Radiation monitoring equipment
About Scientific Production Company “Doza”

SPC “Doza”, Ltd. is a leading Russian company which develops and manufactures radiation monitoring equipment and provides solutions for ionizing radiation monitoring for more than 20 years.

The equipment of SPC Doza helps to ensure radiation and technological safety at nuclear power plants and nuclear reactors in Russia, Ukraine, Uzbekistan, China and India, at nuclear fuel manufacturing enterprises and at the most powerful nuclear Russian icebreaker. Our instruments are used in radionuclide analysis laboratories in all countries of ex-USSR, civil defense agencies and nuclear medicine departments.

The key to our success is the powerful team of developers and researchers with unique knowledge of the Russian nuclear school and work experience in Russian and international research centers and in the Chernobyl zone.

The high-tech manufacturing base, well-equipped testing and metrology laboratories and the quality management system complying with ISO-9001 requirements ensure the high quality of our equipment.

Contents:

- Dosimeters p.2
- Radiometers p.16
- Spectrometers p.19
- Radon monitors p.26
- Calibration equipment p.31
**DKG-05D: Personal gamma dosimeter**

Measurement of gamma-radiation personal dose equivalent Hp(10)

- Stand-alone dosimeter or composed of dosimetric system one
- Audible and visual alarm
- Large memory dose accumulation histories
- Exclusion of unauthorized intervention in dosimetry operation

**Physical characteristics**

- **Detectors:**
  - Silicon
- **Measurement range:**
  - Dose rate: 1 μSv/h ÷ 10 Sv/h
  - Dose: 0.1 μSv ÷ 15 Sv
- **Energy range:**
  - 0.05 ÷ 3.0 MeV

**Electrical characteristics**

- Power supply: rechargeable NiMH battery/1 alcaline battery (type AAA)
- **Operation time:**
  - Till recharging: not less 400 hours
  - With one set batteries not less 1000 hours

**Mechanical characteristics**

- **Overall dimensions, weight:**
  - 47×26×87 mm (with clip), 70 g

**Environmental characteristics**

- IP65
- Temperature range: minus 20 ÷ +45 °C
- Humidity: up to 98 % at 35 °C
- Shock, vibration and drop resistant
- **Alarm:**
  - Excess of alarm thresholds
  - Warnings of self-test failure and battery discharge
  - Audible alarm: 80 dB at 40 cm
  - Visual alarm: blinking LED

**Reference standards:**
- Nuclear: IEC 61526

**Relative equipment:**
- One dosimeter charger ZU-1
- Charge/storage cassetes KZU-28/KZU-56
- "Intellectual charging" feature extends battery life time
- DKG-05D reader US-05
- DKG-05D system reader US-05S
- DKG-05D - reader interface: infrared

**Reader-PC interface:**
- US-05: RS-232
- US-05S: Ethernet
**DVS-02D: Gamma-Neutron Personal electronic dosimeter**

Measurement of gamma- and neutron radiations personal dose equivalent Hp(10)

- Stand-alone dosimeter or composed of dosimetric system one
- Audible and visual alarm
- Large memory dose accumulation histories
- Exclusion of unauthorized intervention in dosimetric operation
- Both albedo thermal neutrons and intermediate, fast neutrons registration
- Usable in the fields of Pu(Be), Po(Be), Cf and other neutron sources as well as near nuclear reactors without neutron spectrum estimation

**Physical characteristics**

**Detectors:**
- Silicon, Li-6

**Gamma measurement range:**
- Dose rate: 1 μSv/h ÷ 10 Sv/h
- Dose: 0.1 μSv ÷ 15 Sv

**Gamma energy range:**
- 0.05 ÷ 6.0 MeV

**Neutron measurement range:**
- Dose rate: 1 μSv/h ÷ 2 Sv/h
- Dose: 20 μSv ÷ 15 Sv

**Neutron energy range:**
- 0.025 eV ÷ 20 MeV

**Electrical characteristics**

**Power supply:**
- Rechargeable NiMH battery
- Operation time till recharging: not less 200 hours

**Mechanical characteristics**

**Overall dimensions, weight:**
- 47×26×87 mm (with clip), 70 g

**Environmental characteristics**

- IP65
- Temperature range: minus 20 ÷ +40 °C
- Humidity: up to 75 % at 30 °C
- Shock, vibration and drop resistant

