



MISSION SUPPORT

Product Catalogue v6

CBRN DETECTION, MONITORING AND UNMANNED SYSTEMS

Radiation · Chemical · Combined CBRN · Unmanned platforms

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Product Improvements

Continuous improvement of products is a policy of Mission Support. All specifications and operating instructions are subject to change.

Product appearance and screen images simulated; specifications subject to change without notice.

Mission Support is a specialist security and CBRN technology company based in The Hague. The company designs, manufactures and supports detection, search and identification equipment and unmanned CBRN reconnaissance systems for the civil nuclear industry, emergency services and security organisations.

The engineering team behind the product line combines decades of experience in radiation measurement, CBRN protection, international inspection of weapons of mass destruction, emergency response and toxic waste management — including first-hand experience of the Chernobyl clean-up operation. Every product is developed to address a specific operational need identified in the field, and is tested and used by our own specialists during training and deployment.

Mission Support works with partners and relevant organisations across Europe, Central Asia, the Middle East and Africa. Technical and technological solutions are tailored to customer requirements, and products are validated in live operational environments.

SERVICES

Mission Support provides services in three areas: training, consulting and technology.

Training

Training programmes range from basic operator instruction to advanced specialised training for integrated systems, and can be custom-developed for a user's needs at short notice. Topics include:

- Individual and group training for purchased equipment, from initial use to maintenance
- Individual and collective HAZMAT and CBRN threat mitigation training
- WMD non-proliferation study and training, including training for OPCW inspectors and headquarters staff
- Strategic concepts and main components of chemical and biological defence strategies
- Specialised training for CBRN hazards mitigation activities
- The Chernobyl clean-up operation: first-hand experience, catastrophe development and its investigation
- Fukushima and Chernobyl: similarities and differences
- History of chemical and nuclear weapons development, stockpiling, use and destruction

Consulting

Made-to-order consulting across all areas of CBRN threat mitigation, grounded in practicality, knowledge and operational realism. Consultants provide advice, technical support and management services on:

- Live-agent and open-source threat assessments
- CBRN threats operational analysis and management
- Vulnerability and capability assessments and build-up of capacities for CBRN threats mitigation
- Advice on equipment development and testing
- Exercise design and coordination
- Development of CBRN training curricula
- CBRN field support with specialised equipment for missions of all kinds
- CBRN laboratory design, features and equipment, including mobile laboratories and training centres

Technology

Products are designed, developed, tested and improved to address specific issues identified by our own staff under operational conditions. They may be innovative, integrated or stand-alone, but are capable of doing what they are designed for in the environment they are expected to be used in. All products, including partner products, are developed, tested and used by our staff during training courses. Core areas:

- CBRN detection and monitoring, protection and decontamination equipment
- CBRN integrated reconnaissance and analytical systems
- Disposal of toxic wastes; toxic chemical, biological and medical waste management and destruction technologies
- System integration, live-agent testing methodology and validation

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PRODUCT CATALOGUE V6

RADIOACTIVE EFFLUENT RELEASES AND ENVIRONMENTAL AUTONOMOUS GAMMA MONITORING EQUIPMENT



Continuous Air Monitor

for simultaneous alpha and beta measurements

The Mission Support MS-CAM Continuous Air Monitor is a professional instrument designed for accurate measurement of airborne alpha- and beta-particulate concentration and estimation of radon equilibrium equivalent concentration (EEC) in the air. The monitor allows setting up two thresholds for every measuring channel and alarms when thresholds are exceeded.

The monitor is designed for autonomous 24/7 operation and needs minimum service and maintenance. An industry standard Millipore® filter or Mission Support proprietary 35 mm x 12 m membrane filter rolls can be used. The measuring results are displayed on a high-contrast LCD located on the front panel and can be accessed remotely using industry standard RS-485 Modbus-RTU interface. This makes MS-CAM an ideal choice for unattended operations and system integration.



Due to the use of advanced proprietary algorithms, the MS-CAM accurately subtracts radon/thoron progeny background to achieve a very low false alarm rate. The gamma background can be subtracted by means of an optional dedicated detector. An advanced averaging algorithm and a set of two thresholds provide robust configuration options for the user to adjust the MS-CAM settings to various operating environments, from occupational workplace monitoring to use at nuclear power facilities. A mobile wheel-cart mounted version for easy transport, especially over stairs and obstacles, is also an option.

FUNCTIONAL HIGHLIGHTS

- Radon/thoron and gamma background compensation
- Built-in flow meter and proportional valve
- Compact and lightweight
- Advanced algorithm for accurate activity concentration measurement
- Proprietary low-cost filter media

COMMUNICATION INTERFACES

- 2 isolated RS-485 Modbus-RTU, RS-232
- 3 isolated analog outputs, 0/4..20 mA
- 4 user programmable SPDT relays
- Ethernet TCP/IP

TYPICAL APPLICATIONS

- Occupational safety and workplace monitoring
- Nuclear fuel cycle industry and Nuclear Power Plants
- Environmental monitoring
- Uranium mining and mineral processing

Specifications

Detection block — Radiological

Airborne activity concentration measurement range

alpha 1×10^{-2} to 5×10^6 Bq/m³

beta 5×10^{-2} to 1×10^7 Bq/m³

EEC of radon progeny 1×10^{-2} to 5×10^6 Bq/m³

Energy range — alpha from 3 to 9 MeV

Energy range — beta from 50 keV to 3 MeV

Relative error, alpha-active airborne particulates $1 \div 5 \times 10^6$ Bq/m³ less than $\pm 30\%$

Relative error, alpha-active airborne particulates $1 \div 5 \times 10^6$ Bq/m³ less than $\pm 15\%$

Relative error, beta-active airborne particulates $5 \times 10^{-2} \div 1 \times 10^{-1}$ Bq/m³ less than $\pm 50\%$

Relative error, beta-active airborne particulates $1 \times 10^{-1} \div 10$ Bq/m³ less than $\pm 30\%$

Relative error, beta-active airborne particulates $10 \div 1 \times 10^7$ Bq/m³ less than $\pm 15\%$

Pneumatic

Flow rate from 15 to 75 LPM

Measurement pressure, temperature, pressure drop according to filter dust loading

Electrical

Power supply AC 220/110V, DC 48V

Power consumption 40 VA

Data interfaces 2 isolated RS-485; 1 RS-232

Discrete outputs 4 user programmable SPDT relays

Analog outputs 3 isolated analog outputs, 0/4...20 mA

Environmental

Temperature range from -20 to +50 °C

Pressure from 84,0 to 106,7 kPa

Humidity up to 95% at +35 °C

Mechanical

Inlet/outlet connection G1/2"

Ingress protection IP65

Dimensions — detection block only, mm 383×251×300

Dimensions — wall rack with pump module, mm 461×275×917

Dimensions — mobile cart with pump module, mm 600×403×1100

Weight — detection block only, kg 14

Weight — wall rack with pump module, kg 15

Weight — mobile cart with pump module, kg 18

Pump module

Pump type oil-less rotary vane

Flow rate up to 75 LPM

Power supply 220V AC (110V optional)

Power consumption 250 VA

Inlet/outlet connection G1/2"

Dimensions, mm 400×210×210

Weight, kg 8,5

External alarm module

Model 24V LED tower light

Type 3 lights: red, yellow, green; buzzer: 120 dBA at 1 meter

Dimensions, mm 500×90×50

Membrane filter

Model Mission Support Alpha-Spectra-1™ or equivalent

Resistance to the air, at linear flow velocity 1 cm/s, not more 50 Pa

Collection efficiency at 1 cm/s air flow, 0,1 micron 99,0%

Collection efficiency at 1 cm/s air flow, 0,4 micron 99,9%

Roll size 35 mm × 12 m

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Continuous Iodine Monitor

The Mission Support model MS-CIM is designed for continuous measurement of the volumetric activity of radioactive iodine isotopes (I-131 and I-133) in both molecular and organic forms contained in the air of working areas, drawn from stacks and ventilation ducts. In addition, the MS-CIM evaluates the concentration of interfering isotopes and accurately differentiates them from the main measurement channel of radioactive iodine. Background changes are also compensated across a wide range of energies, including high energy nuclides.



The mechanical design of the device minimises the total weight and dimensions of the device. Given omnidirectional 4 cm lead shielding, the weight of the detection block is less than 50 kg. The MS-CIM is a single cartridge standard unit with manual cartridge replacement. The spectrometry capability is based on 1024 channel spectrum analysis, which allows radio-iodine isotope localisation. The monitor can be mounted on a horizontal surface, wall rack or wheel cart, which allows easy transport, especially over stairs and obstacles. As the required size and weight are very small, the Iodine Monitor can be deployed almost everywhere in a nuclear power plant.

The Mission Support MS-CIM monitor can be used for various applications in the field of air contamination monitoring as well as for workplace measurements and effluent releases monitoring.

ADVANTAGES

- Wide temperature range
- Proprietary algorithm providing low false alarm rate
- Wide range of isotopes and background compensation
- Simultaneous measurement of I-131 and I-133 volumetric activity
- IP65 housing ingress protection

FUNCTIONAL HIGHLIGHTS

- Small dimensions and weight, given omnidirectional 4 cm lead shielding
- Low cost proprietary charcoal cartridge
- Insensitive to mechanical impacts and cell phone radiation
- Adjustable counting time intervals for calculation of volumetric activity concentration and thresholds
- Support of Modbus-RTU communication protocol for ease of system integration
- Simple calibration procedure using disc check sources
- Effluent trapping of both molecular and organic forms of iodine

Specifications

Detection block — Radiological

Measurement range — I-131 (for 24 hours)	from 0,01 to 1×10^8 Bq/m ³
Measurement range — I-133 (for 24 hours)	from 0,1 to 1×10^8 Bq/m ³
Relative measurement error — I-131	±30%
Relative measurement error — I-133	±30%
Energy range	from 50 keV to 3 MeV
Minimum detectable activity concentration (MDAC)	< 1 Bq/m ³ for 1 hour measurement, 60 LPM rate

Electrical

Power supply	AC 220/110V, DC 48V
Power consumption	20 W
Data interfaces	2 isolated RS-485; 1 RS-232
Discrete outputs	4 user programmable SPDT relays
Analog outputs	3 isolated analog outputs, 0/4...20 mA

Mechanical

Inlet/outlet connection	G1/2"
Ingress protection	IP65
Dimensions, mm	400×190×290
Weight, kg	46

Pneumatic

Flow rate	from 4 to 75 LPM
Measurement	pressure, temperature, pressure drop according to filter dust loading

Environmental

Temperature range	from -20 to +50 °C
Pressure	from 84,0 to 106,7 kPa
Humidity	up to 95% at +35 °C

Pump module

Pump type	oil-less rotary vane
Flow rate	up to 75 LPM
Power supply	220V AC (110V optional)
Power consumption	280 VA
Inlet/outlet connection	G1/2"
Dimensions, mm	400×210×210
Weight, kg	8,5

External alarm module

Model	24V LED tower light
Type	3 lights: red, yellow, green; buzzer: 120 dBA at 1 meter
Dimensions, mm	500×90×50

Iodine cartridge

Type	activated charcoal
Collection efficiency at 100 LPM, 75% humidity — methyl iodine	98%
Collection efficiency at 100 LPM, 75% humidity — molecular iodine	99,8%
Dimensions, mm	Ø57,7×26,8



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Personal Dosimeter of Internal Exposure

The Mission Support model MS-DIE is designed as a personal dosimeter of internal exposure caused by inhalation of alpha- and beta-radioactive aerosols present in the air. It also operates as a personal continuous air monitor (CAM) by measuring volume activity of radioactive airborne particulates and Equilibrium Equivalent Concentration (EEC) of Rn-222 and Rn-220 progeny in real time, providing audio and visual alarms when preset thresholds are exceeded.

