
Initialisation time	≤1 min	
Measurement instability during 24 h continuous operation	≤5%	
PC interface	USB 2.0 USB 2.0 / Bluetooth *(for AT2533/1 version)*	USB 2.0 USB 2.0 / Bluetooth *(for PU-33/1 version)*
Protection class	IP68 (withstands static hydraulic pressure up to 400 kPa at 40 m immersion depth for BDKG-33)	IP54
Power supply	2 x AA-size batteries (3 V) or 2 x AA-size rechargeable batteries (2.4 V)	
Operating time on one set of batteries for $\dot{H}^*(10) \leq 10$ μSv/h	a) ≥250 h b) ≥50 h for AT2533/1 with Bluetooth enabled	≥1000 h
Mean time to failure	≥20000 h	
Average operating life	≥15 years	
Operation temperature range	-30°C to +50°C	
Relative air humidity	≤98% (Air temperature ≤35 °C without condensation)	
Overall dimensions / weight	Ø30x130 mm / 0.25 kg *(BDKG-33)*	85x155x35 mm / 0.3 kg
Cable length / weight	20 m / 1.1 kg, 50 m / 2.75 kg	–

The dosimeters comply with: IEC 60846-2-2015, GOST 27451-87, GOST 12997-84, Safety requirements of IEC 61010-1:2010, EMC requirements of EN 55011:2009, IEC 61000-4-2:2008, IEC 61000-4-4:2004, IEC 61000-4-8:2009, IEC 61000-4-3:2008, IEC 61000-4-6:2008

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