**Alarm:**
- Excess of alarm thresholds;
- Warnings of self-test failure and battery discharge
- Audible alarm: 80 dB at 40 cm
- Visual alarm: blinking LED

**Relative equipment:**
- One dosimeter charger
- Charge/storage cassetes KZU-28/ KZU-56
- "Smart charging" feature extends battery life time
- DVS-02D reader UZS-01S
- DVS-02D - reader interface: infrared

**Reader-PC interface:**
- US-05: RS-232

**Reference standards:**
- Nuclear: IEC 61526
**DKG-02U “Arbiter”: Wide range gamma-dosimeter**

Measurement of gamma radiation ambient equivalent dose \(H^*(10)\) and dose rate \(H^*(10)\)

- Audible signals (clicks) for radiation condition estimation
- Analog scale for search mode
- Audible and visual alarms of the excess of preset dose and dose rate thresholds
- Shock-resistant, water-proof, easy decontamination case
- 100 measurement results memory with date and time of measurement
- Comments saving in memory
- Indication of total dose accumulated during exploitation time
- Indication of measurement result statistical uncertainty

**Physical characteristics**

**Detectors:**
- GM counters

**Measurement range:**
- Dose-rate: 0.1 μSv/h ÷ 3 Sv/h
- Dose: 1 μSv ÷ 100 Sv

**Energy range:**
- 0.05 ÷ 3 MeV

**Electrical characteristics**

- Power supply: 2 alkaline batteries/rechargeable batteries (type AA)
- Operation time till recharging: not less 100 hours

**Mechanical characteristics:**

**Overall dimensions, weight:**
- 152×82×32 mm, 0.3 kg

**Environmental characteristics**

- Temperature range: minus 20 ÷ +50 °C
- Humidity: up to 90 % at +25 °C
- Shock, vibration and drop resistant

**Reference standards:**
- Nuclear: IEC 60846

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**Dosimeters**

Radiation monitoring equipment

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**DKG-07D “Drozd”: Gamma-dosimeter**

Measurement of gamma radiation ambient equivalent dose $H^{*}(10)$ and dose rate $H^{*}(10)$.

- Two independent measurement channels: dose and dose rate
- Audible signals (clicks) for radiation condition estimation
- Continuous measurement with updating measurement result
- Measurement result can be obtained with any desired statistical uncertainty (error)
- Automatic restart when radiation level sharply changes
- Indication of statistical uncertainty (error) during measurement process

### Physical characteristics

**Detectors:**
- GM counter

**Measurement range:**
- Dose-rate: $0.1 \mu Sv/h \div 3 mSv/h$
- Dose: $1 \mu Sv \div 0.2 Sv$

**Energy range:**
- $0.05 \div 3 MeV$

**Temperature range:**
- Minus $20 \div +50 ^\circ C$

### Electrical characteristics

- Power supply: 2 alkaline batteries 1.5 V (type AA)
- Operation time with one set of batteries: not less 200 hours

### Mechanical characteristics

**Overall dimensions, weight:**
- $122 \times 74 \times 29 \text{ mm}, 0.25 \text{ kg}$

**Reference standards:**
- Nuclear: IEC 60846
MKS-15D “Snegir”: multi-purpose radiation survey meter

- Gamma dose H*(10) and dose-rate H*(10) measurement
- Beta and gamma contamination survey
- Indication of statistical uncertainty during the measurement
- Continuous measurement with accuracy increasing with time
- Automatic restart triggered by change of gamma dose-rate
- Compensation of gamma count rate while measuring beta radiation
- Indication of battery charge level
- Audible signal of the excess of preset threshold

Physical characteristics

Detectors:
- GM counter

Measurement range:
- Dose-rate: 0.1 µSv/h ÷ 2.0 mSv/h
- Dose: 1 µSv ÷ 10.0 Sv
- Beta flux density (for Sr-90+Y-90): 10 ÷ 10⁵ cm⁻²·min⁻¹

