



POLIMASTER[®]
Radiation Detection Technologies

ADVANCED RADIATION DETECTION EQUIPMENT

- **Electronic Dosimeters**
- **Personal Radiation Detectors**
- **Spectroscopic Personal Radiation Detectors**
- **Hand-held Radiation Detectors**
- **Radioisotope Identifiers**
- **Portal Radiation Fixed and Deployable Monitors**
- **Combined Gamma Radiation and Chemical Agent Detectors**
- **Automated Personal Dosimetry System**
- **Automated Calibration System**

Electronic Dosimeters

Polimaster direct-reading electronic dosimeters are designed for dose equivalent and dose equivalent rate measurements with alarm to warn once preset threshold levels are exceeded. These instruments are compact and light-weight, feature an extended battery life and non-volatile memory to record and save data which can be downloaded via Bluetooth/IrDA/USB/RF channels to user's PC for further processing and analysis.

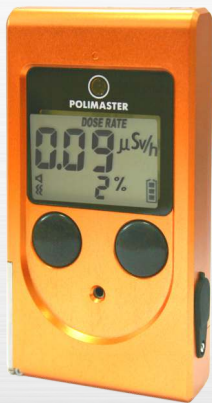
ELECTRONIC DOSIMETERS



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PM1211

A new series of gamma-radiation dosimeters PM1211 is designed as an ambient dosimeters. These dosimeters measure the ambient dose equivalent rate (DER) and ambient dose equivalent (DE) of gamma and X-ray radiation, record data in non-volatile memory, have visual, audible and vibration alarms.

PM1211 is a basic model of the instrument

PM1211-01 is equipped with USB and Bluetooth 4.0

PM1211-02 is equipped with GPS receiver and have rechargeable battery

PM1211-03 is equipped with Bluetooth 4.0, GPS receiver and rechargeable battery

Dose rate range: 0.1 μ Sv/h - 100 mSv/h

Dose range: 1 μ Sv - 25 Sv

Energy range: 48 keV - 3.0 MeV

PM1300

Compact direct-reading electronic personal dosimeter is designed for the real-time control of radiation situation and measurement of personnel exposure. The instrument may be used both for autonomous work and as a part of automated personnel exposure monitoring system. Complies and exceeds the requirements of IEC61526 and ANSI 42.20 standards.

Dose rate range: 1 μ Sv/h - 10 Sv/h

Dose range: 1 μ Sv - 20 Sv

Energy range: 15 keV - 20 MeV

Operating temperature: -20 up to +70 °C

PM1603A/PM1603B PM1604A/PM1604B

Compact dosimeters designed to measure ambient or personal dose and dose rate in a wide range. These devices are suitable for use in the harshest weather conditions and are available in wrist-watch or clip fixture.

Dose rate range: 0.01 μ Sv/h - 6.5 Sv/h (PM1603A/PM1604A)

0.01 μ Sv/h - 13 Sv/h (PM1603B/PM1604B)

Dose range: 0.01 μ Sv - 9.99 Sv

Energy range: 0.048 - 3.0 MeV (PM1603A/PM1603B)

0.048 - 6.0 MeV (PM1604A/PM1604B)

Operating temperature: -20 up to +70 °C

PM1605/PM1605BT

Series is designed to withstand extreme environmental hazards such as limited visibility, raised noise, high temperatures, exposure to sea water, shock and falls. Metal enclosure is resistant to influence of temperature up to 100°C for 2 minutes, and to water immersion (including salt-water) at the depth of 1 meter for not less than 2 hours. Control panel with two big buttons allows the use of the instrument in protective gloves. PM1605BT are equipped with Bluetooth 4.0 and can transmit data in the real time via an application on a smartphone.

Dose rate range: 0.1 μ Sv/h - 10 Sv/h

Environmental protection: IP68

Large, easy-to-read backlit LCD display

Dose range: 1 μ Sv - 100 Sv

Operating temperature: -30 up to +65°C

AA battery, lifetime 12 months

PM1610 PM1610-01 PM1610A PM1610A-01

Compact personal dosimeter for measurement of continuous and pulse X-Ray and gamma radiation. This instrument is powered from the built-in rechargeable battery and is equipped with vibration, audio and visual alarms. Easy PC connectivity via USB.

In addition, PM1610-01/PM1610A-01 versions can be used with wireless readers compliant with ISO 15693.

