

ROTEM

Rotem Industries Ltd.

PERFECTION
IN DETECTION



Radiation Detection Portfolio



The background of the slide features a photograph of three large, grey, hyperboloid cooling towers of a nuclear power plant. The towers are set against a sky with soft, colorful clouds in shades of blue, purple, and pink, suggesting a sunset or sunrise. In the foreground, there are dark silhouettes of trees and a body of water reflecting the sky. The entire image is overlaid with a semi-transparent white rectangular box containing the company logo and text.

ROTEM

Rotem Industries Ltd.

Rotem Industries Ltd. is an Israeli Government-owned company specializing in the commercialization of advanced technologies and sciences in a multidisciplinary environment.

The company focuses on state-of-the-art innovations and reaps the technical harvest of scientific studies and research for the benefit of the academy, industry, defence and commerce worldwide.

The Radiation Detection Division, with over 50 years experience, specializes in the development, production and marketing of radiation detection equipment and systems for Nuclear Power Plants, Nuclear Medicine departments and the Homeland Security market .

Rotem's equipment is CE certified and meeting the highest relevant standard in the industry.

Rotem Radiation Detection Division

DRM-3000 Stationary Monitoring System with integrated Telemetry



0.01 μ Sv/h to 0.1 mSv/h
1 μ R/h to 9.99 mR/h

0.1 μ Sv/h to 10 Sv/h
10 μ R/h to 1000 R/h

Applications:

- Outage and routine fixed monitor
- Portable access control to/from High Rad. Areas
- Ideal for plant surveying

Features:

- IP-65 Hardened, High Impact Plastic Casing
- Supports 1 internal and 3 external detectors
- Auto recognition of ALL Rotem, and other detectors
- Wall or tabletop mounted
- Large 7" HD graphic Display with Status Icons
- Background color on Display reflects dose rate according to thresholds
- Multicolored LED provides visual reference to threshold levels
- Reach back capabilities (BT/XBee)
- High Volume buzzer
- Up to 100 meter cable between Detector and Meter
- WIFI/XBee wireless capabilities

TelePole II : Detector with a meter on an extendable pole



0.5 μSv/hr to 10 Sv/hr
50 μR/hr to 1000 R/hr

Applications:

- Supports ALARA principles by allowing operators to obtain readings 4m (13ft) away from the source
- Routine survey instrument with storage & downloading capabilities
- Readings of hard-to-reach areas (e.g. vehicle surveys, elevated piping, etc.)

Features:

- Color Coded Display indicating Dose Rate field
- Positive quarter lock, lighter Telescopic Pole (Aluminum or Carbon Fiber)
- Stand-alone SMART detectors for quick connect and independent calibration.
- Built-in reach back wireless capabilities (BT and/or Xbee)
- IP-67 version available
- Available with several types of external detectors
- LED flash light on detector's head

Ion Chamber IC3 Portable Survey Meter



1 μSv/h to 1 Sv/h
0.1 mR/h to 100 R/h

Applications:

- Outage and routine requirements
- ALARA Hot Spot tracking mode
- Ideal for plant surveying
- Testing X-Ray pulses from 50 nano seconds

Features:

- Ion chamber (350 cc) survey Meter
- Auto ranging, digital and analog display
- Combines fast response and readout stability
- Data logging capability
- User adjustable threshold alarm
- IRP-51-H*(10) version available
- Sleep Mode with Auto wake up (long battery Life)
- Open Air or Pressurized versions available
- Reach back capabilities (BT/XBee)

Portable Survey Meters

RAM ION Digilog Portable Ion Chamber Survey Meter



1 $\mu\text{Sv/h}$ to 500 mSv/h
(0.1 mR/h to 50 R/h)

Applications:

- Outage and routine requirements
- ALARA Hot Spot tracking mode
- Ideal for plant surveying
- Testing X-Ray instrumentation for safety

Features:

- Ion chamber (500cc) survey Meter
- Auto ranging, digital and analog display
- Combines fast response and readout stability
- Data logging capability
- User adjustable threshold alarm
- IRP-51-H*(10) version available

RAM GAM-1: Portable gamma dose rate & dose survey meter



0.5 $\mu\text{Sv/h}$ to 40 mSv/h
0.05 mR/h to 4 R/h

Applications:

- Personal dose equivalent/dose rate verifications for operations, HP and chemistry personnel.
- HP emergency planning kits "High rad" entrance requirements (redundant to dosimeters).

Features:

- Detector: Energy compensated GM tube.
- Audible click, LED flash.
- Smoothed digital display with fast response.
- Weighs less than 0.5 kg.
- Self-test, low battery and threshold alarm, hands-free use.
- Ruggedized casing
- IRP-51-H*(10) version available.

