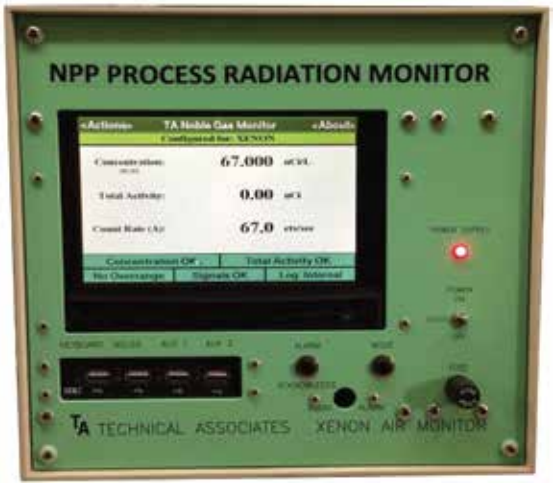

Electronics Cabinet

Nuclear Power Plant Process Monitor

Model FM-9W-IC-25-HT Ion Chamber System

Application

Area monitoring in and around nuclear reactors, reactor pools, hot cells, irradiators and other facilities handling radioactive materials or x-rays.

Features

- Highly Sensitive Gamma
- Meets Loca Requirements, (Loss Of Coolant Accident Prevention)
- All Plug-in Modular
- Rack Mounted Or Case
- Single Or Multiple Channel
- Sealed Ion Chamber For Excellent Radiation Response
  Local Or Remote Monitoring; Usb/ethernet Output
  Smart Electronics- On-board Microprocessor And Data-logging; Lcd Color Display
  User-settable Alarms – Audio & Visual, Units Of Measurement, Etc.
- Safety Class Qualified For Nuclear Power Plant
- **Detector: Ip67**
- **Electronics: Ip 63**

Description

- The FM-9W Series Radiation Monitors incorporate micro-processor driven smart electronics with color LCD display.
- On-board data-logging and user-adjustable parameters are featured. The plug-in modular construction, allows the addition of channels or functions.
- Ion chamber and circuit design prevent the system readings from falling below full scale during an over range condition.
- Both the detector and connecting cables are designed for optimal performance in strenuous conditions, such as in containment buildings.
- High level alarm can be set to any value desired. Alarm activation produces red light on front panel and piercing audio tone.
- Optional relay is also closed (or opened) for activation of remote alarms. Stand-by battery power is optional. Rack or case mounting is supplied.

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Nuclear Power Plant Process Monitor

Model FM-9W-IC-25-HT Ion Chamber System

General Specifications

Detector

Detector Type:	High pressurized ion chamber
Range:	
STANDARD: 5 decades	1 µGy/h to 0.1 Gy/h (100 µR/h to 10 R/h)
Range:	
OPTIONAL: 6 decades	1 µGy/h to 1 Gy/h (100 µR/h to 100 R/h)
Dose Rate Range:	100 nSv/h – 1 Sv/h (10 mR/h – 100 R/h)
Energy Rejection:	Thermal Neutrons, Alphas, Betas
Energy Range:	80 KeV to 7 MeV
Response Time:	0.5 to 3 seconds (slower at lower decade, faster at higher decade)
Environment:	Temperature: 165o C duration of 12 Hours
	Relative Humidity: Up to 95%
	Total Integrated Dose: 2 x 106 Gy
Accuracy:	<± 10%
Temperature Dependence:	<.2% / °C
Storage Temperature Range:	-40°C to 85°C

Electronics (LPDU) FM-9W

Read Out:	Alpha-Numeric	
Modes (Five):	Alert, High, High-High, Operation, Test	
- Alarms:	User Settable To Any Trigger Level	
Alarms – Beacon Assembly:	Green, Yellow, Red	
Low Level Alarm:	Automatic reset	
High Level Alarm:	High level alarm remains activated until ACKNOWLEDGE & RESET button is pushed.	
Alarm Clearance:	Automatic Reset	
Visual Alarm:	On-screen alarms and warnings. **Red**: High level. **Amber**: Low leve	
Environment:	**Temperature:**	Up to 50o C
	Relative Humidity:	Up to 95%
	Total Integrated Dose:	10 Gy

Weight & Dimensions:

Size:	12” x 12” x 12”
Weight:	26 lbs

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Nuclear Power Plant Process Monitor

Model FM-9W-IC-25-HT Ion Chamber System

FM-9W SERIES HUB

Electronics (RDU) FM-9W Series Hub:

Display:	Color LCD display
Display Read Out:	Digital Alpha-Numeric
Read Out Units:	Gy/h (User Settable)
Modes (Five):	Alert, High, High-High, Operation, Test
Alarms:	Green, Yellow, Red
	Warning, Equipment Failure, Over-Range, Detector Status
	Audio: 90 dB at 1 meter
	Visual: Red Flashing when Radiation Reaches Set Point
Alarm Acknowledgement:	Silent Mode Push Button
Low Level Alarm:	Automatic reset.
High Level Alarm:	High level alarm remains activated until ACKNOWLEDGE & RESET button is pushed
Alarm Clearance:	Automatic Reset
Visual Alarm:	On-screen alarms and warnings. **Red**: High level. **Amber**: Low level
Output:	USB/Ethernet
Power Supply:	120v 60 hz or 230v 50 hz or 24 volt DC, 2 Amp
Relay Output:	230v, 10 Amp

Outputs:

Buffered isolated 4-20 mA Logarithmic Analog Output Covering the full range of the monitor.

- Stable Within 1% Due to Drift, Temperature, or Line Variations
- Logic Level Signals
- Contact Closure or Opening
- HIGH Radiation Level Relay De-energized When Signal Exceeds Set Point
- Equipment Failure Relay De-energized with Equipment Failure

Weight & Dimensions

Size: 13.5" W X 11" H X 3.6"

Weight: 8 lbs

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Nuclear Power Plant Process Monitor

Model FM-9W-IC-25-HT Ion Chamber System

Optional

Junction Transfer Box:

- Power Supply Signal
- Detector Signal
- Communication Signal
- Wall or Rack Mount – User Specified

- **Weight & Dimensions:**
- **Size:** 8”x10”x4”
- **Weight:** 10 lbs

Optional Junction Transfer Box

Additional System Description

- Ion chamber is designed and built to withstand maximum temperature of 170°C and total integrated dose of 108 Rads.
- Materials which might be compromised by these conditions are excluded from chamber construction.
- Insulators in ion chamber are specifically mineral or treated glass materials.
- Internal chamber itself is made primarily of stainless steel.
- Cable insulation is mineral
- Length of this cable is determined by user when ordering.
- Electrometer box specially built essentially eliminates possibility of extracameral response.

FM-9W Electronics Module

- **Installation**
  FM-9W & FM-9W Series HUB — Wall or Rack Mount – User Specified
- **Processor:**
  FM-9W & FM-9W Series HUB — Advanced processor computer
- **High Voltage Power Supply:**
  FM-9W — Separately variable from 0 to 1500v. Extremely stable high voltage
- **Monitor Display**
  FM-9W & FM-9W Series HUB — Monitor shows both real-time concentration & accumulated dose
- **Read Out:**
  FM-9W — Data is shown alpha-numerically
  FM-9W Series HUB — Data is shown both graphically & alpha-numerically

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Nuclear Power Plant Process Monitor

Model FM-9W-IC-25-HT Ion Chamber System

IC-25 Sealed Ionization Chamber Detector

Sensitivity:	1.3x10-9 amps R/hr
Slope:	0.10% per 100 Volts or less
Insulation value for inner chamber:	>4T ohms
Capacitance of inner chamber:	<15 pF
Operating Voltage:	-200 to -800 V
Keep Alive Source:	10 µCi Cs-137

Pre-Amplifier

- The pre-amplifier is a current to voltage amplifier.
- Very high input impedance amplifier with high meg feedback resistors.
- Input current starts from sub-pico amp range.
- Amplified voltage drives a pulse generator feeding into the counter/display module.
- Ultra-quiet high voltage supply delivers a flat VDC as required.

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Nuclear Power Plant Process Monitor

Model FM-9W-IC-25-HT Ion Chamber System

Detector Cable

Mineral Insulated Cable:	2 each (HV and Signal)
Length:	5 to 15 feet; Sheath: 0.250" O.D. (User Specified)
Insulation:	High-purity (99.4%) Magnesium Oxide (MgO)
Melting Temp.:	2500°F, 1370°C
Max. Temp. in Air:	1650°F, 900°C