Dose rate range: 0.1 μ Sv/h - 12 Sv/h

Dose range: 0.001 μ Sv - 12 Sv (PM1610/-01)

0.001 μ Sv - 24Sv (PM1610A/-01)

Energy range: 0.02 - 10 MeV



PM1610B PM1610B-01

PM1610B is a special modification of PM1610 series with LR03/AAA battery. Battery life-time is up to 20 days of continuous work. The device provides PC communication via USB.

In addition, **PM1610B-01** version can be used with RF wireless readers in compliance with ISO 15693.

Dose rate range: 0.1 $\mu\text{Sv/h}$ - 12 Sv/h

Dose range: 0.001 μSv - 24 Sv

Energy range: 0.02 - 10 MeV

PM1621/PM1621A PM1621M/PM1621MA

Professional X-ray and gamma personal dosimeters work in a wide energy range from 10 keV to 20 MeV. Models PM1621M/MA feature additional search mode and vibration and light alarms.

Dose rate range: 0.1 $\mu\text{Sv/h}$ - 0.1 Sv/h (PM1621/PM1621M)

0.1 $\mu\text{Sv/h}$ - 1.0 Sv/h (PM1621A/PM1621MA)

Dose range: 1.0 μSv - 9.99 Sv

Energy range: 0.01 - 20 MeV

Operating temperature: -40 up to +60 °C

Personal Radiation Detectors

Highly sensitive Personal Radiation Detectors (PRDs) are designed for detection and localization of gamma and neutron radiation sources/emissions as well as dose rate measurement. The instruments are equipped with CsI(Tl) detectors for detecting gamma radiation as well as LiI(Eu) or He-3 based detectors for neutron radiation detection. The PRDs are equipped with non-volatile memory, IR/Bluetooth/USB interface for the connection with the PC, audio and external/internal vibration alarms. Instruments are compliant with most of IAEA (ITRAP), ANSI N42.32, ANSIN42.33 (1) and IEC 62401 requirements.



Sensitivity for ^{137}Cs : 100 cps/($\mu\text{Sv/h}$) or better

Gamma channel energy range: 0.033 - 3.0 MeV

Neutron channel energy range: thermal - 14 MeV (for PM1401GNM, PM1703GNA-II)

Dose rate range: 0.01 - 99.99 $\mu\text{Sv/h}$

PM1401MA/GNM

Gamma (PM1401MA) and gamma-neutron (PM1401GNM) personal radiation detectors are sensitive and user-friendly instruments with a robust metal body. That makes them ideal for use in harsh environments. PM1401GNM gamma-neutron model is additionally equipped with He-3 based detector and Geiger-Mueller tube that provides high dose rate coverage (up to 10 Sv/h).

A new generation gamma PRD has improved search algorithm and NORM suppress function. Suppress NORM implemented algorithm allows excluding alarm signal when the natural gamma background value increases and Naturally Occurring Radioactive Materials (NORM) are detected.

Compact, highly sensitive gamma personal detectors in a light-weight shock-proof plastic case are equipped with audio, visual and vibration alarms.



PM1703MA-II PM1703MA-II BT

The instrument is used for detection and localization of **gamma** radioactive sources and measurement of dose equivalent rate (DER). The instrument can communicate with PC via USB and Bluetooth (**PM1703MA-II BT**).

PM1703GNA-II PM1703GNA-II BT

The instrument is used for detection and localization of **gamma-neutron** radioactive sources and measurement of dose equivalent rate (DER). The instrument can communicate with PC via USB and Bluetooth (**PM1703GNA-II BT**).

PM1703MO-II BT

The instrument is used for detection and localization of **gamma** radioactive sources and measurement of dose equivalent rate (DER).

Extra GM counter provides extended measurement range of gamma radiation DER and DE.

The instrument can communicate with PC via USB or Bluetooth.

PM1703GNA-II MBT

The instrument is used for detection and localization of **gamma-neutron** radioactive sources and measurement of dose equivalent rate (DER).

Extra GM counter provides extended measurement range of gamma radiation DER and DE.

The instrument can communicate with PC via USB or Bluetooth.

Hand-held Radiation Detectors and Radioisotope Identifiers

The multifunction instruments equipped with the multiple detectors (internal or external) are designed for search, localization, measurement and identification of various radiation sources.



