

Dosimeter-radiometer MKS-18 alpha, beta, X-ray, gamma and neutron radiation

Purpose

Portable multifunctional professional device is intended to measure (depending on the set of radiation detectors):

- ambient dose equivalent rate and $H^*(10)$ and ambient dose equivalent $H^*(10)$ of continuous gamma-radiation;
- ambient dose equivalent rate and $H^*(10)$ and ambient dose equivalent $H^*(10)$ of X-ray and gamma-radiation (including pulse);
- ambient dose equivalent rate and $H^*(10)$ and ambient dose equivalent $H^*(10)$ of neutron-radiation;
- flux density of alpha-, beta-, gamma-radiation.

Features:

- consists of radiation detector (depending on the type of ionization radiation) and one of consoles (at the Customer's choice): UIK-09 (a metal case, built-in accumulator block), UIK-10 (a plastic case, built-in accumulator block, OLED-display), UIK-11 (a plastic case, built-in accumulator block, LCD-display).
- console UIK-09 (at the Customer's choice) can be equipped with an embedded detector BDBG-201-RS, which expands the functionality;
- automatic detection of the type of the connected detector and activation of measurement modes for this type of detector;
- a possibility to select the measurement algorithm and set the threshold setting for each measurement mode;
- audible and visual alarms of exceeding the limits during measurements;
- simplicity and reliability, the ability to equip with additional detector;
- a short time of measurement and fast automatic adaption to change in radiation situation;
- unique algorithms of search, localization of sources and fields of ionization radiation;
- work in a wide range of temperatures in the field, carrying logs of wells and boreholes
- radiation survey of the area with geo-references, stored in the nonvolatile memory of up to 4000 measurement results with possibility of transfer to PC and imposition to electronic maps (additional option);
- embedded communication module Bluetooth which provides data exchange between console and detector by auxiliary device MOB-01 (additional option).



MKS-18: UIK-09 with embedded detector BDBG-201-RS (additional option)



Console UIK-10, UIK-11



BDZA-18-RSF

α



BDZA-18t-RS

α



BDZA-18d-RSF

α



BDZB-18-RSF

β



BDZB-18b-RS

β



BDZB-18s-RS

β



BDPS-18-RSF

α, β



BDKS-18s-RS

γ, β, α



BDKS-18-RS

x, γ



BDMG-18-RS

γ



BDMN-18-RSF

n



BDKN-18-RS

n



BDVG-18-RSF

γ



BDBG-18s-RSF

γ



BDPG-18-RSF

γ



BDKG-18-RS

γ

Main technical characteristics

Measurement console			
	UIK-09	UIK-10	UIK-11
Power supply	accumulators, not less 5300 mA·h (1 pcs)	Li-ion battery, not less 3100 mA·h (1 pcs)	accumulators, AA, not less 1900 mA·h (3 pcs)
Type of case	steel		plastic
Operating supply voltage, V		3,7	4,2
Sound alarm	✓	✓	✓
Embedded GPS-sensor (optionally)	✓	✓	✓
Embedded communication module Bluetooth which provides data exchange between console and detector by auxiliary device MOB-01 (optionally)	✓	✓	✓
Type of display		OLED	LCD
Embedded in the console detector BDBG-201-RS (optionally)	✓	-	-
Degree of protection	IP 67		IP 54
Operating temperature range		from minus 40 °C to 50 °C	from minus 20 °C to 50 °C
Dimensions, mm	125×190×86	165×80×50	165×80×50
Weight, kg	1,4	0,4	0,4