Energy range:
- Gamma: 0.05 ÷ 3 MeV
- Beta: 0.1 ÷ 3 MeV

Temperature range:
- Minus 20 ÷ +50 ºC

Electrical characteristics

- Power supply: 2 alcaline batteries (type AA)
- Battery life at normal background: 400 hours

Mechanical characteristics

Overall dimensions, weight:
- 124×72×35 mm, 0.35 kg

Reference standards:
- Nuclear: IEC 60846, IEC 60325

MKS-15D “Snegir”

MKS-15D “Snegir” backside

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**SRPS-05D: gamma monitor**

Continuous automatic monitoring of the ambient dose equivalent rate.

- Measurement of gamma dose rate $H^*(10)$
- Audible and visual alarm signals for preset thresholds
- Switching on the external signaling or executive devices

**Physical characteristics**

**Detector:**
- GM counter

**Measurement range:**
- $0.1 \mu Sv/h \div 2.0 mSv/h$

**Energy range:**
- $0.05 \div 3.0$ MeV

**Threshold setting range:**
- $0.3 \mu Sv/h \div 2.0 mSv/h$

**Step change of the threshold:**
- In the range $0.3 \div 10 \mu Sv/h$ with the step: $0.01 \mu Sv/h$
- In the range $10 \div 100 \mu Sv/h$ with the step: $0.1 \mu Sv/h$
- In the range $100 \div 2000 \mu Sv/h$ with the step: $1.0 \mu Sv/h$

**Electrical characteristics**

**Power supply:**
- $220 (-15 \%; +10 \%)$ V, $50$ Hz ($\pm 5 \%)$
- Relay output

**Mechanical characteristics**

**Protection index:**
- IP 40

**Overall dimensions, weight:**
- $226 \times 120 \times 75$ mm, $0.7$ kg

**Alarm:**
- Sound alarm: $80 \div 100$ dBA at distance $1$ m
- Visual alarm: red
- Connection of the external alarm signaling unit

**Reference standards:**
- Nuclear: IEC 60846, IEC 60532
DOZA-TLD: multipurpose TLD system

Measurement of:

- Gamma and X-ray personal dose equivalent Hp(10)
- Neutron personal dose equivalent Hp(10)
- Lens dose equivalent Hp(3)
- Skin dose equivalent Hp(0.07)
- TLD reader day-to-day tests using built-in LED
- No needs nitrogen for heating

**Physical characteristics**

**Detectors:**
- $^7$LiF: Mg, Ti (gamma, beta)
- $^6$LiF: Mg, Ti (neutron)

**Gamma and X-ray Hp(10):**
*Measurement range:*
- 50.0 μSv ÷ 10 Sv
*Energy range:*
- 0.015 ÷ 3.0 MeV

**Neutron Hp(10):**
*Measurement range:*
- 0.1 mSv ÷ 100 mSv
*Energy range:*
- 0.025 eV ÷ 10 MeV

**Beta and photons Hp(0.07), Hp(3):**
*Measurement range:*
- 2 mSv ÷ 100 Sv
*Energy range:*
- Beta: 0.25 ÷ 3.5 MeV
- Photons: <15 keV

**Mechanical characteristics**

**Dosimeters overall dimensions, weight:**
- Gamma Hp(10): DTL-2 holder - 62×26×16 mm, 16 g
- DTU holder - 42×28×18 mm, 8 g
- Lens Hp(3), face skin Hp(0,07): Ø 32×16 mm, 9 g
- Finger skin Hp(0,07): 90×20×2 mm, 1 g
- Neutron, gamma Hp(10): 45×35×18 mm, 50 g

**Reference standards:**
- Nuclear: IEC 61066
DKS-96: universal radiation survey meter

Continuous and pulsed gamma and X-ray dose $H^*$(10) and dose-rate measurement.