PM1403

Multifunctional, networked mobile monitor for measuring all types of ionizing radiation and spectrum collection of gamma emitting sources with built-in GPS and GPRS modules.

The device is equipped with a built-in CsI(Tl) detector for the detection and localization of gamma radiation sources and reliable identification of radioisotopes. In addition, the device has five external probes for detection of alpha, beta, gamma and neutron radiation.

Moreover, these smart probes can be used as an integrated part of the radiation control system.

Main unit γ -search and spectrometry (CsI)

Sensitivity for ^{137}Cs : $100 \text{ s}^{-1}/(\mu\text{Sv/h})$

Sensitivity for ^{241}Am : $300 \text{ s}^{-1}/(\mu\text{Sv/h})$

Dose rate range: $0.1\text{-}100 \mu\text{Sv/h}$

BDG2 γ -measuring (GM- tube)

Dose rate range: $0.1 \mu\text{Sv/h} - 10 \text{ Sv/h}$

Energy range: $0.03 - 3.0 \text{ MeV}$

BDG3 γ -measuring and search (CsI)

Dose rate range: $0.1\text{-}40 \mu\text{Sv/h}$

Sensitivity for ^{137}Cs : $200 \text{ s}^{-1}/(\mu\text{Sv/h})$

Energy range $0.05 - 3.0 \text{ MeV}$

BDN neutron search (^3He -tube)

Dose rate range: $1 - 5000 \mu\text{Sv/h}$

Energy range: thermal - 14.0 MeV

BDAB α - β measuring (proportional counter)

α -flux density measurement range: $1\text{-}5 \cdot 10^5 \text{ min}^{-1} \text{ cm}^{-2}$

β -flux density measurement range: $10\text{-}10^6 \text{ min}^{-1} \text{ cm}^{-2}$

Energy range: $0.15 - 3.5 \text{ MeV}$

PM1401K-3/PM1401K-3M/PM1401K-3E

Devices are designed for the detection of the gamma and X-ray (photon), neutron, alpha and beta radiation sources as well as for gamma spectra accumulation and precise measurement of gamma dose rate and levels of contamination of surfaces with alpha and beta irradiating sources.

PM1401K-3/K-3M identification results appear on a bright, easily read color LCD display.

PM1401K-3 equipped with alpha, beta, gamma and neutron detectors.

PM1401K-3M equipped with alpha, beta and gamma detectors.

PM1401K-3E equipped with alpha, beta, gamma and neutron detectors. Built-in identification is disabled (only spectrum accumulation is possible).

Search γ -channel energy range: $0.06 - 3.0 \text{ MeV}$

Sensitivity on ^{137}Cs : $200 \text{ cps}/(\mu\text{Sv/h})$ or better

Measuring γ -channel energy range: $0.015 - 15 \text{ MeV}$

Dose rate range: $0.1 - 10^5 \mu\text{Sv/h}$

α -flux density measurement range: $15.0 - 10^5 \text{ min}^{-1} \text{ cm}^{-2}$

β -flux density measurement range: $6.0 - 10^5 \text{ min}^{-1} \text{ cm}^{-2}$

Neutron search sensitivity: $0.04 \text{ s}^{-1} \text{ cm}^2$ ($1.0 \text{ s}^{-1} \text{ cm}^2$ with a moderator) – for Pu- α -Be

$2.5 \text{ s}^{-1} \text{ cm}^2$ – for thermal neutrons

Combined Gamma Radiation and Chemical Agent Detectors

These instruments are designed to detect gamma radiation sources and chemical agents. Instruments are equipped with a Geiger-Muller detector for radiation detection and ionizing chamber with a beta source for chemical agent detection. Compact and lightweight these instruments are ideal for radiation and chemical survey.



PM2012M/PM2012MA/PM2012MB

The device detects and differentiates organophosphorous and arsenic-containing compounds, measures gamma dose and dose rate and provides audible, visual alarms when preset thresholds are exceeded. Its rugged metallic body makes this detector suitable for military applications. Three-level indication for chemical agents. Instrument is powered from one battery of D size, 1.5 V or mains 9–36 V by cable or power supply unit 220V/12V.

PM2012M/MA transmits all recorded data to a PC via IR channel for data processing and analysis.

PM2012MB transmits all recorded data to a PC via USB and Bluetooth 4.0.