The dosimeter has a compact and lightweight design, which allows carrying it close to the breathing zone of the person during the performance of regular duties. The MS-DIE continuously samples air drawn to the monitor and measures airborne alpha and beta particulate activity deposited on membrane filter media. The advanced measurement algorithm then calculates the committed effective dose of internal exposure received by the operator during their work hours due to inhalation.

The weight of the instrument is only 450 g, which makes it the lightest and most convenient device of its kind in the world. The plastic case of the MS-DIE is rugged and designed for use in severe industrial environments and ease of decontamination. The built-in rechargeable lithium-ion battery is suitable for continuous operation during a whole working shift.

The MS-DIE is invaluable in applications where individual monitoring of personal inhalation exposure is needed: in controlled areas of nuclear power plants, mines and ore processing facilities, as an emergency monitor in case of accidents at NPPs and similar applications.



ADVANTAGES

- Insensitive to mechanical impacts and cell phone radiation
- Ultra compact and lightweight
- Support of Modbus-RTU communication protocol for ease of system integration to personal exposure monitoring systems
- Proprietary algorithm providing low false alarm rate
- Simple calibration procedure using electroplated check sources

FUNCTIONAL HIGHLIGHTS

- Automatic selection between Pu or natural U dose coefficients
- Measurement of flow rate and differential pressure on the membrane filter
- Real-time measurement of committed effective dose and airborne activity concentration
- Designed for group deployment and system integration

TYPICAL APPLICATIONS

- Uranium mining and mineral processing
- Occupational safety and workplace monitoring
- Nuclear fuel cycle industry and Nuclear Power Plants
- Environmental monitoring

Specifications

Radiological		Operational and mechanical	
Airborne activity concentration measurement range — alpha	from 0,1 to 1×10^7 Bq/m ³	Membrane filter type	Ø25 mm Alpha-Spectra-d25
Airborne activity concentration measurement range — beta	from 2 to 1×10^7 Bq/m ³	Flow rate, not less	1,2 l/min
Energy range — alpha	from 2,5 to 10 MeV	Case protection	IP65 (excluding air inlet/outlet)
Energy range — beta	from 100 keV to 2,5 MeV	Size, mm	57×80×164
Relative error, alpha-active particulates $0,1 \div 5$ Bq/m ³	less than ±50%	Weight, g	450
Relative error, alpha-active particulates $5 \div 1 \times 10^7$ Bq/m ³	less than ±15%	Operation time from one battery charge (pump ON), not less	8 hours
Relative error, beta-active particulates $2 \div 10$ Bq/m ³	less than ±50%	Data communication interfaces	RS-485, USB
Relative error, beta-active particulates $10 \div 10^7$ Bq/m ³	less than ±15%	Environmental	
Committed effective dose of internal exposure range — alpha	from 3 µSv to 10 Sv	Temperature range	from -20 to +50 °C
Committed effective dose of internal exposure range — beta	from 0,15 µSv to 1,5 Sv	Pressure	from 84,0 to 106,7 kPa
Dose coefficients used for estimation — alpha	²³⁹ Pu, ^U ²³⁸ automatically	Humidity	up to 95% at +40 °C
Dose coefficients used for estimation — beta	⁹⁰ Sr+ ⁹⁰ Y	Alpha-Spectra-d25 filter	
Relative error of equivalent dose, alpha $3 \div 50$ µSv	less than ±50%	Description	Homogeneous composite fiber material without through holes with membrane working layer
Relative error of equivalent dose, alpha $50 \mu\text{Sv} \div 10 \text{ Sv}$	less than ±15%	Diameter, mm	25±1
Relative error of equivalent dose, beta $0,15 \div 10$ µSv	less than ±50%	Airflow resistance, at linear velocity 1 cm/sec, not more, Pa	50
Relative error of equivalent dose, beta $10 \mu\text{Sv} \div 1,5 \text{ Sv}$	less than ±15%	Filtration efficiency, 0,1 µm at 1 / 20 / 100 cm/sec, %	99,0 / 98,5 / 99,0
EEC measurement range — Radon (²²² Rn)	$1 \times 10^{-1} \div 2 \cdot 10^6$ Bq/m ³	Filtration efficiency, 0,4 µm at 1 / 20 / 100 cm/sec, %	99,9 / 99,5 / 99,9
EEC measurement range — Thoron (²²⁰ Rn)	$1 \times 10^{-1} \div 2 \cdot 10^6$ Bq/m ³	Surface density of the working layer, g/m ² , not more	1,0
		Working layer membrane fiber diameter, nm	80-150

* given the relative error of air flow rate measurement not more than ± 15 %

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Autonomous wireless gamma-radiation monitor

for continuous measurement and transmission of environmental gamma-radiation data

The Mission Support model MS-GRD is an autonomous environmental gamma radiation probe designed for unattended operation as a stand-alone or networked gamma sensor of a wireless monitoring radiation awareness system. It has a dual Geiger-Muller detector for background and high range measurements and optional spectroscopic detectors for automatic spectra collection and radionuclide identification in case an elevated gamma background is detected.

Very low power consumption of the MS-GRD probe enables unattended operation for up to 10 years, which, given duplex RF transmission, makes maintenance costs very low over the service lifetime. The monitor features a modular approach which allows connecting additional meteorological sensors (wind speed, direction, humidity, etc.) and accommodating a back-up battery or solar power supply. An integrated GPS makes MS-GRD aware of its location and alarms in case of system tampering.

The MS-GRD has a variety of communication options, including proprietary RF with up to 100 km line of sight distance, GSM/LTE or Satellite. Two or more communication channels can work in parallel providing redundancy in case of emergencies. Data communication is compliant with IEC and/or ANSI N42.42 format. The monitor is housed in a waterproof aluminium case and is designed to operate in harsh environmental conditions with unmatched accuracy and spectra stability.

FUNCTIONAL HIGHLIGHTS

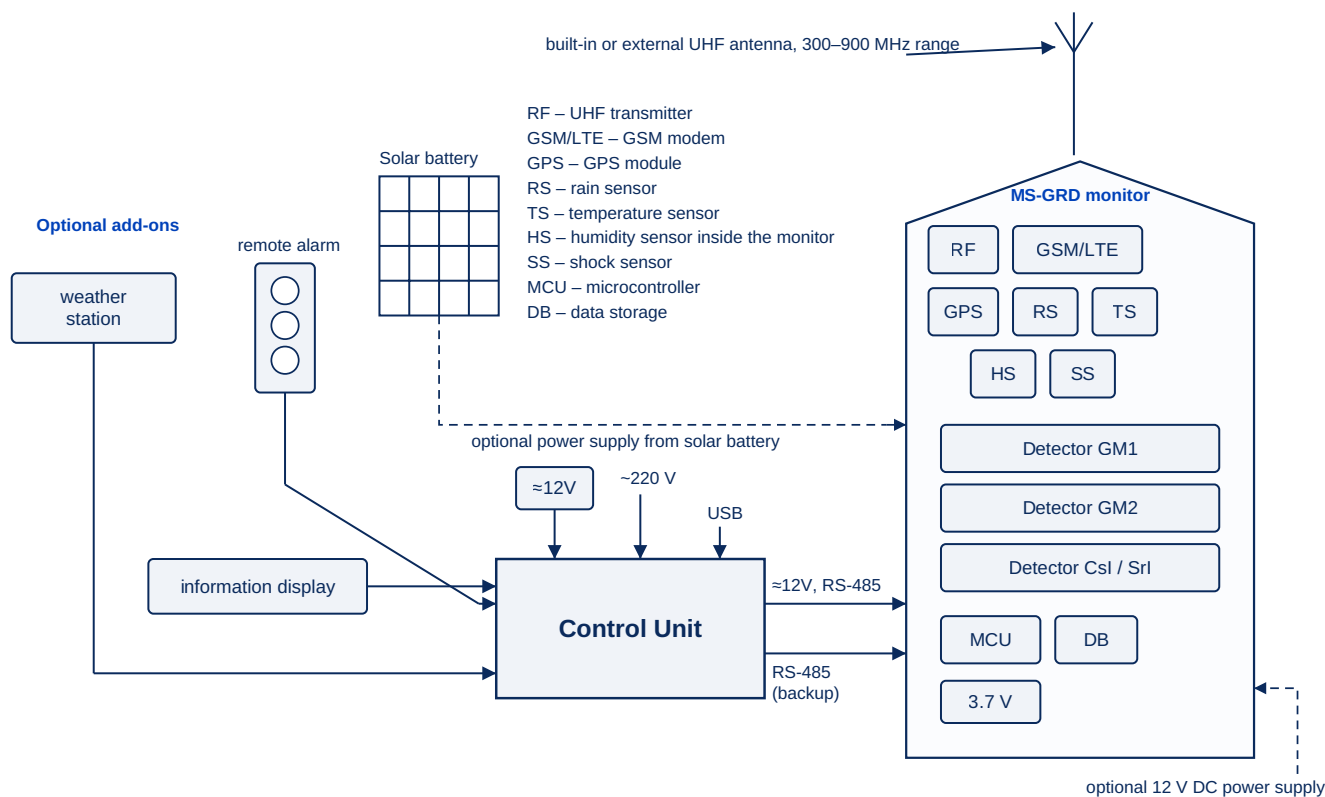
- Multiple detectors: two Geiger-Muller and optional spectroscopic
- Built-in temperature and rain sensors
- IP67 rated weatherproof aluminium enclosure
- Modular add-ons (meteorological sensors, solar panel etc.)
- Designed to be easily networked with multiple communication interfaces
- Long-range UHF radio-communication (ISM range)
- Satellite or GSM/LTE option
- Easy to install and service (very low maintenance costs)
- Extremely low power consumption (up to 10 years unattended operation)
- Automatic radionuclide identification

TYPICAL APPLICATIONS

- Environmental and industrial monitoring
- Early detection of effluent releases in case of emergency
- Nuclear Power Plants area monitoring
- Radiological studies and monitoring
- Waste processing plants and NORM storage areas



Block diagram of MS-GRD and connection options



In its basic configuration the MS-GRD monitor contains two Geiger-Muller detectors: one for background measurements (large volume) and a second one for high rates (up to 10 Sv/h). Optionally, the monitor may be equipped with additional spectroscopic sensors: basic Csl(Tl), directional (multiple Csl detectors to determine irradiation side: N, NE, E, SE, S, SW, W, NW), high resolution Srl or LaBr. When spectroscopic sensors are used, there might be additional requirements for mounting of the monitor, for example avoidance of direct solar light. These shall be determined at the site inspection stage.