Alpha radiation detectors			
	BDZA-18-RSF	BDZA-18d-RSF	BDZA-18t-RS
Type of registered radiation	flux density of α -radiation		
Energy range of registered alpha particles	4 MeV – 7 MeV		
Measurement range of alpha particles flux density, $\text{min}^{-1}\cdot\text{cm}^{-2}$	0,1 – 1·10 ⁵	0,1 – 3·10 ⁴	0,1 – 1·10 ⁶
Measurement range of alpha surface activity, $\text{Bq}\cdot\text{cm}^{-2}$	0,01 - 3·10 ³	0,01-1·10 ³	0,01-3·10 ⁴
Limits of tolerable intrinsic relative error, %	$\pm (20 + 5/Ax)^1$		
Typical sensitivity, $\text{s}^{-1}\cdot\text{min}\cdot\text{cm}^2$, no less	0,40	0,6	0,04
Active area of detector, cm^2	70	110	5
Type of detector	scintillation ZnS(Ag)		semiconductor
Registration efficiency of alpha-radiation ²³⁹ Pu, no less	45 %		
Own background, $\text{min}^{-1}\cdot\text{cm}^{-2}$, no more than	0,3		0,1
Protection class	IP 67		IP 54
Operating temperature range	from minus 40 °C to 50 °C		
Dimensions, mm	Ø 120 × 140	130×180×100	Ø 50 × 60
Weight, kg	1,0	1,5	0,2

Beta radiation detectors			
	BDZB-18-RSF	BDZB-18b-RS	BDZB-18s-RS
Type of registered radiation	flux density of β -radiation		
Energy range of registered beta particles	from 0,12 to 3,5 MeV		
Measurement range of beta particles flux density, $\text{min}^{-1}\cdot\text{cm}^{-2}$	1-5·10 ⁵	5-1·10 ⁴	5-1·10 ⁵
Measurement range of beta surface activity, $\text{Bq}\cdot\text{cm}^{-2}$	0,1-3·10 ²	0,1-3·10 ²	0,1-3·10 ³
Limits of tolerable intrinsic relative error, %	$\pm (20 + 5/Ax)^2$		
Typical sensitivity, $\text{s}^{-1}\cdot\text{min}\cdot\text{cm}^2$, no less	0,15	0,50	0,10
Active area of detector, cm^2	28	80	15
Type of detector	scintillation plastic detector	CST-10 - 2 pcs	scintillation plastic detector
Registration efficiency of beta-radiation ⁹⁰ Sr+ ⁹⁰ Y, no less	45 %		
Own background, $\text{min}^{-1}\cdot\text{cm}^{-2}$, no more than	20		
Protection class	IP 54	IP 67	IP 54
Operating temperature range	from minus 40 °C to 50 °C		
Dimensions, mm	Ø 90 × 130	130×180×120	Ø 65 × 65
Weight, kg	0,9	1,5	0,3

Alpha and beta radiation detectors	
	BDPS-18-RSF
Type of registered radiation	flux density of α - and β -radiation
Energy range of registered alpha particles, MeV	from 4,0 to 7,0
Energy range of registered beta particles, MeV	from 0,12 to 3,5
Measurement range of alpha particles flux density, $\text{min}^{-1}\cdot\text{cm}^{-2}$	from 0,1 to 1·10 ⁵
Measurement range of alpha surface activity, $\text{Bq}\cdot\text{cm}^{-2}$	from 0,01 to 3·10 ³
Measurement range of beta surface activity, $\text{Bq}\cdot\text{cm}^{-2}$	from 1 to 5·10 ⁵

¹ For alpha-radiation sources with a radionuclide ²³⁹Pu.

² For beta-radiation sources with a radionuclide ⁹⁰Sr+⁹⁰Y.

Measurement range of beta surface activity, Bq·cm ⁻²	from 0,1 to 3·10 ³
Limits of tolerable intrinsic relative error of alpha-radiation, %	± (20 + 5/Ax) ³
Limits of tolerable intrinsic relative error of alpha-radiation, %	± (20 + 5/Ax) ⁴
Typical sensitivity, s ⁻¹ ·min·cm ² , no less:	
• alpha-channel	0,10
• beta-channel	0,10
Own background:	
• alpha-radiation, min ⁻¹ ·cm ² , no more than	0,3
• beta-radiation, min ⁻¹ ·cm ² , no more than	20
Active area of detector, cm ²	28
Type of detector	scintillation ZnS(Ag)
Protection class	IP 54
Operating temperature range	from minus 40 °C to 50 °C
Dimensions, mm	Ø 90 × 130
Weight, kg	1,2