NATO Stock Number 6665-33-2087892

Gamma channel:

Energy range: $0.048 - 3 \text{ MeV}$

Dose rate range: $1 \mu\text{Sv/h} - 10 \text{ Sv/h}$

Dose range:

$0.01 \mu\text{Sv} - 10 \text{ Sv}$ (PM2012M)

$0.01 \mu\text{Sv} - 15 \text{ Sv}$ (PM2012MA, PM2012MB)

Chemical module sensitivity:

Organophosphorous substances, no less:

$5 \cdot 10^5 \text{ mg/l}$ for 15 s

Arsenic-containing substances, no less:

$2 \cdot 10^4 \text{ mg/l}$ for 5 s

Contraband Detector

Contraband Detector of non-destructive examination is a portable security instrument that detects hidden items (drugs, explosives, weapons, currency, etc.) within the closed cavities of transport vehicles, freight containers and other objects.



PM2030

Enables to detect hidden items (depth of scanning up to 150 mm) and search for gamma radiation sources. The instrument provides a wireless sound alarm and the vibration alarm from the handle for covert detection and for work in noisy areas.

When scanning behind 1 mm steel partition or 15 mm wood partition, with the speed no more than 5 cm/s, PM2030 detects hidden bars:

- aluminium 30x30x30 mm
- polyethylene 70x70x20 mm
- steel 30x30x10 mm

Radiation Fixed and Deployable Monitors



These types of detectors are widely used for the detection of radioactive materials that may be illicitly trafficked or unintentionally moved across international land borders, sea ports, airports, and similar locations, as well as at recycling plants or controlled access facilities. Fixed and deployable installed monitors are intended for radiation monitoring of vehicles, pedestrians and cargos. The networking capability allows for collecting and transferring data to a remote control center.

PM5000B

Fixed-installed portal monitors for radiation monitoring of vehicles and trains at border crossings. These monitors are capable of detecting gamma and gamma-neutron radiation sources. Modular design of the monitors allows for flexible system configuration according to customer's specification. The system is completed with modern surveillance cameras, remote control and software.



PM5000P

Fixed-installed portal monitor for radiation monitoring of pedestrians, luggage and commodities at different check-points. These monitor is capable of detecting gamma and gamma-neutron radiation sources. The Monitor is suitable both for indoor and outdoor installation. The system is completed with modern surveillance cameras, remote control and software.



PM5000C-05M

Deployable portal monitor for radiation monitoring of vehicles, pedestrians and luggage at temporary check-points. High deployment speed, easy transportation (three plastic hermetic cases), indoor and outdoor installations (IP67), audible and light alarms. Monitor transport set consists of three small-size, light weight, convenient hermetic cases.

The system can be installed and put in operation within a short period of time even in harsh environment and extreme climatic conditions.

Mobile Systems

The aim of a Mobile Detection System and Mobile Laboratory is to detect, localize, measure and identify radioactive and nuclear materials at the "green" border and at border checkpoints, where there are no fixed Radiation Detection Solutions within the framework of controlling the illicit traffic of the radioactive and neutron materials.



PM6000

PM6000 is a specialized vehicle for expert and emergency response teams, fully equipped with all necessary radiation detection equipment including transportation and storage containers. Moreover, it can be equipped with other instruments upon client request (verification and optical equipment, explosives detectors, etc.)



PM6100

PM6100 is an integrated mobile detection solution for the establishment of temporary radiation control posts to prevent illicit trafficking of radioactive sources and nuclear materials.

Primary designation of PM6100 is automatic monitoring of radioactive sources and nuclear materials in moving or static objects such as vehicles, pedestrians and cargos.

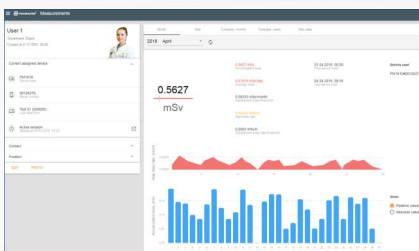
The system is mounted on the chassis of a van and composed of 3 compartments: driver, operator and technical.