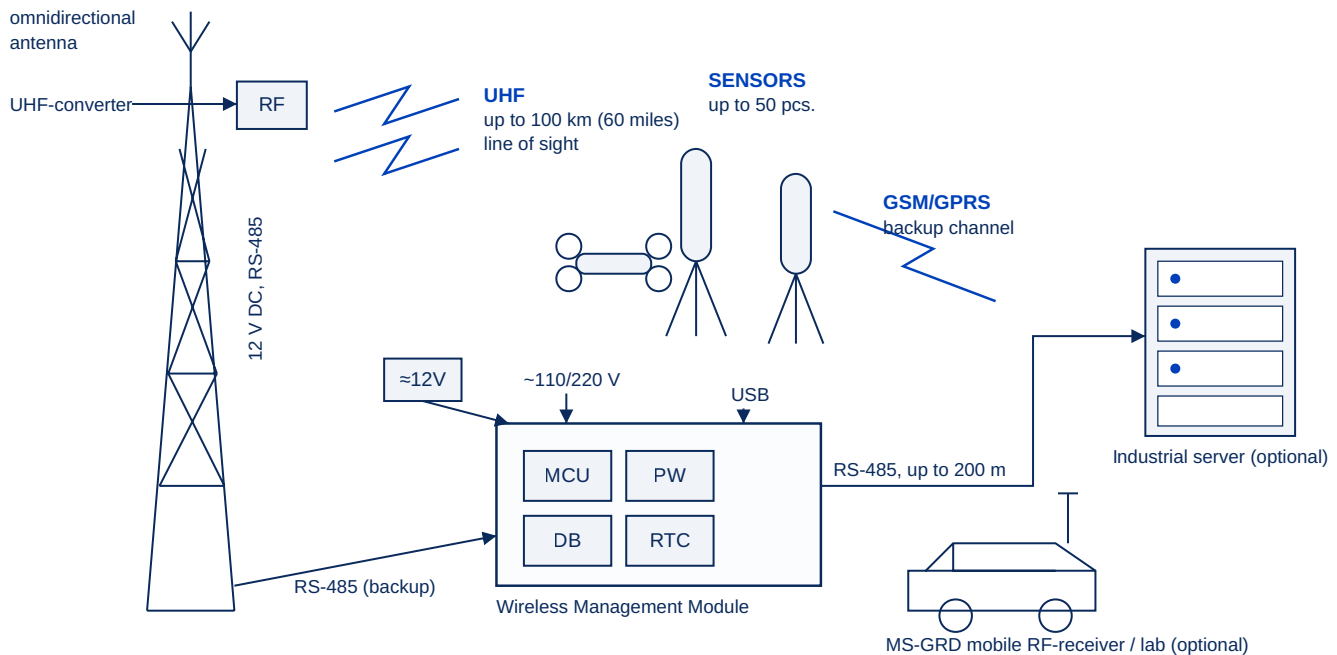
The MS-GRD monitor may be used as a stand-alone unit, powered from a built-in battery, or in combination with optional add-ons. In the latter case it may include:

- Weather station (wind speed, direction, air pressure, temperature and humidity);
- Safety alarm;
- Power backup system, including solar batteries, wind generators, etc.;
- Additional data transmission channels, including Tetra;
- Lightning protection;
- Information display;
- External alarm unit, etc.

Data from different add-on modules is collected by the Control Unit and then transferred over wired or wireless data communication channels to the central database.

There is an option to use the MS-GRD monitor with a direct one-to-one UHF link to a PC with proprietary data management software.

Base RF-receiver station for data collection from multiple MS-GRD monitors



The Base RF-receiver station is designed to connect multiple MS-GRD monitors (up to 50 pcs.) distributed over a controlled area into a single data collection and management network using a built-in UHF long distance data transmission channel. The transmission frequency may be set by the user in a wide range to make it custom or licence-free ISM. Sensitivity of the receiver is good enough to provide data transmission for up to 100 km (60 miles) line of sight distance.

The base station consists of:

- Omnidirectional UHF antenna. The higher the antenna is located, the better the data transmission quality. The antenna is equipped with built-in lightning protection;
- Coaxial cable between antenna and UHF-converter (the shorter between antenna and UHF converter the better);
- UHF-converter, designed for primary data receiving with further processing and transmission via digital RS-485 interface;
- Wireless management module, an autonomous device for intermediate data storage, power management and backup database.

In case of lost UHF communication, or long distance between the base station and the MS-GRD monitor, the data can be transferred over the built-in GSM modem.

Optionally, the Base RF-receiver station can be mounted on a mobile chassis/laboratory.

Specifications

Wireless probe — General

Geiger-Muller dual detector — dose equivalent rate range	from 0,1 µSv/h to 10 Sv/h
Geiger-Muller dual detector — energy range	from 45 keV to 3 MeV
Geiger-Muller dual detector — accuracy	±20%
Additional detectors (optional)	SrI ₂ (Eu)+SiPM spectroscopic detector, below 4% energy resolution; CsI(Tl) spectroscopic detector array with directional sensitivity, below 7.5% energy resolution
Spectra format	512/1024 ch
Isotopes of interest	automatic detection of Cs-137, I-131, Co-60, Xe-135 releases (customizable)
Communication to the reachback — wired	RS-485, Ethernet
Communication to the reachback — RF	proprietary UHF (open ISM or customizable frequency range)
Communication to the reachback — cellular/satellite (optional)	GSM/LTE, Inmarsat

Wireless probe — Electrical

Autonomous	3,6 V, 20 Ah, LiSOC12 battery
Battery life	up to 10 years at normal use
External power supply	5 - 24V DC
Power consumption from external power supply	less than 2,5 W

Wireless probe — Mechanical and environmental

Ingress protection	IP67
Dimensions, mm	ø70×700
Weight, kg	3
Temperature range	from -50 to +60 °C
Pressure	from 84,0 to 106,7 kPa
Humidity	from 0 to 100%

Modular add-ons (optional)

Back up power	12 V DC, Solar panel
Meteorological sensors	Wind speed and direction, temperature, humidity, rain

Base RF receiver

Range	up to 100 km at the line of sight
Sensitivity	-148 dBm
Power supply	5V DC; 110/220V AC optional
Power consumption, not more	1 W
Communication interfaces	RS-485 Modbus RTU, USB
Number of simultaneous connections to wireless probes	up to 100 units within the range of receiver



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The new Mission Support spectroscopic gamma-radiation probe is designed to work autonomously within various applications that require acquisition of high-resolution photon spectra in lightweight, low power consuming and wide temperature range applications. It includes a high-resolution $\text{SrI}_2(\text{Eu})$ scintillator of approximately 1"x1" volume with SiPM array readout. This may include unmanned vehicles and aerial drones, stand-alone weather stations, intelligent sensor systems and similar.



The probe acquires 2048-ch spectra and, due to the SiPM readout, is resistant to temperature variations and mechanical impacts, thus making it easy to operate and service — the probe does not need any frequent calibration of spectra using reference sources to stabilise gain. All this allows identification of the isotopes of interest built into the probe; thus, the user may just upload the library required for the selected application and get the final result ready for decision making.

The probe is powered from an external battery over the wire, but a built-in rechargeable for the case of unforeseen power interruptions is also an option. The operation of the probe, sending-receiving data and commands in real time, is performed over the RS-485 interface compliant to ANSI N42.42 data format, which makes it easy to integrate into existing sensor networks. The user-friendly configuration software as well as the optional USB interface makes it convenient for lab use, which extends the range of applications to measurement of food and soil contamination, air and water activity and similar.

FUNCTIONAL HIGHLIGHTS

- <3.5% energy resolution
- Wide range temperature gain stabilization
- IP67 rated weatherproof aluminium enclosure
- Multiple communication interfaces
- Low power consumption
- Automatic radionuclide identification
- Built-in spectra identification

COMMUNICATION INTERFACES

- RS-485 Modbus industrial
- USB
- ANSI N42.42 data format for easy integration

TYPICAL APPLICATIONS

- Environmental and industrial monitoring
- Early detection of effluent releases in case of emergency
- Nuclear Power Plants area monitoring
- Radiological studies and monitoring
- Waste processing plants and NORM storage areas

Specifications

Metrological		Communication	
Detector	1"×1" Srl ₂ (Eu)+SiPM array	Interfaces	RS-485 Modbus, USB
Dose equivalent rate range	0,05 µSv/h to 10 mSv/h	Protocol compliance	ANSI N42.42
Energy range	from 40 keV to 3 MeV	Power supply	
Accuracy	±20%	External	5V DC, 100 mA
Spectroscopic		Built-in (optional)	Li rechargeable battery
Resolution	< 3.5% at Cs-137 (typical 3.2%)	Mechanical	
Spectra format	2048 ch	Ingress protection	IP67
Isotopes of interest	automatic detection of Cs-137, I-131, Co-60, Xe-135 releases (customizable)	Dimensions, mm	Ø45 × 120 mm
		Weight	120 g
		Environmental	
		Temperature range	from -50 to +50 °C
		Pressure	from 84,0 to 106,7 kPa
		Humidity	from 0 to 100%

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Multipurpose Personal Radiation Monitor

Simultaneous alpha-, beta- and gamma detection



The MS-PRM is a compact, versatile all-in-one detector model designed for simultaneous search for surface contamination by alpha-, beta- and gamma-active radionuclides. Depending on the model, it may also be used as a Personal Radiation Detector (PRD) in applications involving search of gamma, and optionally neutron, radioactive sources in compliance with ANSI N42.32 and IEC 62401, or used as a gamma radiation dose ratemeter of up to 10 Sv/h value.



The distinguishing feature of the MS-PRM is completely independent detection channels providing one-pass scanning for alpha-, beta- and gamma radiation. This significantly decreases time-to-scan of the object for contamination and eases measurement procedures. The user can set up adjustable alarm thresholds to respond to various application scenarios. The detector's rugged design ensures reliable performance in demanding environmental conditions, both indoors and outdoors, with minimal maintenance and servicing requirements.

The MS-PRM is applicable in various sectors, including the nuclear industry, nuclear fuel cycle processes, and operational areas of nuclear power plants (NPPs), where it can be utilised for the simultaneous detection and measurement of alpha- and beta-contamination on personnel and equipment exiting controlled and supervised zones. It is also suitable for radioactive waste management and environmental monitoring applications. Furthermore, the device can be employed to identify elevated concentrations of naturally occurring radioactive materials (NORMs) in by-product waste resulting from oil and gas exploration and production activities.