Additional Cable Specifications

Sheath Diameter:	±0.001 inch (±0.0025mm) or 1% of Nominal diameter, whichever is greater
Wall Thickness:	10% of sheath diameter as a minimum
Thermocouple Wire Calibration:	Meets Standard Limits of Error tolerance on calibration per ASTM E-230
Insulation Resistance At Room Temperature:	Greater than 1000 megohms@50VDC (sheath diameters of 0.080 inch/ 2.0mm and less), 1000 megohms@500VDC (sheath diameters of 0.120 inch / 3.0mm and greater)
High Temperature Insulation Resistance:	
0.040" diameter at 600°F (316°C)	One foot length will be in excess of 10 megohms
0.62" diameter & larger at 600°F (316°C)	One foot length will be in excess of 100 megohms
Dielectric Strength:	***These are reference values for application to conductor cable only.***
Data is at 60Hz and 70°F (21°C)	
Straight:	100VAC per mil of insulation thickness.
	Bent: - 45VAC per mil of insulation thickness.
Temperature: Insulation Range:	–450°F (-270°C) to 3000°F (1650°C) without change of phase or chemical reaction with adjacent metals.
Melting Temperature of Insulation:	4800°F (2640°C). Limiting temperature is associated with metals used.
Pressure:	Can withstand external pressure up to 50,000psi (3500kg/cm2).
Nuclear:	Insulation can be subjected to a mean neutron flux of 2 x 1011n.cm-2S-1@100°C and a total peak irradiation of 8 x 1018n.cm-2 with no significant change in characteristics.
Formability:	Can be bent around a mandrel having a radius equal to twice the sheath diameter without rupturing the sheath or causing loss of insulation resistance.
Fabrication:	Sheath can be welded, brazed, and soldered using normal care for the metals and thickness involved without changing insulation resistance.

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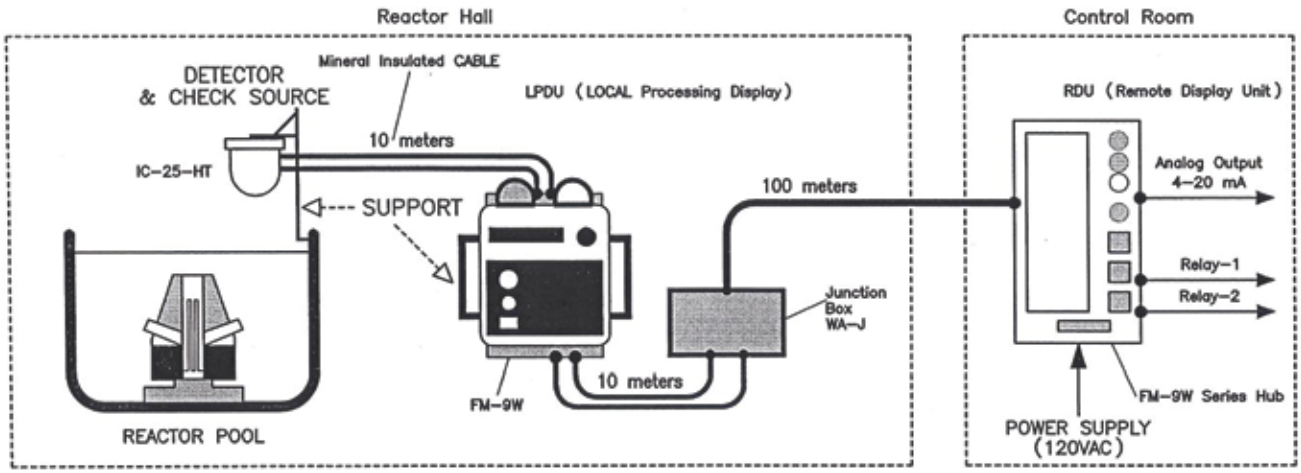
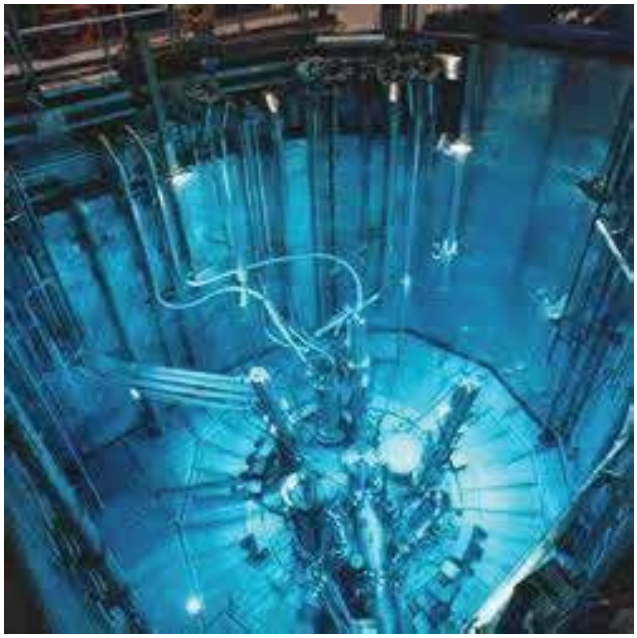
Nuclear Power Plant Process Monitor

Model FM-9W-IC-25-HT Ion Chamber System



Pool Surface Radiation Monitoring System



Reactor Pool

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