RAM DA-2000 / RAM DA-3 2000



0.5 $\mu\text{Sv/h}$ to 1 Sv/h
50 $\mu\text{R/h}$ to 100 R/h

Applications:

- Nuclear Power Plants, Nuclear and Medical research centers, H.P. Departments

Features:

- Various detectors can be connected and instantly recognized
- Capable of displaying several units of measurement (CPS, CPM, $\mu\text{Sv/h}$, mR/h...)
- Optional Internal Energy compensated GM tube (DA-3 version)
- Data logging capability

Complementary Detectors:

GM-40 series

- For gamma radiation over a very wide range
- Based on different types of energy compensated GM tubes
- Extended hook up cable of up to 100 meters can be used

IC-10 Detector

- Wide range gamma, x-ray and beta radiation measurement
- Based on 0.5 liter atmospheric ionization chamber
- Uses special features and advanced technology

PM-11 Detector

- Scintillation probe for high energy gamma radiation detection
- NaI 2" x 2" diameter scintillator
- Single channel analyzer (SCA)

And these are just a few...



WebiSmarts - Area and Stack Monitoring System

The WebiSmarts system is designed to measure and collect radiation data automatically and continuously from cyclotron facilities, radiochemistry laboratories, treatment rooms and PET Centres. Radiation is monitored by a variety of detectors and results are transferred through a series of meter to a central computer located in the control room.

The WebiSmarts system is installed in over 340 sites worldwide and is recognized by cyclotron manufacturers (GE, IBA and others) as the leading, most economical system available today.

PET monitoring and Nuclear Medical Departments

Our Radiation Monitoring System is based on field proven, highly reliable radiation detectors, TCP/IP Based Meters and Web based Software. The system provides real time on line radiation levels. The data is used for both radiation safety and improving the site operation.



Features:

- Stack Monitoring with quantitative, online activity release measurement.
- Area Monitoring.
- Production Monitoring.
- Comprehensive radiation analysis software.
- Site Safety Control.
- Automatic Activity Release Report.
- Automatic calculation of the total activity for selected period of time.

DPU-3 Stationary Monitoring System with integrated Telemetry

IP Based Data Processing Unit capable of supporting 1 x Internal Detector and 3 x external detectors.



Features:

- IP-65, Hardened, High Impact Plastic Casing
- Supports 1 internal and 3 external detectors
- Auto recognition of ALL Rotem, and other detectors
- Wall or Tabletop mounted
- Large 7" HD Graphic Display with Status icons
- Background Color on Display reflects dose rate according to thresholds
- Up to 100 m cable between Detector and Meter
- Advanced communication: TCP/IP, RS-485, Wi-Fi, Xbee...

GM-41 Detector

- Used in the Cyclotron vault and in the Hot Cells.
- Set to report activity and is useful to measure the activity before the material is moved out of the Hot cell into the Dose Calibrator. (dose and dose rate)
- **Measuring Range:** 1 $\mu\text{Sv/h}$ to 1 Sv/h (0.1 mR/h to 100 R/h)

GM-42 Detector

- Used in the Radiochemistry Lab, Control Room, Q.A. Dept, Radiopharmacy and other hot rooms to measure general radiation (dose and dose rate).
- **Measuring Range:** 0.1 $\mu\text{Sv/h}$ to 10 mSv/h (0.01 mR/h to 1 R/h)

Neutron Detectors

- Neutron Detector mounted in cyclotron vault according to regulator requirements in some countries.
- The neutron detector can be detached from the monitoring channel and connected to a RAM DA-2000 portable instrument to provide a combined portable survey instrument, for surveys and a fixed area monitor.

And many more....

WebiSmarts Coincidence Stack Monitoring System

The PM-11 Coincidence System comprises of a combination of four detectors operating in unison to detect very low emissions that occur only within the Exhaust Stack and provide online Isotope identification.

The data from the four detectors are combined into a single data string and displayed on each point on the map.

The Emissions Report reads the data from the PM-11 and the beta detectors and automatically assigns borders to each release.

PET monitoring and Nuclear Medical Departments

Emissions Report

The Emissions Report is part of the WebiSmarts System, dedicated to producing a complete effluent report per specified period (Daily, Weekly, Monthly YTD). Users can see and edit an updated accurate report of their plant's emissions at any time.



Detectors:



PM-11 Detector

- High Sensitivity detector used in the Exhaust Stack to measure radioisotope releases, down to the 10^{-7} $\mu\text{Ci/cc}$ regulatory requirements.
- Combined with online readings from the flow meter, provides full reporting on released concentration and activity amounts in both units of Bq/m^3 or nCi/ml



GM-42 Detector

- Provides coverage for larger releases where the PM-11 becomes saturated



Beta Detector

- The beta detector provides a unique capability of not only marking local releases but also identifying the isotope being released **in real time**.