AUTOMATED PERSONAL DOSIMETRY SYSTEM

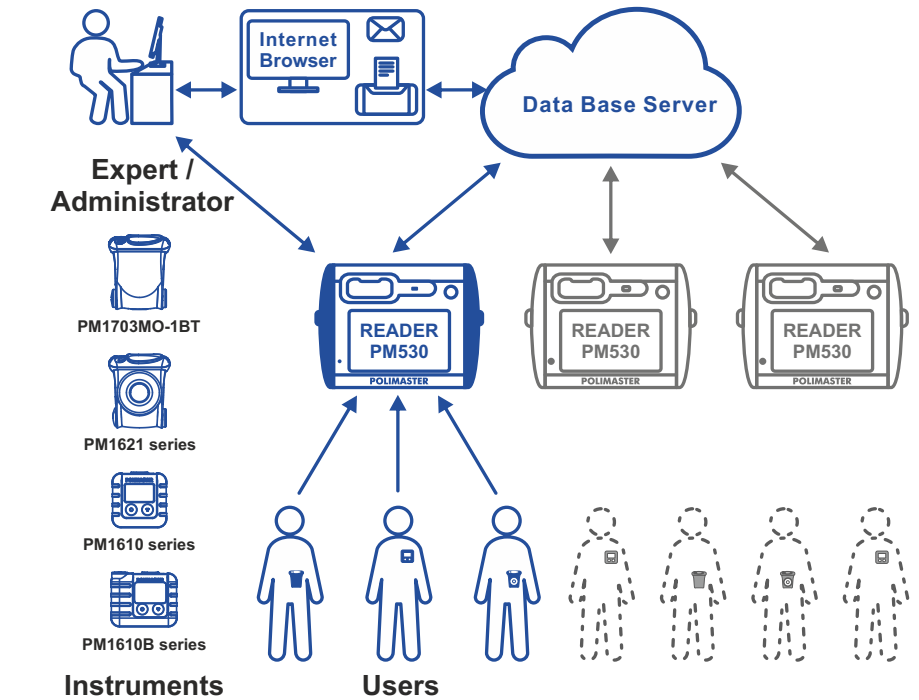
APDS PM530 represents a web-based complex solution, designed for automatic collection of personnel radiation exposure information and management of the personnel exposure data base.

APDS PM530 is a hardware and software complex consisting of the server software and Reader PM530-DC. The Software allows to process and store the information on the accumulated dose equivalent (DE) of the personnel in the database. The Reader is designed to acquire information of the dosimeters, set and change the DE thresholds, set up the dosimeters user settings.

User	Accumulated dose, mSv	Max dose rate, mSv/h
User 2	0.0125	0.00018
User 3	0.00027	0.00011
User 1	0.5627	0.00033



System architecture



Features

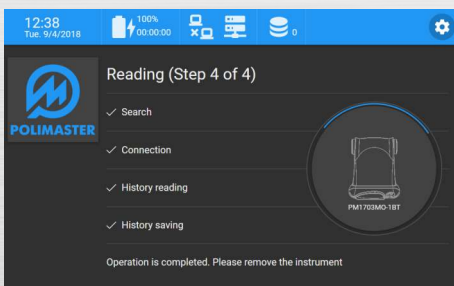
- Web-cloud or LAN data base server technology
- Formation and correction of a tree-structured hierarchal data base with access restrictions
- Management (addition, changing, deletion) of users, assigning roles (User / Expert / Administrator) as well as their inclusion into department / organization
- Dynamic control of the dosimeters by the corresponding department
- Formation of radiation exposure reports

Specifications

- Compatible with Dosimeter Reader PM530-DC and Windows 10 based devices (Laptop, PC, Tablet PC)
- Integration of up to 10 000 dosimeters
- Indefinitely long storage time of any volume data — Web-cloud-technology
- Formation of structured hierarchal data base with appropriate access restrictions (for example, department / organization / all together) by the administrator

	Windows 10 devices (Laptop, PC, Tablet PC)				
	Dosimeter Reader PM530-DC		PM1211*	PM1300*	PM1605* PM1605BT*
Dosimeter	PM1703MO-1BT PM1621	PM1610 PM1610A PM1610B			
Communication protocol	IrDA	USB	USB Bluetooth	USB RF	USB Bluetooth

* May be integrated into the system upon customer's request



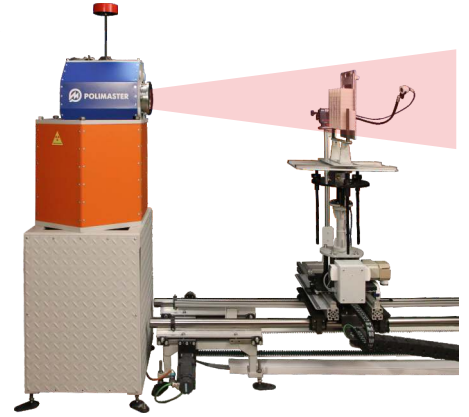
AUTOMATIC IRRADIATION CALIBRATION SYSTEM PM9100/PM9101

Automatic Irradiation Calibration System PM9100/PM9101 is designed for the calibration, verification and quality assurance of a wide range of radiation measurement and test equipment of various manufacturers. PM9100/PM9101 forms the reference radiation fields compliant with ISO 4037-01 requirements that allows to use it as a reference standard system.