FUNCTIONAL HIGHLIGHTS

- One-pass scanning for alpha-, beta- and gamma-radiation
- 45×45 mm phoswich alpha-beta detector insensitive to gamma
- IEC 60325 alpha- beta- compliant
- Sensitivity of MS-PRM and MS-PRM-02 models compliant to ANSI N42.32 for PRDs
- Minimum of training and supervision required
- Weatherproof storage and transportation case
- Rechargeable battery and USB interface

POTENTIAL APPLICATIONS

- As emergency monitor in case of accidents and large area contamination
- As hand-held frisker for radiation workers to monitor themselves
- As a versatile detector for First Responders to monitor all types of radiation
- As scale and sludge measurement of offshore oil and mining activities

Types of Monitors

Model	alpha-channel	beta-channel	gamma-channel	neutron-channel
MS-PRM	+	+	CsI(Tl)	—
MS-PRM-01	+	+	Plastic Scintillator	—
MS-PRM-N	+	+	CLYC	CLYC

Specifications

Alpha/beta detector

Type	Phoswich α - and β -detector
Window area	20 cm ² (45×45 mm)
Surface activity (contamination) measurement range — alpha (²³⁹ Pu)	from 0,02 to 1.5·10 ⁴ Bq/cm ²
Surface activity (contamination) measurement range — beta (⁹⁰ Sr- ⁹⁰ Y)	from 0,3 to 2·10 ⁴ Bq/cm ²
Surface emission rate measurement range — alpha (²³⁹ Pu)	from 0,6 to 5·10 ⁵ cpm/cm ²
Surface emission rate measurement range — beta (⁹⁰ Sr- ⁹⁰ Y)	from 6 to 5·10 ⁵ cpm/cm ²
Energy range — alpha	from 4 MeV to 7 MeV
Energy range — beta	from 150 keV to 3 MeV

Gamma detector: MS-PRM

Type	CsI(Tl)+SiPM
Energy range	from 50 keV to 3 MeV
Gamma sensitivity	100 cps/μSv/h (Cs-137); 800 cps/μSv/h (Am-241)
Response time	< 2 sec (ANSI N42.32 compliant)
Dose Rate range	0,1 - 100 μSv/h
Accuracy	±20%

Gamma detector: MS-PRM-01

Type	Plastic scintillator
Energy range	from 50 keV to 7 MeV
Dose Rate range	from 0,1 μSv/h to 10 Sv/h
Accuracy	±20%

Gamma-neutron detector: MS-PRM-N

Type	CLYC
Energy range	50 keV - 3 MeV (gamma); thermal - 14 MeV (neutron)
Neutron indication range	1.0 - 999 cps
Neutron sensitivity	0.1 cps·cm ² /neutron (Pu-α-Be); 3 cps·cm ² /neutron (thermal)
Gamma Dose Rate range	0,1 - 100 μSv/h
Gamma sensitivity	100 cps/μSv/h (Cs-137); 800 cps/μSv/h (Am-241)
Accuracy (gamma)	±20%

Operating modes

Simultaneous alpha-, beta- and gamma- search mode
Simultaneous α - and β - surface contamination measurement
Gamma dose rate measurement mode
Gamma-search mode

Functional

Power supply	3.7V Li-ion rechargeable battery
Operation time from one battery charge, not less	150 hours
Display units	cps, Bq/cm ² , cpm/cm ² , μSv/h
Data interfaces	USB, RS-485
Internal memory	up to 1000 events
Type of alarms	sound, light
Cleaning	housing easy to decontaminate
Accessories (optional)	protective holster, dock/charger station, spare protective aluminized mylar

Environmental and mechanical

Temperature	from -10 to +45 °C
Humidity	up to 85% at +35 °C
Atmospheric pressure	from 84 to 106,7 kPa
Ingress protection	IP54
Size, mm	42×80×128
Weight, g	350

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Personal Radiation Detectors

The Mission Support MS-PRD is a family of advanced Personal Radiation Detectors (PRDs and SPRDs) that integrate the latest technologies in sensor materials, AI-based detection algorithms, patented solutions for directional sensitivity, and wireless data networking. The units are designed to detect, locate, and identify the sources of gamma and neutron radiation, accumulate and store gamma-radiation spectra, provide fast identification of basic radionuclides, monitor exposure of personnel during operations, and alarm in case of dangerous radiation levels.

All MS-PRD PRDs have an advanced NORMs rejection algorithm, therefore sensitivity of PRDs to critical industrial isotopes does not get worse at larger NORMs background. The PRDs can also automatically adjust search thresholds to changing background, which does not require manual background re-calibration when entering/exiting buildings and areas with significantly different gamma background.

The unique feature of the MS-PRD is full spectroscopic functionality on board: all models can accumulate, display and store gamma scintillation spectra, as well as provide fast identification of the most frequently met isotopes. The MS-PRD also has an option of directional sensitivity, which doesn't require any additional operations from the wearer: the unit just points to the direction of the largest gamma-radiation level, which makes the task of locating gamma-radiation sources straightforward.

The MS-PRD PRDs have rugged shock proof housing designed for all weather operating conditions. Power is supplied from an easily replaceable in the field single AA-type battery. Units might be mounted on the vehicle deck using an additional charger/dock station, as well as worn on the belt with a protective holster. The instrument is invaluable for use by First Responders, Border and Customs services, Fire and Police brigades and similar users in cases involving release or security of gamma/neutron radioactive and nuclear materials.

FUNCTIONAL HIGHLIGHTS

- Full spectroscopy on board: may accumulate, display and store gamma-radiation spectra
- Automatic adjustment to changing background and NORM rejection algorithm
- Built-in identification of frequently met isotopes using AI algorithms
- Patented technology for directional sensitivity of gamma detector
- Gamma-neutron version of PRD based on CLYC scintillator
- <2.5% Cs-137 energy resolution option for SPRD model using LaBr crystal
- Variety of data communication interfaces including wireless reachback

POTENTIAL APPLICATIONS

- Prevention of illicit trafficking of radioactive and nuclear materials
- Search for orphan or lost radioactive sources
- Critical infrastructure protection, safety of buildings and public events
- Emergency management and response to accidents involving radioactive/nuclear materials
- Provision of public safety and security in case of nuclear terrorism
- Environmental monitoring and measurement of radioactive releases from NPPs



MS-PRD — model range



There are 4 basic models of MS-PRD Personal Radiation Detectors:

- MS-PRD: basic gamma PRD/SPRD model
- MS-PRD-01: gamma only PRD/SPRD with directional sensitivity to gamma-radiation and increased detector volume
- MS-PRD-02: gamma-neutron PRD/SPRD
- MS-PRD-03: gamma-only PRD/SPRD with improved spectroscopic resolution (LaBr)
- MS-PRD-04: gamma only PRD/SPRD with extended dose rate range

Every model of MS-PRD can be equipped with an additional detector based on tissue-equivalent plastic scintillator for measurement of personnel exposure in large gamma-radiation fields of up to 10 Sv/h.

Basic gamma PRD/SPRD model MS-PRD. Compliant with ANSI N42.32 and equipped with a single CsI(Tl) scintillation crystal. Suitable for performing basic operations for prevention of accidents with sources of gamma radiation and response in case of emergency. The MS-PRD-04 model is similar to the basic MS-PRD, but equipped with an additional high dose rate (up to 10 Sv/h) detector.

Directional gamma PRD/SPRD model MS-PRD-01. The only PRD on the market with true directional capability that can detect the direction to the source of ionizing radiation using self-sensitivity (does not use any external moderators or complicated location procedures).

Directional features offer an intuitive search experience as users in shipyards or large customs ports are able to identify the location of the alarming radiation quickly and with precision. For luggage or shipping inspections, directional support ensures a clear scenario is reported to management and any threats can be isolated expeditiously. The detector array which supports the directional algorithm uses state-of-the-art isolation techniques and thereby eliminates the need for heavy collimators, making the MS-PRD the most capable and compact PRD/SPRD available today.

Gamma-neutron PRD/SPRD model MS-PRD-02. Dual-mode gamma-neutron PRD/SPRD based on CLYC crystal with SiPM readout. Features outstanding sensitivity to fast and thermal neutrons due to Cl and Li components of detector material, optionally capable for fast neutron spectroscopy. The CLYC-based detector also has better spectroscopic resolution (typically <5% at 662 keV) which makes the ID algorithm running on the MS-PRD faster and more accurate.

High-resolution spectroscopic PRD/SPRD MS-PRD-03. Compliant with ANSI N42.48 and equipped with LaBr-based scintillator crystal coupled with SiPM array readout. Provides better than 3% Cs-137 resolution in a wide temperature range.

The instrument can automatically characterize the isotope in case of alarm to the basic groups of interest: NORM, INDUSTRIAL, MEDICAL or SNM, and identify user-selected isotopes of interest. Most alarms at large events are driven by medical treatments, so the MS-PRD-03 offers a convenient MEDICAL/NOT MEDICAL indicator. This allows fast verification of the alarm incident and a fast and proper response by the first-line operator.

MS-PRD — key technologies



MS-PRD LCD screen captures: directional bar, CPS/DER readout, spectrum plot, identification and settings screens

Patented technology for directional sensitivity of gamma detector

Locating the source of gamma radiation after an alarm goes off can be one of the most challenging and time-consuming tasks when using PRDs in the field. Typically, this requires specialized techniques and additional training to perform effectively. But with the MS-PRD, finding the radiation source has never been easier. When the alarm activates, the MS-PRD shows the direction to the radiation source on the top bar of the LCD screen.

For even greater accuracy, simply double-press the operation button to enter Compass Mode. The MS-PRD's directional arrow will point you straight to the source. If the arrow points right, turn right. If it points left, turn left. It's that simple.

Full spectroscopy in every unit

Each MS-PRD device is equipped with a 1024-channel spectroscopic gamma detector. In the event of an alarm, the user can initiate the gamma spectrum acquisition, display it on the LCD screen, and store it in non-volatile memory for future reference. For CsI(Tl) detectors, the average energy resolution is approximately 7.5% at the 0.662 MeV energy of Cs-137, which is sufficient for detecting most industrial isotopes encountered in the field. The procedure is straightforward: select "Spectra" from the instrument's menu, clear any existing spectra, and the MS-PRD will automatically begin accumulating new spectral data. Once the accumulation is complete, the "Save" and "Identify" options will become available.

Built-in identification of frequently met isotopes using AI algorithms

The MS-PRD employs a suite of algorithms designed for the rapid identification of commonly encountered isotopes, including industrial isotopes such as Cs-137 and Co-60; naturally occurring radioactive materials (NORM) such as Th-232, Th-228, and K-40; nuclear isotopes like Am-241; and medical isotopes such as I-131. Once the spectral data has been accumulated, users can initiate the "Identification" process to obtain results.