Gamma radiation detectors

	BDMG-18-RS	BDBG-201-RS ⁵	BDVG-18-RSF	BDPG-18-RSF	BDBG-18s-RSF	BDKG-18-RS
Type of registered radiation	ADER γ , ADE γ		ADER γ , FD γ		ADER γ , ADE γ ,	Exposure dose rate γ Flux γ
Energy range of registered gamma particles	from 50 keV to 3 MeV					
Measurement range of ambient dose equivalent rate H*(10)	0,05 μ Sv/h - 10 Sv/h		0,03-30 μ Sv/h	0,03-300 μ Sv/h	0,005-100 μ Sv/h	-
Measurement range of ambient dose equivalent H*(10)	0,1 μ Sv-10 Sv		-	-	0,1 μ Sv-10 Sv	-
Measurement range of gamma particles flux density, s ⁻¹ ·cm ⁻²	-	-	3-2400	3-3·10 ⁴	-	-
Specific activity Cs-137, Bq/kg	-	-	-	-	100 - 5·10 ⁵	-
Measurement range of gamma exposure dose rate, μ R/h	-	-	-	-	-	5-1·10 ⁴
Measurement range of gamma flux, s ⁻¹	-	-	-	-	-	20-4·10 ⁴
Limits of tolerable intrinsic relative error, %	± (15 + 5/Ax) ⁶		± 15			
Typical sensitivity, no less	4,0 s ⁻¹ · μ Sv ⁻¹ ·h (sens.subrange) 4,0 s ⁻¹ ·mSv ⁻¹ ·h (rough subrange)		2500 s ⁻¹ · μ Sv ⁻¹ ·h	400 s ⁻¹ · μ Sv ⁻¹ ·h	400 s ⁻¹ · μ Sv ⁻¹ ·h	1,5 s ⁻¹ · μ R ⁻¹ ·h
Active area of detector	-	-	Ø 63 × 63 mm	Ø 25 × 40 mm	Ø 25 × 40 mm	Ø 18 × 30 mm
Type of detector	CBM-20 Gamma-1- 1	-	Monocrystal NaI(Tl)	Monocrystal NaI(Tl)	Monocrystal NaI(Tl)	CBM-20 Gamma-1- 1
Protection class	IP 67		IP 54		IP 67	IP 54
Operating temperature range	from minus 40 °C to 50 °C					
Dimensions, mm	Ø 40 × 235	-	Ø 90 × 180	480×191×50	Ø 40 × 180	Ø 38 × 400
Weight, kg	0,3	-	3,0	1,0	1,0	2,0

Gamma-, beta, alpha- radiation detectors

	BDKS-18s-RS
Type of registered radiation	ADER γ , ADE γ , FD α , FD β
Energy range of registered alpha particles, MeV	from 4,0 to 7,0
Energy range of registered beta particles, MeV	from 0,12 to 3,5
Energy range of registered gamma particles	from 50 keV to 3 MeV
Measurement range of alpha particles flux density, min ⁻¹ ·cm ⁻²	from 1 to 1·10 ⁵

³ For alpha-radiation sources with a radionuclide ²³⁹Pu.

⁴ For beta-radiation sources with a radionuclide ⁹⁰Sr+⁹⁰Y.