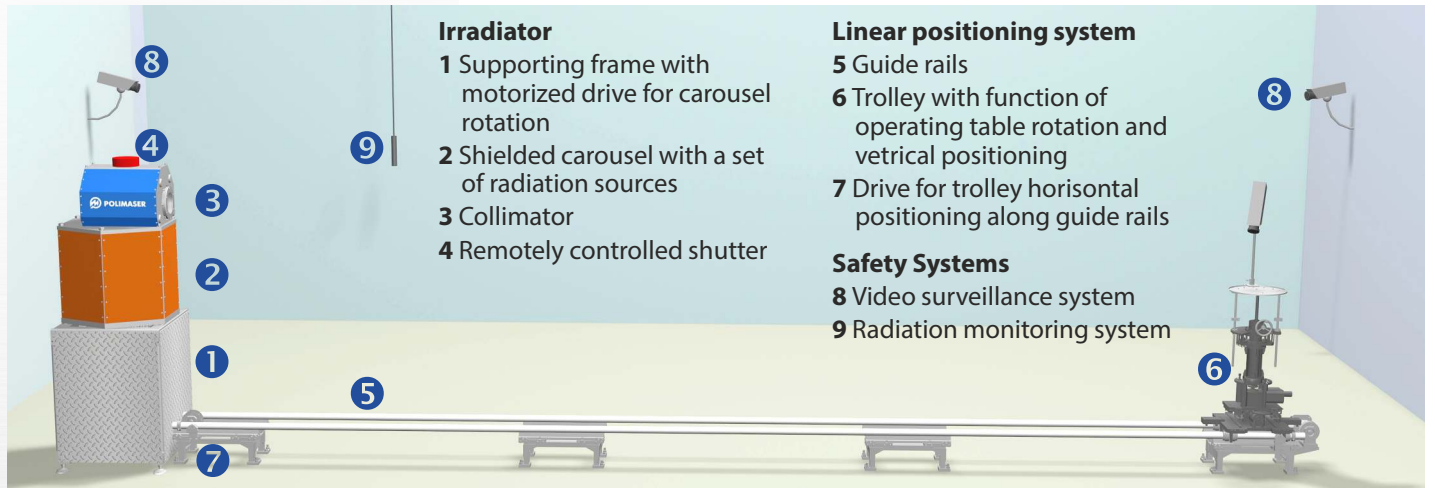


Features

- Contains up to 6 radioactive sources with different activities
- Includes customized collimators
- Provides maintenance free service life
- Supports completely automated operation controlled via LAN interface
- Includes emergency button to return source in storage position manually
- Returns the source in a safe storage position in case of power failure



System layout in the irradiator room



Irradiator

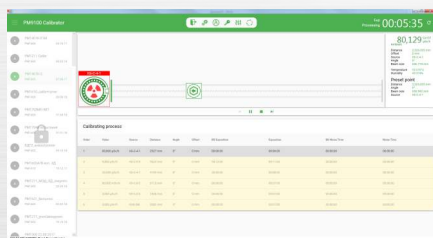
- 1 Supporting frame with motorized drive for carousel rotation
- 2 Shielded carousel with a set of radiation sources
- 3 Collimator
- 4 Remotely controlled shutter

Linear positioning system

- 5 Guide rails
- 6 Trolley with function of operating table rotation and vertical positioning
- 7 Drive for trolley horizontal positioning along guide rails