In cases where no isotopes are identified, users have the option to either continue spectral accumulation and attempt identification again or save the spectral data for subsequent analysis. The saved spectra can be processed later using the provided ID software or any industry-standard software package, as the files are stored in standard formats (IAEA *.spe or ANSI N42.42), ensuring compatibility with the majority of available software solutions.

Automatic adjustment to changing background and NORM rejection algorithm

The standard PRD adapts to changing background radiation by recalculating the alarm threshold based on environmental conditions. This process typically requires manual updates by the operator whenever radiation levels change significantly. The MS-PRD takes this a step further with its automatic background update feature, ensuring seamless operation by adjusting automatically when transitioning from high to low radiation levels, such as when exiting a building.

Moreover, in environments with high background radiation from Naturally Occurring Radioactive Materials (NORMs), detecting Industrial (IND) or other isotopes of interest can become challenging. To overcome this, the MS-PRD is equipped with an intelligent, AI-driven algorithm that detects artificial isotopes even in high-NORM environments, providing superior performance and detection (select Adaptive Search Mode from the menu).

Types of Monitors

Model	gamma-channel	neutron-channel	high-range gamma detector (optional)
MS-PRD, -04	CsI(Tl)	—	tissue-equivalent plastic scintillator with up to 10 Sv/h exposure rate measurement
MS-PRD-01	dual CsI(Tl) with directional sensitivity	—	
MS-PRD-02	CLYC (<5% 0.662 keV resolution)	CLYC (fast and thermal neutrons)	
MS-PRD-03	LaBr (2.5% 0.662 keV resolution)	—	

Specifications

Gamma detector: MS-PRD, MS-PRD-01, MS-PRD-04

Type	CsI(Tl)+SiPM
Energy range	from 50 keV to 3 MeV
Gamma sensitivity	100 cps/μSv/h (Cs-137); 800 cps/μSv/h (Am-241)
Response time	< 2 sec (ANSI N42.32 compliant)
Dose Rate range	0,1 - 100 μSv/h
Accuracy	±20%
Typical energy resolution	7.5% (at 0,662 keV Cs-137)

Gamma-neutron detector: MS-PRD-02

Type	CLYC+SiPM
Energy range	from 50 keV to 3 MeV
Gamma sensitivity	90 cps/μSv/h (Cs-137); 800 cps/μSv/h (Am-241)
Response time	< 2 sec (ANSI N42.32 compliant)
Dose Rate range	0,1 - 100 μSv/h
Accuracy	±20%
Typical energy resolution	5% (at 0,662 keV Cs-137)

Gamma detector: MS-PRD-03

Type	LaBr+SiPM
Energy range	from 50 keV to 3 MeV
Gamma sensitivity	100 cps/μSv/h (Cs-137); 800 cps/μSv/h (Am-241)
Response time	< 2 sec (ANSI N42.32 compliant)
Dose Rate range	0,1 - 100 μSv/h
Accuracy	±20%
Typical energy resolution	2.5% (at 0,662 keV Cs-137)

MS-PRD-04: High-range gamma detector

Type	Plastic scintillator
Energy range	from 50 keV to 7 MeV
Dose Rate range	from 0,1 μSv/h to 10 Sv/h
Accuracy	±20%

Operating modes

Gamma/neutron radioactive sources search and measurement mode

Gamma spectra accumulation mode. Fast identification of selected isotopes

Direction to the gamma-radiation source mode (MS-PRD-01 model)

Functional

Spectra format	1024 channels
Number of spectra stored in memory, spectra format	50 spectra, IAEA *.spe format or ANSI N42.42
Data interfaces	USB; Bluetooth LTE (optional)
Internal memory	up to 1000 data events
Type of alarms	sound, vibration, light
Accessories (optional)	protective holster, car dashboard mount, dock/charger station
Power supply	1 AA-type battery
Battery lifetime	up to 700 hours at normal use
Cleaning	housing easy to decontaminate

Environmental and mechanical

Temperature	from -40 to +50 °C
Humidity	up to 98% at +35 °C
Atmospheric pressure	from 84 to 106,7 kPa
Ingress protection	IP65
Size, mm	39×68×96
Weight, g	200

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Hand-held Combined Metal and Gamma-radiation Monitor

The new model MS-MGM is an easy to use hand-held metal detector with an additional function to detect and locate gamma-radioactive substances in checked baggage, objects and personnel. During just a single scan the MS-MGM allows simultaneous detection of metals and radioactive substances, thus substantially reducing clearance time and the quantity of instruments used by personnel at the check-point.



The unique operational advantage of the MS-MGM model that makes it different from any existing analogues is the sensitivity of its gamma detector. The MS-MGM uses a CsI(Tl) scintillation detector, similar to specialized PRDs (personal radiation detectors) used in homeland security. This substantially extends the range of applications of the instrument, making it in particular useful in cases where the use of regular PRDs is intolerable. Given the common housing and shape of the instrument it makes it easy to e.g. hide the additional scan for radioactive substances, while doing a regular security check with a metal scanner, etc. Another application area is the management of medical waste, where the need for simultaneous control of syringe needles and radioactively contaminated substances is needed.

The MS-MGM can be used both indoors and outdoors for inspection of people, vehicles, luggage, premises and open areas. It requires little training and is easy and convenient to use.

ADVANTAGES

- Ultimate sensitivity (similar to specialized PRDs)
- Proprietary algorithm providing low false alarm rate
- Self-calibrating to different backgrounds
- Wide temperature range
- Sound and vibration alarms
- Rugged and lightweight
- Requires no or little training

TYPICAL APPLICATIONS

- Customs and border protection check points
- Medical waste management
- Airports and seaports, points of entry
- Public and sport events
- Building security and critical infrastructure protection

Specifications

Radiological		Mechanical	
Detector	3cc CsI(Tl) +SiPM	Ingress protection	IP54
Sensitivity	100 cps/ μ Sv/h (Cs-137)	Dimensions, mm	420×85×45
Energy range	from 50 keV to 3 MeV	Weight, g	470 (with battery)
Preset threshold	30 μ R/h (0.30 μ Sv/h)	Environmental	
Typical time to alarm, gamma	< 2 sec.	Temperature range	from -20 to +50 °C
Metal		Pressure	from 84,0 to 106,7 kPa
Typical detection distance (in the air) — knife, mm	150 ($\pm$ 10)	Humidity	up to 95% at +35 °C
Typical detection distance (in the air) — gun, mm	200 ($\pm$ 10)	Functional	
Typical detection distance (in the air) — magnetic plate 100×100 mm, mm	200 ($\pm$ 10)	Three-colour LED indication	Green LED = ON; Blue LED = GAMMA ALARM; Red LED = METAL ALARM
Typical detection distance (in the air) — lead container, mm	200 ($\pm$ 10)	Battery	one 9V (type 6F22)
Metal detector, frequency	40 kHz	Battery lifetime	80 hours (at normal operation conditions)
Scanning speed, m/s	from 0.1 to 0.5		

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PRODUCT CATALOGUE V6

DOSIMETERS AND DETECTORS



Electronic Personal Dosimeter

with tissue-equivalent energy response

The new Mission Support MS-EPD3 electronic personal dosimeter is primarily designed as a versatile device for personnel of Nuclear Power Plants (NPP). Operating across various energies and dose rates, it contains a plastic scintillator detector which makes its energy response close to that of human tissue. Due to its superior sensitivity compared to semiconductor p-n junction detectors, the MS-EPD3 provides very fast and accurate measurements at variable radiation fields, is capable of correctly measuring pulsed radiation from NDT and medical equipment, and demonstrates better performance at low background measurements.



The MS-EPD3 has several data interface options: USB or RS-485 for use as an individual dosimeter or within a dose management system at NPPs, as well as optional Bluetooth LE to operate within wireless mesh networks. Powered by a single AA-type regular or rechargeable battery easily replaceable in the field, the MS-EPD3 personal dosimeter is convenient for use in emergencies, for example by first responders. Furthermore, sensitivity of the detector in many scenarios is sufficient to replace gamma search instruments (PRDs).

The ability to operate correctly in pulsed radiation fields makes the MS-EPD3 an ideal choice for security check points where X-ray or accelerator-based scanners are used, in medical applications, oil and gas industry and similar institutions.

FUNCTIONAL HIGHLIGHTS

- Tissue-equivalent plastic scintillator detector
- Gamma sensitivity equivalent to large-volume GM-tubes
- Fast response to background changes
- Designed to correctly measure pulsed radiation from accelerators and X-ray scanners
- IEC 61526 and ANSI N42.20 standards compliant
- Shockproof and weatherproof rugged housing
- Functions on one AA-type battery
- Designed for group operation and programming

POTENTIAL APPLICATIONS

- Personnel of Nuclear Power Plants and related industry
- Wide range of medical applications; hospitals and clinics
- May be used as versatile EPD for First Responders in case of accidents
- NDT applications with pulsed x-ray
- Personnel of security check-points that use accelerators and baggage scanners

Specifications

Radiological		Functional	
Detector type	doped plastic scintillator	Clip may be reversed to meet different wearing scenarios (within the pocket or outside)	
Dose rate measurement range	0.1 $\mu\text{Sv/h}$ - 10 Sv/h		
Accuracy within the dose rate measurement range, less than	20%		
Hp(10) dose measurement range (photon)	1 μSv - 20 Sv	Designed for automatic charging and readout when used with group storage rack at NPPs	
Accuracy within Hp(10) dose measurement range (accuracy + linearity), less than	20%	Optional Bluetooth Low Energy for operation in mesh wireless networks	
Energy range	40 keV - 7 MeV	Environmental and mechanical	
Energy response	30%		
Operational		Temperature	from -10 to +50 °C
Display units	μSv , mSv, Sv	Humidity	up to 95% at +35 °C
Data interfaces	USB, RS-485	Atmospheric pressure	from 84 to 106,7 kPa
Internal memory	up to 2000 events	Ingress protection	IP65
Type of alarms	sound, light, vibration	Size, mm	23×63×91 without clip
Cleaning	housing easy to decontaminate	Weight, g	85
Power supply	AA-type Alkaline or rechargeable battery		
Operation time from one battery charge, not less	90 days		

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Electronic Personal Dosimeter

direct-reading dosimetry of Hp(10) for photon radiation



The MS-EPD4 is a direct-reading electronic personal dosimeter designed for measurement of personal dose equivalent Hp(10) and personal dose equivalent rate. It is intended for individual monitoring of occupational exposure to photon radiation at nuclear power plants, nuclear fuel cycle facilities and other workplaces with ionizing radiation.



The dosimeter employs a tissue-equivalent, lead-doped polystyrene scintillator with an energy-compensated response from 40 keV to 7 MeV. A sealed IP67 housing, 1.5 m drop resistance and a service life of at least 15 years make the MS-EPD4 suitable for daily issue in demanding industrial environments.

The MS-EPD4 is designed for group charging and readout at nuclear power plants: dosimeters are configured, read out and archived via the MS-EPD4 Reader over USB or RS-485, with two configurable alarm thresholds per measured quantity and non-volatile memory for at least 2,000 events.

