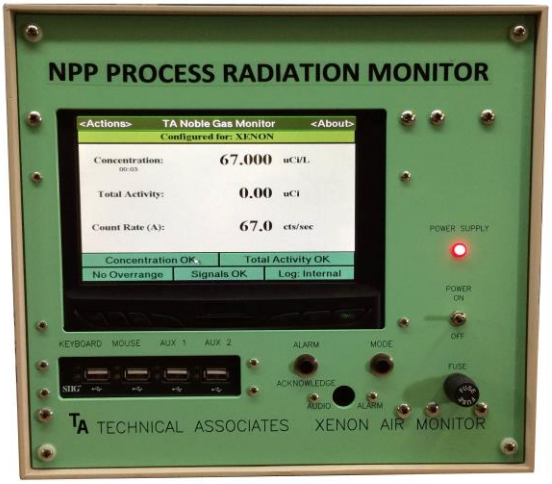
NUCLEAR POWER PLANT PROCESS MONITOR

Model FM-9W-IC-25 Ion Chamber

FEATURES:

- MEETS LOCA REQUIREMENTS,
  (Loss of Coolant Accident Prevention)
- ALL PLUG-IN MODULAR
- RACK MOUNTED OR CASE
- SINGLE OR MULTI-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, ECT.
- SAFETY CLASS QUALIFIED FOR NUCLEAR POWER PLANT



APPLICATION:

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

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 off full scale during an over range condition.
- Both the detector and connecting cable 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.

TA CBRN Real - Time Air & Water Specialists

TA **TECHNICAL ASSOCIATES** Divisions of US NUCLEAR CORP

OVERHOFF TECHNOLOGY

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GENERAL SPECIFICATIONS:

Range:	$1x10^{-3}$ to $1x10^{2}$ mSv/h (0.1 mR/h to 10 R); 5 decades
Energy range:	100 KeV to 6 MeV
Accuracy:	± 10% of indicated value
Response time:	0.5 to 3 seconds (slower at lower decade, faster at higher)
Display:	Color LCD display
Operating temperature:	-20°C to 50°C (90% RH main electronics) (100% RH detector & primary cable)
Maximum temperature:	150°C Ion chamber & first 5ft of cable
Temperature dependence:	<.2% / °C
Storage temperature range:	-40°C to 85°C
Radiation life:	10^{8} R Total Integrated Dose: Chamber and cable.
Output:	USB/ethernet
Power supply:	115v 60c/sec or 230v 50c/sec or 24 volt DC, 2 Amp
Relay output:	230v, 10 Amp

ADDITIONAL SYSTEM DESCRIPTION:

- Ion chamber is designed and built to withstand maximum temperature of 150°C and total integrated dose of 10^{8} 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.
- Length of this cable is determined by user when ordering, up to allowable maximum.
- Electrometer box specially built essentially eliminates possibility of extracameral response.

FM-9W ELECTRONICS MODULE:

- **Installation:** Standard wall or rack mount.
- **Processor:** Advanced processor computer.
- **High Voltage Power Supply:** Separately variable from 0 to 1500v. Extremely stable high voltage.
- **LCD Color Monitor:** Monitor shows both real-time concentration and accumulated dose.
  Data is shown both graphically and numerically.

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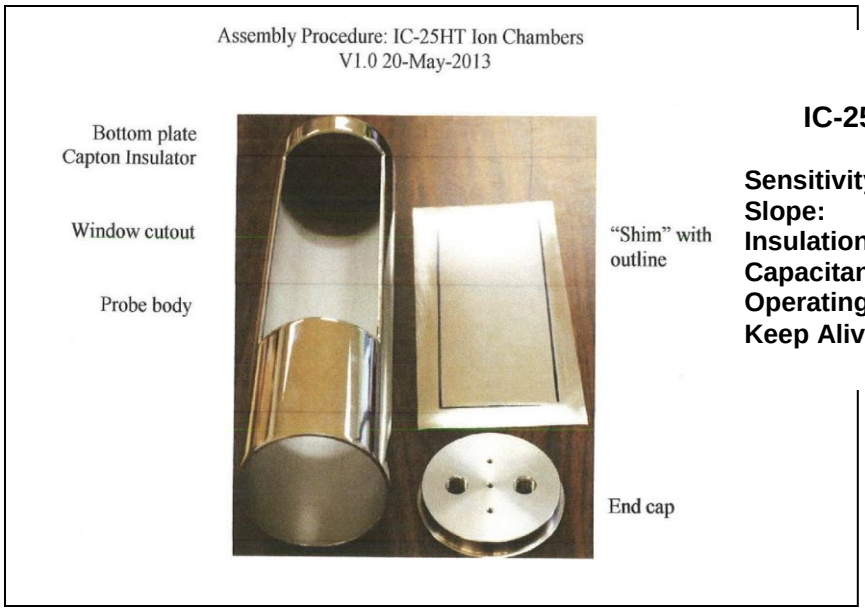
- **Alarms:** User settable to any trigger level.
  - **Low Level Alarm:** Automatic reset.
  - **High Level Alarm:** High level alarm remains activated until RESET button is pushed.
  - **Visual Alarm:** On-screen alarms and warnings. **Red:** High level. **Amber:** Low level
  - **Audible Alarm:** 1000 Hz, greater than 80 db

Outputs:

- Logic level signals
- Contact closure or opening
- Ethernet LAN connection
- USB Ports

The following solid-state modules are included in the standard system:

- Digital Acquisition Board
- MGA-5202 Preamplifier including fully adjustable single channel analyzer
- MV-5-12 Power Supply Module- 5 V and 12 V
  (Once HV levels are set, they don't change)
- MAL Built-in Alarm Module



IC-25 Sealed Ionization Chamber Detector:

Sensitivity:	1.3×10^{-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

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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 LCD counter/display module.
- Ultra-quiet high voltage supply delivers a flat VDC as required.

DETECTOR CABLE:

Mineral Insulated Cable:	2 each (HV and Signal)
Length:	5 to 15 feet; Sheath: 0.250" O.D.
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.

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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/cm^2).

Nuclear: Insulation can be subjected to a mean neutron flux of $2X10^{11}n.cm^{-2}S^{-1}$@100°C and a total peak irradiation of $8X10^{18}n.cm^{-2}$ 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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