- Alpha, beta and gamma contamination survey
- Neutron dose $H^*$(10) and dose-rate measurement
- Gamma radiation flux density in boreholes and liquid media measurement

**Electrical characteristics**

*Power supply:*
- UIK-05: four C-size batteries
- UIK-05-01: rechargeable battery
- UIK-06: rechargeable battery

*Interfaces:*
- RS-232
- USB (via adapter)

*Reference standards:*
- Nuclear: IEC 60846, IEC 60325, IEC 61005, IEC 62363

- Detector type automatic determination and corresponding measurement modes Selection
- Alarm threshold settings – for dose, dose-rate, alpha and beta contaminations
- “Detect” and “Locate” modes for survey probes
External probes alpha:

**Alpha: BDZA-96**
Detector:
- ZnS(Ag) 70 cm²
Measurement range (for Pu-239):
- $0.1 \div 10^4 \text{ min}^{-1}\text{cm}^{-2}$
Overall dimensions, weight:
- $\varnothing 130 \times 240 \text{ mm}, 1.1 \text{ kg}$

**Alpha: BDZA-96B**
Detector:
- ZnS(Ag) 300 cm²
Measurement range (for Pu-239):
- $0.1 \div 2 \cdot 10^3 \text{ min}^{-1}\text{cm}^{-2}$
Overall dimensions, weight:
- $\varnothing 230 \times 290 \text{ mm}, 4.0 \text{ kg}$

**Alpha: BDZA-96M**
Detector:
- ZnS(Ag) 10 cm²
Measurement range (for Pu-239):
- $0.1 \div 10^5 \text{ min}^{-1}\text{cm}^{-2}$
Overall dimensions, weight:
- $\varnothing 65 \times 240 \text{ mm}, 0.9 \text{ kg}$

**Alpha: BDZA-96S**
Detector:
- ZnS(Ag) 30 cm²
Measurement range (for Pu-239):
- $0.1 \div 5 \cdot 10^4 \text{ min}^{-1}\text{cm}^{-2}$
Overall dimensions, weight:
- $\varnothing 90 \times 240 \text{ mm}, 1.0 \text{ kg}$

**Alpha: BDZA-96T**
Detector:
- Silicon 5 cm²
Measurement range (for Pu-239):
- $0.1 \div 10^6 \text{ min}^{-1}\text{cm}^{-2}$
Overall dimensions, weight:
- $\varnothing 50 \times 60 \text{ mm}, 0.15 \text{ kg}$
External probes beta:

**Beta: BDZB-96**

Detector:
- scintillator 28 cm²

Measurement range (for Sr-90+Y-90):
- $10 \div 10^3$ min⁻¹·cm⁻²

Energy range:
- $0.03 \div 3.0$ MeV

Overall dimensions, weight:
- Ø 90×230 mm, 0.9 kg

**Beta: BDZB-99**

Detector:
- GM counter 30 cm²

Measurement range (for Sr-90+Y-90):
- $20 \div 10^4$ min⁻¹·cm⁻²

Energy range:
- $0.12 \div 3.0$ MeV

Overall dimensions, weight:
- Ø 88×80 mm, 0.4 kg
- Telescopic pole length 0.7 m

**Beta: BDZB-96B**

Detector:
- GM counter 80 cm²

Measurement range (for Sr-90+Y-90):
- $3 \div 10^4$ min⁻¹·cm⁻²

Energy range:
- $0.12 \div 3.0$ MeV

Overall dimensions, weight:
- 210×150×50 mm, 1.0 kg

**Beta: BDZB-96S**

Detector:
- GM counter 15 cm²

Measurement range (for Sr-90+Y-90):
- $10 \div 3\cdot10^4$ min⁻¹·cm⁻²

Energy range:
- $0.12 \div 3.0$ MeV

Overall dimensions, weight:
- Ø 65×65 mm, 0.3 kg
- Telescopic pole length 0.7 m
**External probes gamma:**

**Gamma: BDKS-96B**

*Detector:*
- Tissue-equivalent scintillator Ø 45×20 mm

*Measurement range:*
- Dose rate $H^{*}(10): 0.1 \, \mu Sv/h \div 1 \, Sv/h$
- Dose $H^{*}(10): 0.1 \, \mu Sv \div 10 \, Sv$

