

**MODEL 321/421
NUCLEAR
POWER
PLANT
TRITIUM
MONITOR**

NUCLEAR POWER PLANT TRITIUM MONITOR MODEL 321/421 NPPM

This tritium monitor is a version of the OTC standard 321/421 series, configured for the special environmental conditions associated with nuclear power plants, especially those of the CANDU type. This monitor can be used for other applications where tritium specific measurements in the presence of other radionuclides are required.

Major distinguishing features include the following:

Measures tritium or tritium oxide specifically

Immune to other radioisotopes, including reactor gases as well as radon

Gamma compensated dual chamber design

Plate out proof ionization chambers eliminate "background" zero drift

Drift free "zero"

Rugged industrial enclosure

Unaffected by variations in temperature or humidity

A variety of alarms and controls are available. Optional Remote Displays and Sampling Units can be built to suit different applications.



SENSITIVITY - NOISE LEVELS

The Model 421 NPPM has been designed to exhibit sensitivities commensurate with safety requirements associated with worker exposure in power plants. Sensitivity limits induced by background noise levels with instruments incorporating 2 liter ionization chambers approach $0.3 \mu\text{Ci}/\text{m}^3$.

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RANGE

The Model 421 NPPM is dual range, extending measurement to up to 6 plus decades.

MAINTENANCE

Except for routine attention the sample line dust filters and preventive maintenance to the sampling pump, the instrument will provide decades of trouble free service.

SUPERVISORY SIGNALS

Computer compatible outputs are provided to signal operational failure including loss of sample flow, pump failure, electrical failure including that of the electronics, and failure of the ionization chambers.



MEASUREMENT

Range, typical	two, automatically switch 0.1 - 10,000 $\mu\text{Ci}/\text{m}^3$ low range 1.00 - 200.00 mCi/m^3 high range other ranges available
Display	4 1/2 digital panel meter
Accuracy	$\pm 2\%$ of reading, \pm L.S.D., whichever is greater
Stability and Drift	$\pm 1.0 \mu\text{Ci}/\text{m}^3$ long term (thirty days), ambient temperature conditions
Noise Response	$\pm 1.5 \mu\text{Ci}/\text{m}^3$, 1 sigma, with alpha suppression in use
Rate	three linear electronic time constants approximately 40 seconds for signals up to about $80 \mu\text{Ci}/\text{m}^3$ approximately 10 seconds for signals from 80 to $10,000 \mu\text{Ci}/\text{m}^3$ approximately 3 seconds for signals above $1.00 \text{mCi}/\text{m}^3$
Warm Up Time	less than ten minutes

ALARM SYSTEMS

High Level	Low Range Level alarm with 4-digit thumb wheel potentiometer preset from 1 - 9,999 $\mu\text{Ci}/\text{m}^3$. High Range Level alarm with 3-digit thumb wheel potentiometer preset from 2 - 200 mCi/m^3 . Toggle switch selector for High or Low Range Level Set Points. An Alarm condition activates a visual (red LED) an acoustic indicator and fail-safe relay closure. Toggle switch selector for latching or non-latching modes and reset. Acknowledge push button to silence acoustic indicator after alarm is tripped.
Malfunction	Failure of any one three conditions will activate a non-latching visual indicator and fail-safe relay closure. One, a dc power supply monitor verifies all internal dc supplies are within specification. Two, verifies that the electrometer cable is connected. Three, sample flow monitored by a delta pressure switch.

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**IONIZATION CHAMBER
INTERNALLY MOUNTED**

Measuring volume:	1,200 cm each
Total wetted volume:	2,000 cm ³ each
Electrodes	Wire Grid, contamination resistant
Pressure	0.1 to 2 atmospheres
Ports	1/4" stainless steel Swagelok

**SAMPLE FLOW SYSTEM
INTERNALLY MOUNTED**

Pump Flow Rate	diaphragm type 115/230 VAC 50/60 Hz
Flow meter Dust	14 LPM maximum @ 0 psia
Filter Connection	0 - 10 LPM adjustable
Low Flow Sensor	HEPA respirator type
	1/4" stainless steel Swagelok tube fittings
	Differential pressure switch

ENVIRONMENTAL

Temperature	-40° C to +65° C storage 0° C to +55° C operating
Humidity	0 - 95 % RH Ventilation or air conditioning is
Air Conditioning	not required.