FUNCTIONAL HIGHLIGHTS

- Tissue-equivalent Pb-doped plastic scintillator detector
- Dose equivalent rate range 0.1 $\mu\text{Sv/h}$ to 10 Sv/h
- Dose equivalent range 1 μSv to 20 Sv
- Energy range 40 keV to 7 MeV
- Audible, visual and vibration alarms
- Typically 3,000 h operation from one AA battery
- IP67, drop resistant to 1.5 m
- Designed for group charging and readout at NPPs

COMPLIANCE

- IEC 61526:2024
- ANSI N42.20
- IEC 61000-6-2 (EMC)
- IEC 60529, IEC 60068 series

TYPICAL APPLICATIONS

- NPP personnel dosimetry
- Nuclear fuel cycle industry
- Industrial radiography and NDT
- Medical and research facilities

Specifications

Radiological

Detector type	Pb-doped polystyrene scintillator
Measured quantities, photon radiation	Personal dose equivalent Hp(10) and personal dose equivalent rate
Dose equivalent rate display range	0.01 μ Sv/h to 20 Sv/h
Dose equivalent rate measurement range	0.1 μ Sv/h to 10 Sv/h
Dose equivalent rate accuracy	$\leq \pm 20\%$
Dose equivalent display range	0.01 μ Sv to 100 Sv
Dose equivalent measurement range	1 μ Sv to 20 Sv
Dose equivalent accuracy	$\leq \pm 15\%$
Energy range, photon	40 keV to 7 MeV
Energy response (relative to Cs-137)	$\leq \pm 30\%$

Alarms

Dose equivalent alarm range	1 μ Sv to 20 Sv
Dose equivalent rate alarm range	1.0 μ Sv/h to 10.0 Sv/h
Thresholds	two per quantity, configurable via software
Alarm types	audible, visual (LED), vibration

Operational

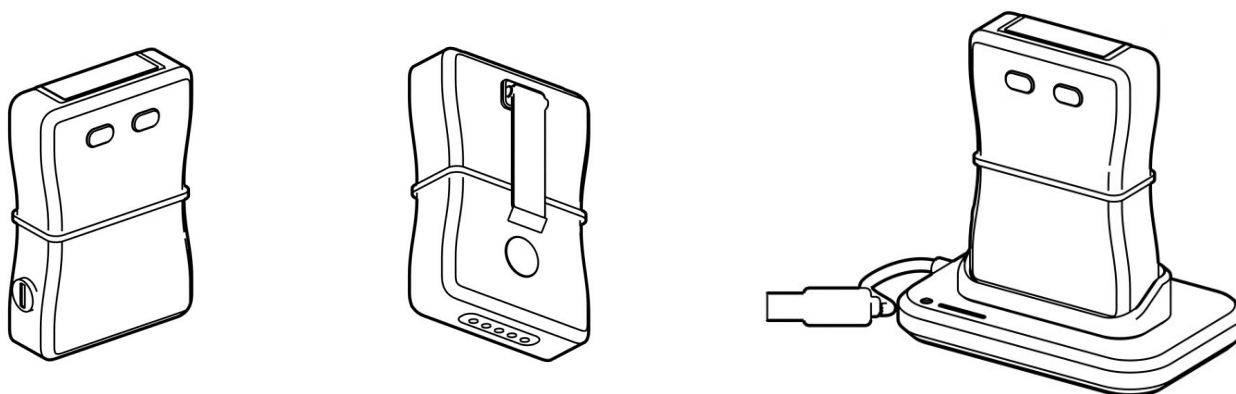
Display	segmented LCD with backlight
Display units	μ Sv, mSv, Sv — automatic ranging
Data interfaces	USB or RS-485 via MS-EPD4 Reader
Non-volatile memory	$\geq 2,000$ events

Physical and environmental

Dimensions (without clip)	23 × 63 × 91 mm
Weight (without clip and battery)	≤ 85 g
Power supply	1 × AA battery (FR6, LR6 or NiMH)
Battery life, continuous operation	typically 3,000 h (≈ 90 days)
Operating temperature	-20 to +50 °C
Humidity	up to 95% at +40 °C
Atmospheric pressure	84.0 to 106.7 kPa
Ingress protection	IP67
Drop resistance	1.5 m onto concrete

Reliability

MTBF	$\geq 30,000$ h
MTTR	≤ 60 min
Service life	≥ 15 years



MS-EPD4 external elements and MS-EPD4 Reader (group charging and readout)

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Gamma Radiation Detectors

for integration into security systems and special vehicles

MS-GRD is a new generation of radiological detectors intended for use as emergency radiological detectors in case of accidents at potentially hazardous facilities. The detectors are designed to be built into security systems and inside special vehicles as an element of a collective protection system.

MS-GRD 3.1 includes one gamma radiation detector based on a Geiger–Müller tube. MS-GRD 3.2 includes two Geiger–Müller detectors: one placed inside the facility and the other monitoring background radiation outside. MS-GRD 3.3 combines a Geiger–Müller tube with a highly sensitive CsI(Tl) scintillation detector.



Specifications

CsI(Tl) detector

Sensitivity, gamma radiation (^{137}Cs , ^{241}Am)	$100 \text{ s}^{-1}/(\mu\text{Sv/h})$
Energy range	0.06 – 3.0 MeV
Dose equivalent rate (DER) measurement range	0.1 $\mu\text{Sv/h}$ – 100 $\mu\text{Sv/h}$
DER measurement accuracy	$\pm 25\%$
Response time	0.25 s
Operating temperature	–30 to +50 °C

Geiger–Müller detector

Dose equivalent (DE) measurement range	0.1 $\mu\text{Sv/h}$ – 9999 mSv
Dose equivalent rate (DER) measurement range	0.1 $\mu\text{Sv/h}$ – 10 Sv/h
DER measurement accuracy	$\pm 25\%$
Energy range	0.06 – 3.0 MeV
Operating temperature	–30 to +50 °C

Common

DC power supply voltage	12 – 24 V
MTBF	6000 h
Warm-up time	not more than 2 min
Interfaces	CAN
Military standard	MIL-STD-810G
Ingress protection	IP65
Indication unit	LCD 1.5", IP65
Alarm	light / sound
Weight	0.5 kg

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PRODUCT CATALOGUE V6

MOBILE MONITORING AND TRANSPORTABLE SOLUTIONS



Mobile radioactive gaseous monitoring laboratory

for routine monitoring and emergency response

The Mission Support MS-RML are custom-made products based on mobile chassis (user selectable MAN, Mercedes, Ford etc.), or 20/40 feet containers designed to solve specific tasks related to radioactive airborne particulate concentration and surface contamination measurement. Designed for use as early warning and emergency response solutions in areas where the risk of accidents involving radioactive airborne emissions by alpha, beta and gamma radioactive isotopes is elevated.



For primary use by first responders, nuclear power plants, fire brigades and environment protection agencies. Mobile laboratories can be customised to meet various needs and concepts of operation.

While measuring, all detectors inside the MS-RML lab are connected into a single network, keeping combined records of measurements before/after decontamination, air concentration, personal exposure measurement etc., which allows keeping a centralised database with pictures and geo-tagging for easy diagnosis and treatment assignment.

The MS-RML mobile laboratory can be additionally equipped with mobile fast deployable decontamination equipment, weather station, diesel generators etc.

FUNCTIONAL HIGHLIGHTS

- Fast deployable, ready for immediate operation
- Complete set of instruments for measurement of gaseous effluent releases
- Customizable to meet particular customer's needs
- May be used as transportable solution for the MS-GRD base UHF station

POTENTIAL APPLICATIONS

- Emergency response at early stages of nuclear accidents
- Mobile checkpoints and perimeter control
- Environmental monitoring
- Radon and thoron progeny measurement
- Demolition monitoring
- Effluent releases monitoring

MS-RML — installed equipment and layout



The regular range of equipment installed in the mobile lab is:

- Continuous radioiodine monitor. To measure air activity of I-131, I-133 and I-129 releases, based on high resolution gamma spectroscopy;
- Continuous alpha- beta- active particulates monitor. To measure the slightest traces of concentration activity of industrial and NPP releases in case of emergency;
- Dust and air quality monitor;
- Noble gas monitor;
- RPM monitor — built-in into the vehicles or transportable and deployable;
- Food/water contamination monitor;
- Weather sensors (wind speed and direction, humidity, rain, temperature etc.).

One application of the mobile vehicle lab is as a transportable solution for the base UHF station. In this case it makes it possible to collect data from remote MS-GRD environmental gamma sensors, to provide security of the local area, for example public safety during a sport event, especially in urban areas where the large number of buildings makes long-range signal communication complicated.



PRODUCT CATALOGUE V6

COMBINED CBRN SOLUTIONS

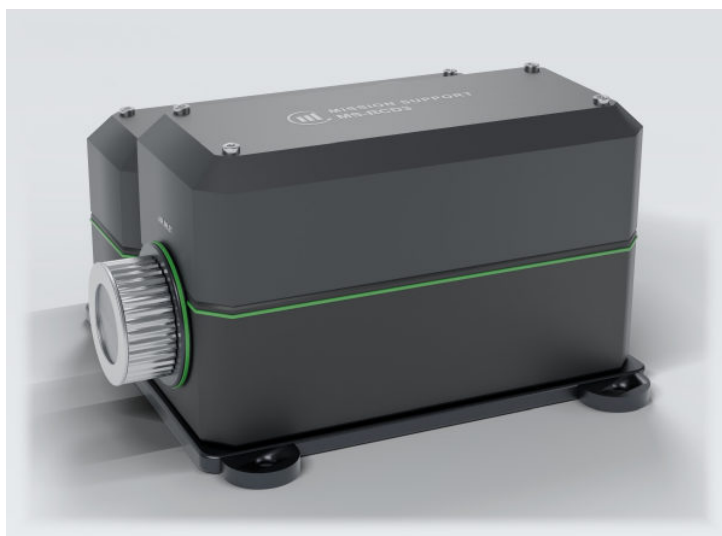


Radiological and Chemical Detector

CWA, TIC and gamma-radiation detection for vehicles and unmanned platforms

The MS-RCD3 family (3.1/3.2/3.3) provides detection of chemical warfare agents (CWA) and toxic industrial chemicals (TIC), detection of radioactive sources and monitoring of radioactive contamination of the area.

The base MS-RCD3 unit is supplied for integration into safety systems and unmanned aerial and ground vehicles. The indication-unit configuration is designed for integration inside armoured vehicles as an element of a collective protection system. The shockproof-tablet configuration is intended for special vehicles of CBRNE and HAZMAT units, police, rescue services and border guards.