*Energy range:*
- $0.015 \div 10 \, MeV$

*Overall dimensions, weight:*
- Ø 72×265 mm, 1.8 kg

**Gamma and beta: BDKS-96S**

*Detector:*
- Double GM counters

*Measurement range:*
- Gamma dose rate $H^{*}(10): 0.1 \, \mu Sv/h \div 1 \, mSv/h$
- Gamma dose $H^{*}(10): 0.1 \, \mu Sv \div 10 \, Sv$
- Beta: $10 \div 3 \cdot 10^{4} \text{ min}^{-1} \cdot \text{cm}^{-2}$

*Energy range:*
- Gamma: $0.05 \div 3 \, MeV$
- Beta: $0.1 \div 3 \, MeV$

*Overall dimensions, weight:*
- Ø 80×80 mm, 0.35 kg
- Telescopic pole length 0.7 m

**Gamma: BDMG-96**

*Detector:*
- GM counters

*Measurement range:*
- Dose rate $H^{*}(10): 0.1 \, \mu Sv/h \div 10 \, Sv/h$
- Dose $H^{*}(10): 0.1 \, \mu Sv \div 10 \, Sv$

*Energy range:*
- $0.05 \div 3 \, MeV$

*Overall dimensions, weight:*
- 40×250 mm, 0.5 kg
- Telescopic pole length: 0.7 m, 4 m (by request)
**External probes gamma:**

**Gamma-search: BDVG-96**

*Detector:*
- Scintillator NaI(Tl) Ø 63×63 mm

*Measurement range:*
- Flux density measurement range: 4 ÷ 2000 s\(^{-1}\)·cm\(^{-2}\)
- Dose rate H*(10) for Cs-137: 0.03 ÷ 30 μSv/h
- Sensitivity for Cs-137: 3000 (pulses·s\(^{-1}\))/(μSv·h\(^{-1}\))

*Overall dimensions, weight:*
- Ø 70×350 mm, 2.0 kg
- Modular pole length: 1.6 m

**Gamma-search: BDPG-96**

*Detector:*
- Scintillator NaI(Tl) Ø 25×40 mm

*Measurement range:*
- Flux density measurement range: 10 ÷ 8000 s\(^{-1}\)·cm\(^{-2}\)
- Dose rate H*(10) for Cs-137: 0.05 ÷ 100 μSv/h
- Sensitivity for Cs-137: 500 (pulses·s\(^{-1}\))/(μSv·h\(^{-1}\))

*Overall dimensions, weight:*
- 50×190×480 mm, 2.0 kg
- Telescopic pole length: 1.0 m

**Gamma-search: BDPG-96M**

*Detector:*
- Scintillator NaI(Tl) Ø 18×30 mm

*Measurement range:*
- Flux density measurement range: 10 ÷ 24000 s\(^{-1}\)·cm\(^{-2}\)
- Dose rate H*(10) for Cs-137: 0.05 ÷ 300 μSv/h
- Sensitivity for Cs-137: 200 (pulses·s\(^{-1}\))/(μSv·h\(^{-1}\))

*Overall dimensions, weight:*
- Ø 35×320 mm, 0.5 kg
- Telescopic pole length: 0.7; 1.6 or 4 m
External probes:

**Gamma: BDKG-96 stainless steel casing for geologic applications, well logging**

*Detector:*
- Scintillator NaI(Tl) Ø 18×30 mm

*Measurement range:*
- Flux density measurement range: $10 \div 10^5 \text{s}^{-1}\cdot\text{cm}^{-2}$
- Dose rate $H^*(10)$ for Cs-137: $0.05 \div 100 \mu\text{Sv/h}$
- Sensitivity for Cs-137: 200 (pulses·s$^{-1}$)/(μSv·h$^{-1}$)

*Overall dimensions, weight:*
- Ø 35×460 mm, 6.0 kg
- Cable length: 1.5 ÷ 1000 m

**Neutron: BDMN-96**

*Detector:*
- Scintillator with ZnS(Ag) and LiF enriched Li-6

*Measurement range:*
- Dose rate $H^*(10)$: $0.1 \mu\text{Sv/h} \div 0.1 \text{ Sv/h}$
- Dose $H^*(10)$: $0.1 \mu\text{Sv} \div 1.0 \text{ Sv}$