⁵ An embedded radiation detector in measurement console UIK-09

⁶ For gamma-radiation sources with a radionuclide ¹³⁷Cs

Measurement range of alpha surface activity, Bq·cm ⁻²	from 0,1 to 3·10 ³
Measurement range of beta particles flux density, min ⁻¹ ·cm ⁻²	from 1 to 5·10 ⁵
Measurement range of alpha surface activity, Bq·cm ⁻²	from 0,1 to 3·10 ³
Measurement range of ambient dose equivalent rate H*(10)	from 0,1 μSv/h to 1 mSv/h
Measurement range of ambient dose equivalent H*(10)	from 0,1 μSv to 10 Sv
Limits of tolerable intrinsic relative error of alpha-radiation, %	± (30 + 5/Ax) ⁷ ± (20 + 5/Ax) ⁸
Limits of tolerable intrinsic relative error of beta-radiation, %	± (20 + 5/Ax) ⁹
Limits of tolerable intrinsic relative error of gamma-radiation, %	± (15 + 5/Ax) ¹⁰
Typical sensitivity, no less:	
• alpha-channel, s ⁻¹ ·min·cm ⁻² :	0,04
• beta-channel, s ⁻¹ ·min·cm ⁻² :	0,10
• gamma-channel, s ⁻¹ ·μSv ⁻¹ ·h:	4,0
Own background during measurement:	
• alpha-radiation, min ⁻¹ ·cm ⁻² , no more than	0,3
• beta-radiation, min ⁻¹ ·cm ⁻² , no more than	20
Active area of detector (Counter type Beta-2), cm ²	15
Type of detector	Counter type Beta-2 Counter type Beta-2m
Protection class	IP 54
Operating temperature range	from minus 40 °C to 50 °C
Dimensions, mm	Ø 80 × 80
Weight, kg	0,4

X-ray and gamma radiation detector

	BDKS-18-RS
Type of registered radiation	ADER, ADE X,γ
Energy range of registered X-ray and gamma-radiation	from 15 keV to 10 MeV
Measurement range of ambient dose equivalent rate H*(10) of registered X-ray and gamma-radiation	0,01 μSv/h-30 Sv/h
Measurement range of ambient dose equivalent H*(10) of registered X-ray and gamma-radiation	0,1 μSv-10 Sv
Limits of tolerable intrinsic relative error, %	± (15 + 5/Ax) ⁷
Typical sensitivity, no less:	
• sensitive subrange, s ⁻¹ ·μSv ⁻¹ ·h	8,0
• rough subrange, s ⁻¹ ·mSv ⁻¹ ·h	4,0
Active area of detector, mm ²	Ø 30 × 15
Type of detector	Tissue equivalent scintillation detector
Protection class	IP 67
Operating temperature range	from minus 40 °C to 40 °C
Dimensions, mm	Ø 60 × 235
Weight, kg	1,0

Neutron radiation detector

	BDMN-18-RSF	BDKN-18-RS
Type of registered radiation	ADER, ADE, FD n	
Energy range of registered neutron-radiation	from 0,025 eB to 14 MeV	
Measurement range of ambient dose equivalent rate H*(10) of neutron-radiation	0,1 μSv/h-0,1 Sv/h	
Measurement range of ambient dose equivalent H*(10) of neutron-radiation	0,1 μSv-10 Sv	
Measurement range of flux density of neutron-radiation	0,1-1·10 ⁵ s ⁻¹ ·cm ⁻²	
Limits of tolerable intrinsic relative error, %	± (20 + 5/Ax) ¹¹	
Energy dependence, %	± 40	not standardized
Typical sensitivity, no less	0,40 s ⁻¹ ·μSv ⁻¹ ·h	1,0 s ⁻¹ ·μSv ⁻¹ ·h
Own background	0,03 μSv/h (s ⁻¹ ·cm ⁻²)	
Active area of detector, mm	Ø 30 × 5	Ø 18 × 140
Type of detector	thermal neutron detector (in polyethylene moderator, ball Ø 240 mm)	slow neutron counter filled with ³ He (in polyethylene moderator, cylinder Ø 100 mm)
Protection class		IP 67
Operating temperature range		from minus 40 °C to 50 °C

⁷ For measuring range FD α: 1-30 min⁻¹·cm⁻²; surface activity α: 0,1-3 Bq·cm⁻²

⁸ For measuring range FD α: 30-1·10⁵ min⁻¹·cm⁻²; surface activity α: 3-3·10³ Bq·cm⁻²

⁹ For beta-radiation sources with a radionuclide ⁹⁰Sr+⁹⁰Y.

¹⁰ For gamma-radiation sources with a radionuclide ¹³⁷Cs

¹¹ For radiation of Pu-α-Be neutron sources