PHYSICAL, MAIN CABINET

Size	29.37' [747mm] High x 23.63'[600mm] Wide x 18.62' [473mm] Deep wall mounted NEMA 12 painted steel enclosure with key lockable door
Power up	115/230 VAC, 50/60 Hz, 50 W including pump and to 4 remote indicators
Weight	186 lbs [84kg]



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SPECIFICATIONS**

RECYCLING DRYER UNIT

Desiccant dual copper tube coaxial columns containing desiccant agent. Columns are equipped with internal heaters for the regeneration of the desiccant

Cycling System

Motor driven cam timer controls solenoid valves and the heaters for sequential operation of each column

Column A	Column B
In use	1. heat column
In use	2. purge vapor
In use	3. cool column

The sequence of events takes six hours for completion, whereupon the sequence recommences for the opposite column.



VISUAL INDICATORS

Status Indicator	Rotary pointer knob indicates different states of the sample/regenerate process for both desiccant columns
Low Flow	indicates when purge pump flow is <2 LPM
Power	115/230 V, 50/60 Hz, 1500 Watts
Circuit Protection	Crcuit breaker/power ON/OFF switch
Physical Size	30" [762mm] W x 46.75" [1187.5mm] H x 13.5" [343mm]D wall mounted painted steel enclosure
Weight	245 lbs [111 kg]



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TRITIUM SAMPLING UNIT (OPTIONAL)

Pump Flow Rate Flow Meter

Dust Filter Pressure 115/230 VAC, 50/60 Hz

Connections Low Flow Sensor 89 LPM Maximum at 0 psia

Vacuum Sensor 10-100 LPM

HEPA respirator type

CONTROLS

0.1 - 2 atmospheres

Power Control Pump Control

1/4" stainless steel Swagelok tube fittings

Sample Control Valve Selection differential pressure switch

vacuum switch

VISUAL INDICATORS

Manifold Low Flow

Pushbutton switch for power

Connections

Maintained pushbutton switch for power to pump

ENVIRONMENTAL

Temperature

maintained pushbutton switch for MAIN/REMOTE control

controlled by a rotary switch

Humidity

Air Conditioning

red LED, "on" when purge pump flow fails or falls below 2 LPM.

PHYSICAL

Physical Size

1/4" stainless steel Swagelok tube fittings

Power Weight

-40° C to +65° C Storage
0° C to +50° C Operating

0 - 95 % RH

Ventilation or air conditioning is not required.

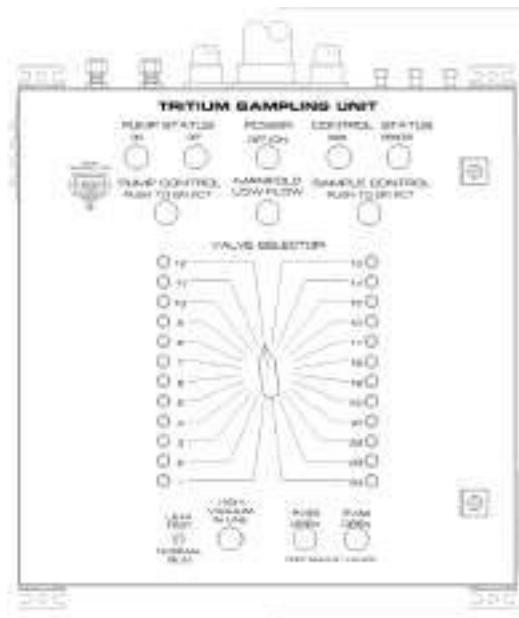
23.62' [600mm] Wide x 25.75' [654mm] High x
15.16' [385mm] Deep NEMA 12 Enclosure

120VAC, 60Hz, 1Ph, 15A

101 lbs [46 kg]

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REMOTE DISPLAY / CONTROL UNIT (OPTIONAL)

Power Control	ON/OFF toggle switch for power to unit
Pump Control	ON/OFF maintained pushbutton switch for power to pump
Sample Control	MAIN/REMOTE maintained pushbutton switch for control unit selection
Valve Selection	Valve selection controlled by PLC touch screen

VISUAL INDICATORS

PLC Touch Screen	Displays Tritium Concentration 120VAC, 60Hz, 1Ph, 2A
Power	

ENVIRONMENTAL

Temperature	-40° C to +65° C Storage 0° C to +50° C Operating
Humidity Air	0 - 95 % RH not required.
Conditioning	

PHYSICAL

Physical Size	23.62' [600mm] Wide x 25.75' [654mm] High x 15.16' [385mm] Deep Excluding Hardware
NEMA Rating	NEMA 12
Power	120VAC, 60Hz, 1Ph, 2A
Weight	66 lbs [30 kg]



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