*Energy range:*
- $0.025 \text{ eV} \div 10 \text{ MeV}$

*Overall dimensions, weight:*
- Detector: Ø 54×200 mm, 0.35 kg
- Moderator: Ø 245 mm, 7.3 kg

**Neutron-search: BDKN-96**

*Detector:*
- He-3 counter in polyethylene moderator

*Measurement range:*
- Dose rate $H^*(10)$ for Pu-Be: $0.1 \mu\text{Sv/h} \div 0.1 \text{ Sv/h}$
- Dose $H^*(10)$ for Pu-Be: $0.1 \mu\text{Sv} \div 1.0 \text{ Sv}$

*Energy range:*
- $0.025 \text{ eV} \div 14 \text{ MeV}$

*Overall dimensions, weight:*
- Detector: Ø 100×300 mm, 2.0 kg
**RZB-05D: Hand-foot-clothing monitor**

- No gas supply needed
- Clothing control: detachable right hand detector
- Alpha detector optional connection
- Numeric and color (red, green) indication of control results
- LED sensor of hand-foot positioning for start of measurement
- Automatic compensation of gamma background and contamination of detector
- Audible alarm signals of the excess of preset thresholds
- Measurement value indication: min$^{-1}$ cm$^{-2}$ or Bq/cm$^2$

## Physical characteristics

**Detectors:**
- Gamma, beta - GM counters
- Alpha - scintillator ZnS(Ag)

**Detecting nuclides:**
- Alpha: Pu-239, U-234, U-238
- Gamma: Tc-99m, I-123

**Efficiency:**
- Alpha:
  - Pu-239: 40%
  - U-234: 25%
  - U-238: 15%
- Beta: Sr-90+Y-90: 40%

**Measurement range:**
- Alpha: $1 \div 10^3$ min$^{-1}$ cm$^{-2}$
- Beta: $10 \div 10^3$ min$^{-1}$ cm$^{-2}$
- Gamma: $10^4 \div 10^7$ min$^{-1}$ cm$^{-2}$

**Energy range:**
- Alpha: 3.0 ÷ 8.0 MeV
- Beta: 0.08 ÷ 3.5 MeV
- Gamma: 0.05 ÷ 3.0 MeV

**Operation temperature range:**
- Minus 10 ÷ +50 °C

## Electrical characteristics

- Power supply: 220 V, 50 Hz

## Mechanical characteristics

**Overall dimensions, weight:**
- 740x750x1180 mm, 45 kg

**Reference standards:**
- Nuclear: IEC 61098

**Versions:**
- With/without alpha detector
- Indication: (min$^{-1}$ cm$^{-2}$) or (Bq/cm$^2$)

**Detectors overall dimensions, sm:**
- Hand: 178 x 235
- Foot: 185 x 436
Whole body contamination monitor RZBA-04-04M

- No gas supply needed
- Compensation for background gamma radiation and contamination of detector units
- Individual threshold setting for each measurement channel
- Visible and audible alarms “CONTAMINATION” and “CLEAN”
- Indication of contaminated body parts on the panel with image of the body
- Optional remote alpha-detector

Physical characteristics

Detectors:
- Beta - GM counters
- Alpha - scintillator ZnS(Ag)

Measurement range:
- Beta: $5 \div 15000 \text{ min}^{-1}\text{cm}^{-2}$
- Alpha: $0,1 \div 10000 \text{ min}^{-1}\text{cm}^{-2}$

Energy range:
- Alpha: $4.0 \div 5.6 \text{ MeV}$
- Beta: $0.15 \div 2.5 \text{ MeV}$

Operation temperature range:
- $+5 \div +50 ^\circ\text{C}$

Electrical characteristics

Power supply:
- 220 V, 50 Hz

Interfaces:
- RS-232
- RS-485

Mechanical characteristics

Overall dimensions, weight:
- $2650\times940\times930 \text{ mm}$, 310 kg

Reference standards:
- Nuclear: IEC 61098

Versions:
- With/without alpha detector
- Indication: $(\text{min}^{-1}\text{cm}^{-2})$ or $(\text{Bq/cm}^2)$
UMF-2000: Low level alpha-, beta-counter