Flow Meter

- The Flow Meter provides the data necessary to display units of Concentration (Bq/m^3 or nCi/ml) and Activity (Bq or nCi)

Remote Area Monitoring Systems

PM-33 Environmental Monitor

Extremely sensitive and very wide range gamma survey meter designed to measure dose radiation with a measuring range of between background to 15 mSv/h (1.5 R/h) with a sensitivity of 4,500 CPS per $\mu\text{Sv/h}$ (137Cs) provides an accurate dose rate till 10 $\mu\text{Sv/h}$ and the Meter compliments with an accurate dose rate till 15 mSv/h (1.5 R/h).



Features:

- Portable One Handed Operation
- Backlight
- Large, easy to read, color coded TFT Display
- Ergonomically designed to function using only 4 push-buttons
- Fast time responses while keeping the reading fluctuations minimal
- Low current consumption, more than 100 hours of operation with a 4 1.5 Volt AA batteries
- Weatherproof Suitcase available

Waterproof Area Monitors

The AMP instruments are used by more than 85% of NPP's in the U.S.A

Features:

- Portable One Handed Operation
- Backlight
- Large, easy to read, color coded TFT Display
- Ergonomically designed to function using only 4 push-buttons
- Fast time responses while keeping the reading fluctuations minimal
- Low current consumption, more than 100 hours of operation with a 4 1.5 Volt AA batteries
- Weatherproof Suitcase available
- Waterproof up-to 20m

AMP-50 Low Range Area Monitor



0.1 $\mu\text{Sv/h}$ to 40 mSv/h
10 $\mu\text{R/h}$ to 4 R/h

AMP-100 Medium Range



100 $\mu\text{Sv/h}$ to 10 Sv/h
10 mR/h to 1,000 R/h

AMP-200 High Range



10 mSv/h to 150 Sv/h
1 R/h to 15,000 R/h

AMP-300 Very High Range



1mSv/h to 300 Sv/h
0.1 R/h to 30,000 R/h

Environmental Monitoring

RAM R-200 Emergency Response Kit



0.1 $\mu\text{Sv/h}$ to 1 Sv/h
10 $\mu\text{R/h}$ to 100 R/h



Applications:

Designed to meet the ANSI N42.33 standard

- General purpose extremely rugged survey meter
- Portable or stand-alone radiation measurement station
- The RAM-R-200 is a rugged portable gamma meter designed according to Mil. Specs. for measuring wide range gamma radiation fields. The instrument is available with external smart probes: For alpha, beta and gamma radiation and contamination.

For Radiation: RG-40, RG-42 and RP-11 probes

For Contamination: RG-10, RG-12 and PA-100M probes

Features:

- Reliable telescopic rod including meter and external probes.
- Wide range internal gamma detector.
- Built-in RS-232 communication.
- Special operation modes like counting data acquisition.
- Automatic detector identification with each change of detector.

Complementary Detectors:

RP-11 Detector

Highly Sensitive gamma detector

- Radiation Detected: Gamma above 50 keV
- Scintillator: NaI(Tl) 2"Ø x 2" thick.
- Window of 1 mm. (0.04") Al.
- Sensitivity: 20,000 CPS/mR/h (137Cs)
- Count Rate Range: 0 to 50,000 CPS



RG-11 Detector

α, β, γ contamination detector

- Range: 0-100 MCPM
- Window: 1.5 – 2.0 mg/cm²
- Effective Area: 15.5 cm²
- Sensitivity: 3500 CPM/mR/h (137Cs), 500 CPM/Bq/cm² (90Sr90Y)



PA-100 Detector

Alpha contamination detector

- Type: Air proportional
- Window Thickness: 0.85mg/cm² aluminized window
- Effective area: 100 cm² (15.5 in²)
- Probe Efficiency (2 π): 18% (241Am)
- Surface Sensitivity: 530 CPM/Bq/cm² compensated in the meter to 100% to be 3000 CPM/Bq/cm²

And these are just a few...

RAM GENE-1 Mark II Contamination and Radiation Survey Meter



0 to 7,200 μ Sv/h
0 to 720 mR/h

Applications:

- Single hand operation of a combined dose rate and contamination meter without external detector
- Designed for use by untrained hospital personnel in case of a radiological incident to test incoming casualties for external radiation or ingested contamination.
- Sensitive to 32P and 35S isotopes.

Features:

- Includes radiological filter, compliant to IEC60846 and IEC60325 for ambient dose equivalent readings
- Detector: 1 $\frac{3}{4}$ " Pancake GM tube.
- Easy to read 7-segment LCD display panel.
- User selectable thresholds.
- Portable, lightweight, compact, one hand operation.
- Simple 3 push-button operation.



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