DETECTS

- CWA: sarin, soman, mustard gas, lewisite, Vx
- TIC: chlorine, ammonia
- Gamma dose rate and radioactive sources

APPLICATIONS

- Environmental radiological monitoring
- Determination of the dose rate of gamma radiation
- Localization of radioactive contamination areas
- Automatic determination of CWA and TIC in the environment
- Localization of hazardous areas

Specifications

Chemical detection

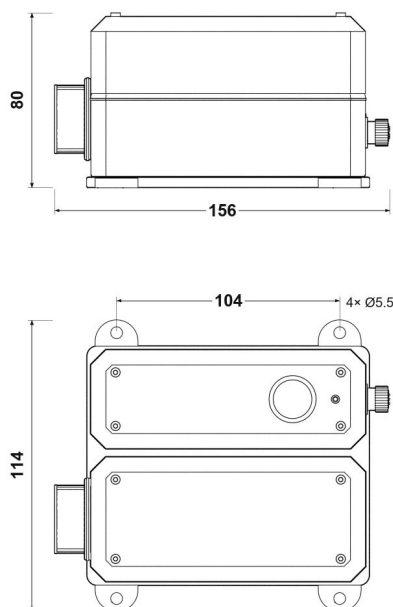
Max alarm delay at dangerous gas concentrations	< 5 s
Alarm concentration — Sarin (±25%)	$2 \times 10^{-1} \text{ mg/m}^3$
Alarm concentration — Soman	$5 \times 10^{-2} \text{ mg/m}^3$
Alarm concentration — Vx	$2 \times 10^{-2} \text{ mg/m}^3$
Alarm concentration — Mustard gas	2 mg/m^3
Alarm concentration — Lewisite	$2 \times 10^{-1} \text{ mg/m}^3$
Alarm concentration — Ammonia	20 mg/m^3
Alarm concentration — Chlorine	1 mg/m^3

Radiological

DER registration of gamma radiation (±30%)	0.1 $\mu\text{Sv/h}$ to 2.0 Sv/h
Sensitivity to photon radiation, 0.06–2.0 MeV (^{137}Cs)	not less than 100 $\text{s}^{-1}/(\mu\text{Sv/h})$

General

Operating temperature	$\pm 40 \text{ }^\circ\text{C}$ (max $\pm 60 \text{ }^\circ\text{C}$)
Weight	1.2 kg
Protection	IP67
Standard	MIL-STD-810G
DC supply voltage	12 to 24 V
MTBF	10,000 h
Possible interfaces	CAN, USB, RS-485



Dimensional drawings and indication unit

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Radiological and Chemical Detector

handheld and unmanned radiological and chemical monitoring

MS-RCD2 is a multifunctional detector combining continuous automatic chemical monitoring of the air — for chemical warfare agent groups G/V (sarin, soman, Vx) and H/L (mustard gas, lewisite) and toxic industrial chemicals such as ammonia and chlorine — with an emergency radiological detector for accidents at potentially hazardous facilities and terrorist attacks.



MS-RCD2 is designed as a handheld detector and for integration on board UGVs and UAVs. The device consists of two modules: the detector module and the navigation and data-transmission module. Alarms, alarm type and alarm coordinates are transmitted via radio channel at a distance of up to 1000 m; a shockproof laptop displays a map of the area and alarm signs, and stores the date, time, type and coordinates of each alarm in a database for subsequent viewing.

CONFIGURATION

- Detector module
- Navigation and data-transmission module
- Shockproof laptop (Panasonic class)

APPLICATIONS

- Handheld radiological and chemical monitoring
- Integration on board UGVs and UAVs
- Element of collective protection of special vehicles
- Emergency response and area survey

Specifications

Chemical detection

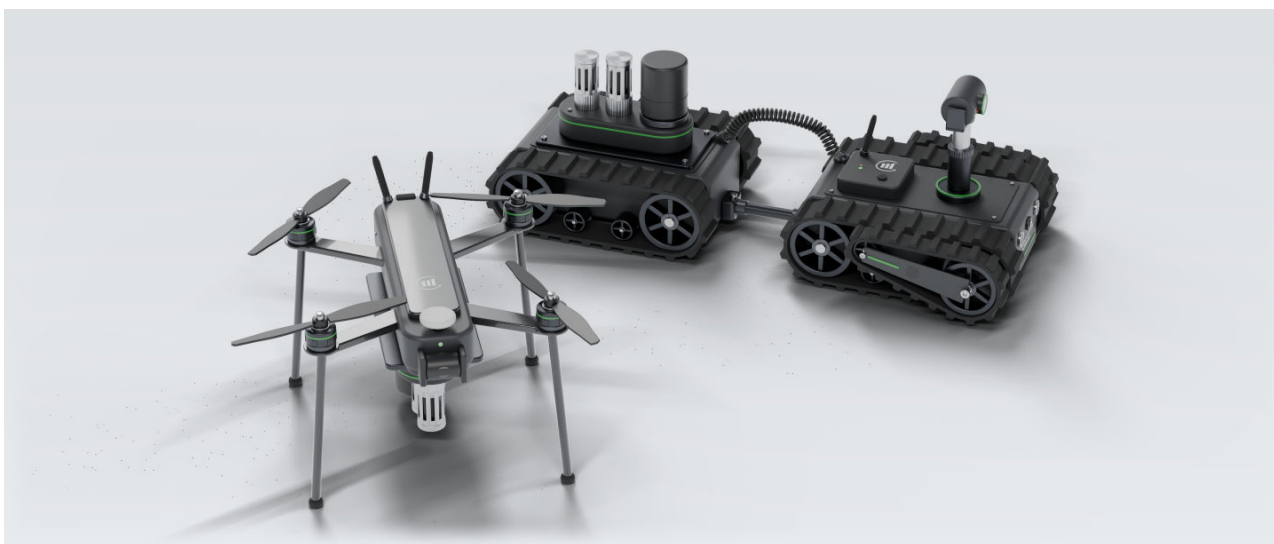
CWA sensitivity — Sarin	$2 \times 10^{-1} \text{ mg/m}^3$
CWA sensitivity — Soman	$5 \times 10^{-2} \text{ mg/m}^3$
CWA sensitivity — Vx	$2 \times 10^{-2} \text{ mg/m}^3$
CWA sensitivity — Mustard gas	2 mg/m ³
CWA sensitivity — Lewisite	$2 \times 10^{-1} \text{ mg/m}^3$
TIC sensitivity — Ammonia	20 mg/m ³
TIC sensitivity — Chlorine	1 mg/m ³
Response time at threshold — CWA / TIC	5 s / 15 s
After-action — CWA / TIC	30 s / 300 s

Radiological

Radiological detector 1	CsI(Tl)
Average count rate range	1 – 50,000 cps
Energy range	0.06 – 2.0 MeV
Sensitivity by ¹³⁷ Cs	at least 100 s ⁻¹ /(μSv/h)
Radiological detector 2	Geiger–Müller counter
DER range	0.1 μSv/h to 2 Sv/h

General

Operating temperature	–40 to +60 °C
DC power supply voltage	12 – 24 V
MTBF	6000 h
Warm-up time	not more than 2 min
Interfaces	CAN
Decontamination	yes
Ingress protection	IP65
Dimensions	75×145×168 mm
Operation time, fully charged laptop battery	4 – 6 h
Alarm	light / sound
Weight — device / detector module	1075 g / 590 g



Integration on UAV and UGV platforms

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Radiological and Chemical Monitoring Module

for unmanned platforms, special transport and handheld use



The MS-RCM module is designed for emergency preparedness and remote environmental survey: detection of radioactive materials as well as chemical warfare agents (CWA) and toxic industrial chemicals (TIC). The module can be installed on board different robotic platforms — land, water and air — and, equipped with a protective cover with direct air pumping, can also be mounted on special transport. The module consists of a gamma radiation detector, a CWA detector (mustard gas, lewisite, sarin, soman, Vx) and a TIC detector (chlorine, ammonia).

The MS-RCM model is powered from the onboard supply of the unmanned vehicle, with module control and data transfer via the vehicle data-transmission channel. MS-RCM-01M is additionally equipped with a protective cover for installation on special transport and a Geiger-Müller counter for radiation hazard assessment. MS-RCM-02 is designed for autonomous use with visual and audible alarm; it can be operated as a hand-held instrument or installed on board unmanned vehicles and motor transport, and comprises the MS-RCM with an autonomous power-supply module equipped with GPS, a data-transfer radio channel, receiving antenna and software for Windows. A protected tablet PC is supplied optionally.



APPLICATIONS

- Monitoring and mapping of contaminated territories
- Search and localization of gamma radiation sources
- Automatic determination of CWA and TIC in the environment
- Component of collective protection systems of special transport

SOFTWARE

- Downloading and storage of location maps
- Indication of the operating state of the detectors
- Event recording with date, time and coordinates
- Per-detector display of event sites on the map
- Switching sound alarm on/off



Specifications

Models

MS-RCM	65×155×103 mm, 590 g; vehicle socket 9–24 VDC; CAN-bus
MS-RCM-01M	310×140×140 mm, 7250 g; vehicle socket 12–24 VDC; CAN-bus
MS-RCM-02	75×145×168 mm (+190 mm antenna), 1075 g; battery lifetime 4 h; radio channel up to 1.5 km

Gamma radiation detector

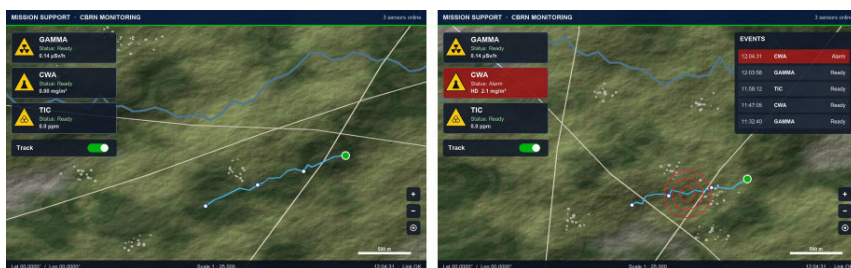
Detector	CsI(Tl)
Average count rate range	1 – 65,000 cps
DER range (MS-RCM-01M)	0.1 $\mu\text{Sv/h}$ – 1 Sv/h
Energy range	0.06 – 1.5 MeV
Sensitivity ^{137}Cs — MS-RCM / -02	at least 260 $\text{s}^{-1}/(\mu\text{Sv/h})$
Sensitivity ^{60}Co — MS-RCM / -02	at least 120 $\text{s}^{-1}/(\mu\text{Sv/h})$
Sensitivity ^{137}Cs / ^{60}Co — MS-RCM-01M	at least 300 / 150 $\text{s}^{-1}/(\mu\text{Sv/h})$
Minimum detectable activity at 0.2 m, 0.5 m/s, background $\leq 0.25 \mu\text{Sv/h}$	^{133}Ba 55 kBq; ^{137}Cs 100 kBq; ^{60}Co 50 kBq

CWA and TIC detectors

CWA detector	ionizing chamber with ^{63}Ni beta source, 33 MBq (radioisotope instrument of the 1st group; source activity below 1 MSA)
TIC detector	electrochemical sensor
Sensitivity — Sarin	0.05 mg/m^3
Sensitivity — Soman	0.02 mg/m^3
Sensitivity — Vx	0.005 mg/m^3
Sensitivity — Mustard gas, Lewisite	0.1 mg/m^3
Sensitivity — Ammonia	60–100 mg/m^3
Sensitivity — Chlorine	4–6 mg/m^3
Response time — CWA / TIC	5 s / 15 s
After-action — CWA / TIC	30 s / 300 s
Warm-up time	not more than 2 min

Compliance

The instrument complies with	ITRAP/IAEA, ANSI N42.32, IEC 62401
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Special software: detector state indication, event mapping and alarm management



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PRODUCT CATALOGUE V6

UNMANNED PLATFORMS



Aerial Radiological Reconnaissance

compact UAV for search, localization and mapping of radioactive sources

MS-UAV-ARR is a compact quadcopter for aerial and radiological reconnaissance: search, localization and identification of radioactive sources, contaminated-area mapping and monitoring of nuclear power plant territories and emergency situations. Flight in search mode is fully automatic, with an optional thermal imager for night operations.