- Simultaneous measurement of alpha/beta activities in the sample
- Active shielding: anti-coincidence background subtraction using GM counters
- Lead shielding 30 mm

Physical characteristics

Detectors:
- Silicon specrometric detector 450 or 1000 mm²

Measurement range:
- Alpha: 0,01 ÷ 1000 Bq
- Beta: 0,1 ÷ 3000 Bq

Energy range:
- Alpha: 3,5 ÷ 8,0 MeV
- Beta: 0,05 ÷ 3,5 MeV

Electrical characteristics

Power supply:
- 220 V, 50 Hz

Interfaces:
- RS-232
- USB

Mechanical characteristics

Overall dimensions, weight:
- 337×286×190 mm, 22 kg

Versions:
- Detector area 450 mm²
- Detector area 1000 mm²
**MKG-01D “Sadovnik”: Spectrometry system**

- Categorization of wastes for the purpose of further processing, including wastes with unknown radionuclide composition
- Measurements during the incoming waste inspection (accepting for storage, disposal)
- Certification of unconditioned and conditioned wastes in closed containers without opening them (at nuclear plants or at facilities providing collection, storage, transportation, conditioning, processing, temporal storage and final disposal of radioactive waste)
- Activity measurement of extended objects in situ without opening the equipment
- Activity measurement of extended objects after opening (for example, assessment of tubes used for oil transportation)

### Physical characteristics

**Detector:**
- Detector unit GEM (GMX) with HPGe detector and multi-positioning cryostat CFG-PMOD4-7 with 7 litre Dewar
- Dose rate probe BDMG-200

**Energy range**
- With GEM detector: 40 ÷ 3000 keV
- With GMX detector: 5 ÷ 1500 keV
- Dose rate probe BDMG-200 - 50 ÷ 3000 keV

**Measurement range:**
- $1 \times 10^{-7} \div 10$ Sv/h
- Relative efficiency of detection (in photopeak) at 1332.5 keV (Co-60): 10 ÷ 150 %

### Electrical characteristics

**Power supply:**
- 220 V, 50 Hz

**Interface:**
- USB

### Complete set

**Basic complete set:**
- Spectrometric detector unit GEM (GMX) with HPGe detector and multi-positioning cryostat CFG-PMOD4-7 with 7 litre Dewar
- Portable digital multichannel analyzer DigiDART
- Dose rate probe BDMG-200
- Autonomous power supply unit with built-in battery
- Industrial computer, keyboard
- Laser range-finder
- Thermographic printer
- Web-camera
- Device equipped with stepper motor, for positioning of the spectrometric detector
- Calibration device with OSGI-type reference sources (Am-241, Co-60, Ba-133, Eu-152) for energy calibration
- Removable collimators with end cap
- Measurement procedures
- “Claster” software
RGA-04: Radon monitor

- Continuous automatic Radon monitoring
- Three visual alarm signals of the excess of preset thresholds
- Measurement of mean annual radon concentration in the air
- Measurement results averaging within any period of measurements
- Automated estimation of Equivalent Equilibrium Volume Activity (EEVA)
- Of the Radon Decay Products with all the results stored in the memory

Physical characteristics

Detector:
- Silicon

Measurement range:
- 2 ÷ 65000 Bq/m³

Memory capacity:
- up to 1600 measurement results

Measurement duration:
- 1 min ÷ 200 days

Temperature range:
- +5ºC ÷ 50ºC

Electrical characteristics

Power supply:
- 220 V, 50 Hz
- Rechargeable battery

Interface:
- RS-232
- Continuous operation from battery: not less 7 days

Mechanical characteristics

Overall dimensions, weight:
- 160×180×80 mm, 1,0 kg

Reference standards:
- IEC 61577
“Alpharad plus”: Radon, Thoron & their Progeny Monitor

Measurement of radon and thoron concentration and effective equivalent concentration (EEC):
- In the air
- In the indoor air of residential, public and industrial buildings and structures
- Measurement of radon in drinking water sources
- Measurements of radon flux from the soil surface at land plots allocated for construction of houses, public buildings and industrial facilities
- Measurements of radon concentration in soil air.