Safety Systems

- 8 Video surveillance system
- 9 Radiation monitoring system



Calibration Certificate		№ 00132889/0416-1 Date: 2016	
Calibrated by:	Polmaster Ltd., 51 F. Skirnyj Str., Minsk 220141, Belarus www.polmaster.com, polmaster@polmaster.com		
Customer:	Polmaster Europe SAS, Ezerov Str., 4, Dirdiškašiai, Nemėžio sen., LT-13264 Vilnius, Lithuania		
Item:	K-Ray and Gamma Personal Dosimeter PM1630	Environmental:	Temperature 22°C
Item Serial No.:	00132889	Humidity:	60%
Calibration performed:	29.04.2016	Barometric pressure:	98.5 kPa
Calibration method:	manufacturer calibration method	Radiation background:	0.1 µSv/h

This document certifies that the identified above item was calibrated and verified in ¹³⁷Cs reference radiation field using the following Calibration Standards:
 - Gamma Calibration System №1 certified on 01.06.2014, Certificate No. 48-48910/1 by BIRMI;
 - Gamma Calibration System №2 certified on 01.06.2014, Certificate No. 48-48910/2 by BIRMI.
 The above-mentioned standards are traceable to IAEA/BIPM standards and comply with ISO/IEC 17025:2005(1) and ISO 9001:2008(1). BIRMI is a network member of IAEA/WMO/SIB.

Calibration results			
Dose Equivalent Rate			
Conventional true dose equivalent rate value, H_{eq}	Reading, H_i	Relative error of measurement, Δ_i , %	Limit of intrinsic relative error of measurement, %
8.000 µSv/h	8.620 µSv/h	6.5	±15.18
80.000 µSv/h	83.600 µSv/h	4.38	±15.02
800.000 mSv/h	791.440 mSv/h	-1.07	±15
8 Sv/h	8.062 Sv/h	0.78	±15

The relative error of measurement is within the limits of permissible intrinsic relative error of measurement given in the technical specification of the item operation manual.

Head of Calibration Laboratory
Name: _____
Signature: _____

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Specifications

- Number of sources in storage holder: up to 6 (²⁴¹Am, ¹³⁷Cs, ⁶⁰Co, etc.)
- Maximum activity of source:
 - PM9100: 9.6x10¹³ Bq (¹³⁷Cs), 7.2x10⁹ Bq (⁶⁰Co)
 - PM9101: 1.3x10¹² Bq (¹³⁷Cs), 7.2x10⁸ Bq (⁶⁰Co)
- Exposure rate range (¹³⁷Cs):
 - PM9100: 24 µR/h – 2530 R/h
 - PM9101: 24 µR/h – 34.1 R/h
- Dose equivalent rate range (¹³⁷Cs):
 - PM9100: 0.2 µSv/h – 26.5 Sv/h
 - PM9101: 0.2 µR/h – 0.4 Sv/h
- Collimator options: ISO 4037-01, Ø60 x 150 mm, Ø90 x 150 mm, custom
- Accuracy of reference radiation field
 - typical: 5%
 - by request, no more than 1.5 – 3%
- Dose rate, when sources are in storage position, no more:
 - 10 µSv/h on the irradiator surface
 - 0.5 µSv/h at 1 meter distance from the irradiator surface

Polimaster is a well-known developer and manufacturer of radiation detection equipment since 1992 with its own regional manufacturing and distribution centers in Western and Eastern Europe and North America.

Polimaster expertise is implemented in design, development and production of high-end electronic radiation detection equipment.

Polimaster offers a wide range of radiation detection equipment from compact personal radiation dosimeters to large fixed-installed radiation portal monitors. This equipment is capable of detecting, locating, measuring and identifying sources of radioactive emissions in different environments.

Main applications of Polimaster products include but not limited to:

- **Prevention of illicit trafficking of radioactive and nuclear materials**
- **Prevention, detection, and response to terrorist or other malicious acts with the use of radioactive materials**
- **Protection of nuclear facilities and transport against sabotage**
- **Emergency response to accidents involving radioactive or nuclear materials;**
- **Monitoring occupational exposure for professionals working with radiation sources in health care facilities, research institutes, nuclear reactors and their support facilities, nuclear weapon production facilities**
- **Controlling of radioactive materials in scrap metal at recycling facilities and other industrial or domestic waste.**

Main users of our equipment include but not limited to:

- **Customs and border patrol**
- **Military**
- **Police**
- **First responders and firefighters**
- **Security and safety agencies**
- **Nuclear power plants**
- **Research laboratories**
- **Nuclear medicine**

For more information and detailed technical specifications please contact our offices in your region or visit our global web site at www.polimaster.com



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