The control channel uses cryptographic encryption, and the platform carries no software locks and does not depend on GSM networks. Weather monitoring supports contamination-spread prediction based on wind direction and speed.

SOLUTION

- Aerial and radiological reconnaissance
- Fully automatic flight in search mode
- Optional thermal imager for night flights
- Cryptographic encryption of the control channel
- No software locks; independent of GSM networks

ADVANTAGES

- Search, localization and identification of radioactive sources
- Contaminated-area mapping
- Weather monitoring and contamination-spread prediction
- Monitoring of nuclear power plant territories
- Monitoring of emergency situations

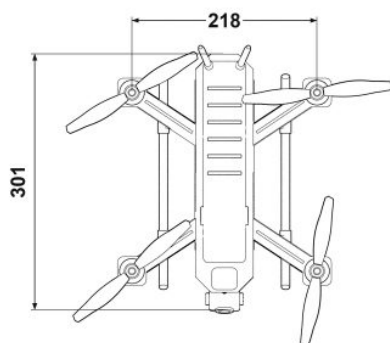
Specifications

MS-UAV-ARR

Maximum altitude	3000 m
Tactical range	3 km
Maximum range	5 km
Maximum flight time	55 min
Maximum wind speed near the ground	15 m/s
Maximum payload weight	400 g
Operating temperature	-15 to +60 °C
Props	7 inch
Frame	carbon / plastic

Camera

Operating system	integrated OS Linux
Video	720p (1280×720) 30 fps
Maximum resolution	3 Mpix
Stabilization	gyro-stabilized, single axis
Matrix	1/2.9" Progressive CMOS F23



Ground control station

Display	5 inch
Protection	IP64
Military standard	MIL-STD-810G
Working time	12 h
Operating temperature	-35 to +60 °C

Radiological detectors

Detector 1	CsI(Tl)
Sensitivity (¹³⁷ Cs, ²⁴¹ Am)	100 s ⁻¹ /(μSv/h)
Energy range	0.06 – 3.0 MeV
DER measurement range	0.1 – 100 μSv/h
Response time	0.25 s
Detector 2	Geiger-Müller
DER measurement range (G-M)	0.1 μSv/h – 10 Sv/h
DER measurement accuracy	±(20+0.002/H)%, H = DER in μSv/h
Operating temperature	-30 to +60 °C



MS-UAV-ARR dimensions and ground control station

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CBRN Reconnaissance Robot

chemical, biological, radiological and nuclear defence

MS-CBRN-RR is a compact tracked robotic platform for chemical, biological, radiological and nuclear defence, offered in three configurations: RCR for radiological and chemical reconnaissance, TACTICAL for military and special missions, and INSPECTION for survey of potentially hazardous areas.

The system is the lightest and most compact in its class, works both independently and as two connected modules, and includes a throwable shockproof module. It is carried as a backpack by a single operator and deployed within minutes.



CONFIGURATIONS

- RCR — radiological and chemical reconnaissance
- TACTICAL — military and special missions
- INSPECTION — survey of potentially hazardous areas

PAYLOADS

- Radiological and chemical detectors
- Alpha and beta aerosols detector
- Video camera at h = 1500 mm
- Cargo bucket
- Cargo backpack

MULTIFUNCTIONALITY



RCR

radiological and chemical reconnaissance



TACTICAL

military and special missions



INSPECTION

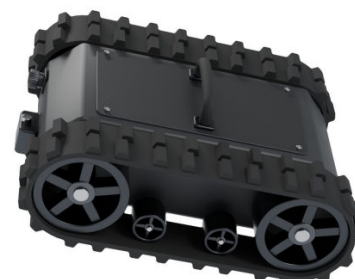
survey of potentially hazardous areas



Lightest and most compact in class



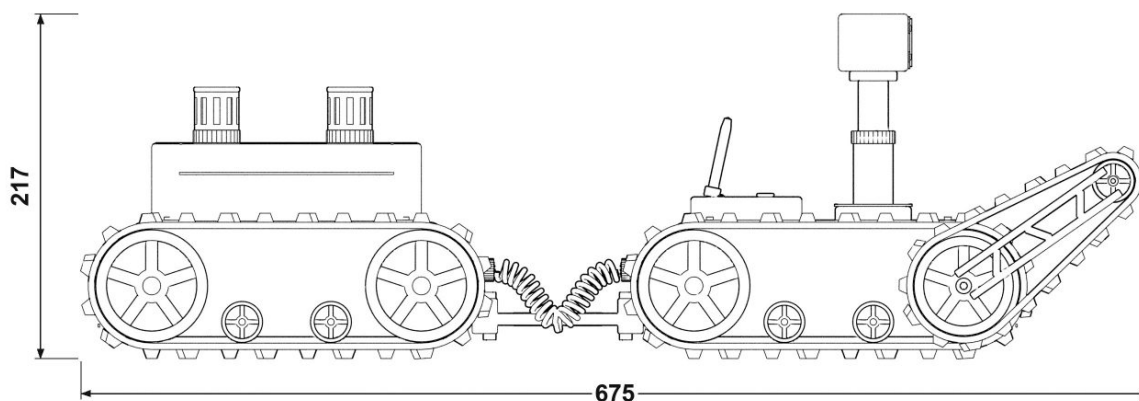
Works both independently and connected



Throwable shockproof module

Specifications

System		Environment and control	
System contents	2 modules, operator unit, accessories, transport case, documentation (payloads as requested by the customer)	Operating temperature	-35 to +60 °C
Operating time	1 – 2 h (operation mode dependent)	Operating range	1000 m line of sight
Cameras, real-time day & night video + zoom	8 cameras 1920×1080 + 2 camera payloads	Protection	IP68
Maximum payload	10 kg	Military standard	MIL-STD-810G
Weight	5.5 kg	Illumination module	LED / IR LED
Speed	7 km/h	MTBF	5000 h



MS-CBRN-RR — connected modules, dimensions in mm

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Multifunctional UGV for Monitoring and Logistics

monitoring, logistics and evacuation platform

MS-MML is a wheeled multifunctional unmanned ground vehicle for monitoring, logistics and evacuation: 24/7 observation with video and thermal cameras and various payloads, delivery of goods and ammunition, and evacuation and transportation of people.

The all-electric 4×4 platform carries up to 150 kg at up to 45 km/h. Interchangeable payload modules include a combined video and thermal camera with ×30 zoom, a rotating 1920×1080 camera, variable-height and 360° view cameras, a manipulator for picking up and dropping cargo, a hydrodynamic destroyer, and radiological and chemical detectors.



Specifications

Platform

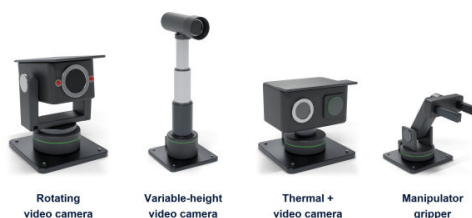
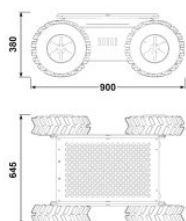
Dimensions	900 × 645 × 380 mm
Weight	35 kg
Load capacity	150 kg
Maximum speed	45 km/h
Drive	all-electric, 4×4
Power	4 kW

Operation

Operating time — mixed control cycle	4 h
Operating time — monitoring mode	22 h
Radio channel range	2000 m in line of sight
Temperature range	−35 to +60 °C
Ingress protection	IP68
MTBF	5000 h

Payloads (external, mounted)

360° view camera; combined thermal and video camera with ×30 zoom; rotating camera 1920×1080; variable-height video camera; manipulator; hydrodynamic destroyer; radiological and chemical detector



MS-MML dimensions and interchangeable payload modules

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Unmanned Catamaran Fleet with UAVs

environmental, hydrological, search-and-rescue and security monitoring



MS-UCF is a fleet of four unmanned catamarans with integrated UAVs for autonomous missions around the clock: monitoring of water areas, coastal lines, marine traffic and underwater objects; search, identification and support of people; and border protection.



Route planning is adaptive, taking into account weather conditions, currents and the probability of target detection. Roles are distributed and reassigned within the group, and integrated neural networks search for people, marine life, vessels of all types, drifting and underwater objects, and anomalies. UAVs take off and land on a gyro-stabilized platform in sea states up to 5; thermal imagers support searching for people at night and in poor visibility, and the combination of underwater, surface and air observation maximizes mission efficiency. A modular electromechanical winch with a cable up to 100 m long immerses sensors, analyzers and samplers; customer equipment and chemical and radiological detectors and monitors can be integrated.

MONITORING

- Autonomy up to 72 hours
- UAV flight up to 45 minutes
- UAV charging 120 minutes
- Take-off and landing in waves up to sea state 5

SEARCH AND CONTROL

- People search and identification 24/7
- Water areas, coastal lines and marine traffic
- Underwater objects
- Border protection

Specifications

Platform		UAV group	
Unmanned catamaran	length 6000 mm, width 2500 mm, height 2500 mm	UAVs	integrated quadcopters, up to 10 (depending on mission)
Hybrid power engine	autonomy up to 72 hours	Maximum flight time	45 min
Displacement	1.5 t	Flight range	up to 10 km
Maximum payload weight	0.5 t	Full charge time	120 min
Speed	15 knots	Payloads (electromechanical winch)	
Temperature range	−35 to +60 °C	Water analysis	SpectroTRACER Aqua (Bertin GmbH)
Radio channel range (line of sight)	up to 60 km	Replaceable sensors	pH, temperature, salinity, pollution
Cameras		Radiation detection and monitoring	Mission Support α, β, γ detectors
Day and night vision, real time + zoom	8 video cameras 1920×1080; 2 thermal imaging cameras; 2 plug-in video cameras	Chemical detection	TIC and CWA detectors
		Sampling	samplers
		Winch	modular electromechanical, cable up to 100 m

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