Physical characteristics

Detector:
- Silicon

Measurement range:
- Measuring unit for EEC:
  - Measurement range of radon EEC $1.0 \div 1.0 \times 10^6$ Bq•m$^{-3}$
  - Measurement range of thoron EEC $0.5 \div 1.0 \times 10^4$ Bq•m$^{-3}$
  - Air flow through the filter $10.0 \pm 0.5$ l/min
- Measuring unit for concentration:
  - Measurement range of radon-222 concentration in air $1.0 \div 2.0 \times 10^6$ cps
  - Measurement range of $^{210}$Po(ThA) $1 \times 10^3 \div 1 \times 10^2$ cps
  - Air sampler flow rate $1.0 \pm 0.2$ l/min
  - Measurement range of radon-222 concentration in water samples $6 \div 800$ Bq•kg$^{-1}$
  - Measurement range of radon-222 flux from soil surface $20 \div 10^3$ mBq/s•m$^2$
  - Measurement range of radon-222 concentration with preliminary sampling of air using air samplers $20 \div 10^7$ Bq•m$^{-3}$
  - Measurement range of radon-222 concentration in samples of soil air $10^3 \div 10^6$ Bq•m$^{-3}$

Operation temperature range:
- $1 \div 35$ °C

Electrical characteristics

Power supply:
- 8.0 VA

Mechanical characteristics

Overall dimensions, weight:
- “Alpharad plus - AR” 220×200×165 mm, 3.6 kg

Reference standards:
- IEC: 61577
**UPG-P: Desktop Gamma beam irradiator**

Calibration of gamma dose and dose rate meters.

Calibration of:
- Ambient equivalent dose $H^*(10)$ meters (Sv, Sv/h)
- Personal equivalent dose $Hp(10)$ meters (Sv, Sv/h)
- Exposure dose $X$ meters (R, R/h)
- Two sources in irradiator
- Select source and collimator opening using tumbler

**Physical characteristics**

**Range of reproduced dose rate:**
- $0.5$ μSv/h ÷ $1.0$ mSv/h (50 μR/h ÷ 100 mR/h)

**Sources activities:**
- $6 \times 10^6, 6 \times 10^8$ Bq (0.2; 20 mCi) Cs-137

**Overall dimensions:**
- $1250\times400\times300$ mm

**Irradiator weight:**
- Not more than 37 kg

**Calibration bench weight:**
- Not more than 15 kg

**Reference standards:**
- IEC 60846, IEC 61526
**UPGD-2M-D: Gamma beam irradiator**

Calibration of gamma dose and dose rate meters

Calibration of:
- Ambient equivalent dose $H^*(10)$ meters (Sv, Sv/h)
- Personal equivalent dose $H_p(10)$ meters (Sv, Sv/h)
- Exposure dose $X$ meters (R, R/h)
- Four sources in irradiator
- Select source and move to working position/return to storage position using special rod
- Transfer container for temporary storage of sources
- Red light signal of source working position

### Physical characteristics

**Range of reproduced dose rate:**
- $0.5 \, \mu\text{Sv/h} \div 50 \, \text{mSv/h}$ ($50 \, \mu\text{R/h} \div 5 \, \text{R/h}$)

**Maximum activity of source:**
- $2 \times 10^{11}$ Bq ($5.0 \, \text{Ci}$) Cs-137

**Overall dimensions:**
- Irradiator: $800 \times 500 \times 500 \text{ mm}$
- Guide rails length: $3.0 \text{ m}$
- Height: $1.6 \text{ m}$
- Weight: not more than $700 \text{ kg}$
- Required room dimensions: not less than $7 \times 3 \times 3 \text{ m}$

### Electrical characteristics

**Power supply:**
- $220 \, \text{V, 50 Hz}$

**Reference standards:**
- IEC 60846, IEC 61526, IEC 61066
Radiation monitoring equipment

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