

MODEL 421 NUCLEAR POWER PLANT TRITIUM MONITOR

核电站氚监测器

NUCLEAR POWER PLANT "WIDE RANGE" TRITIUM MONITOR MODEL 421 NPPM 核电站宽量程氚监测器型号421NPPM

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.

此款氚监测器是 OTC 公司标准 321/421 系列，为核电站有关的特殊环境设计，尤其“坎杜”型堆。这款监测器也可用于在其它核素存在情况下氚的精确测量

Major distinguishing features include the following:

主要特点:

Measures tritium or tritium oxide specifically
专门测氚和氚氧化物

- Immune to other radioisotopes, including reactor gases as well as radon
不受其它放射同位素影响，包括反应堆气体和氡
- Gamma compensated dual chamber design
伽马补偿双室设计
- Plate out proof ionization chambers eliminate "background" zero drift
防污电离室消除“本底”零点漂移
- Drift free "zero"
无零漂移
- Rugged industrial enclosure
结实工业用外箱
- Unaffected by variations in temperature or humidity
不受温度和湿度变化影响
- A variety of alarms and controls are available. Optional Remote Displays and Sampling Units can be built to suit different applications.

提供各种报警和控制，根据不同使用要求配备远程显示和采样器



SENSITIVITY - NOISE LEVELS

灵敏度-噪音值

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 $0.3 \mu\text{Ci}/\text{m}^3$.

型号421NPPM的设计显示的灵敏度符合核电站与工人暴露相关安全要求，

2L电离室监测器测量来自本底噪音，灵敏度接近 $0.3 \mu\text{Ci}/\text{m}^3$ 。

RANGE

量程

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

型号421 NPPM双量程，扩展测量达到6+个数级



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MAINTENANCE 维护

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.

除了日常注意样品管路，粉尘过滤器和预防性样品泵维护外，仪器将十年无故障运行

SUPERVISORY SIGNALS 监控信号

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.

提供计算机兼容输出以便工作故障时发出信号，包括样品流丢失，泵故障，电学故障，包括电子学和电离室故障。

NUCLEAR POWER PLANT TRITIUM MONITOR, MODEL 421 NPPM VERSION

核电站氚监测器，型号421NPPM 版本

MEASUREMENT

测量

Range, typical

范围，典型

two, automatically switch

2量程，自动切换

0.1 – 10,000 $\mu\text{Ci}/\text{m}^3$ low range

低量程0.1– 10,000 $\mu\text{Ci}/\text{m}^3$

1.0 – 200.00 mCi/m^3 high range

高量程1.0– 200.00 mCi/m^3

other ranges available

其它量程可选

Display

显示

4 1/2 digital panel meter

4 ½数字前板仪表

Accuracy

精度

$\pm 2\%$ of reading, \pm L.S.D., whichever is greater

读数的 $\pm 2\%$ ， \pm L.S.D.,选数值较大者

Stability and Drift

稳定和漂移

$\pm 1.0 \mu\text{Ci}/\text{m}^3$ long term (thirty days), ambient temperature conditions

$\pm 1.0 \mu\text{Ci}/\text{m}^3$ 长期（30天），环境温度条件

Noise

噪音

$\pm 1.5 \mu\text{Ci}/\text{m}^3$, 1 sigma, with alpha suppression in use

$\pm 1.5 \mu\text{Ci}/\text{m}^3$, 1西格玛， α 抑制功能

Response Rate

响应率

three linear electronic time constants

3个线性电子时间常数

approximately 40 seconds for signals up to about $80 \mu\text{Ci}/\text{m}^3$

接近40秒，信号达 $80 \mu\text{Ci}/\text{m}^3$

approximately 10 seconds for signals from 80 to $10,000 \mu\text{Ci}/\text{m}^3$

接近10秒信号达 $80 - 10,000 \mu\text{Ci}/\text{m}^3$

approximately 3 seconds for signals above $1.00 \text{mCi}/\text{m}^3$

接近3秒，信号达 $1.00 \text{mCi}/\text{m}^3$ 以上

Warm Up Time

热机时间

less than ten minutes

少于10分钟

ALARM SYSTEMS

报警系统



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High Level 上限

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.

低量程值报警，带4位数指轮电位计预设范围1 – 9,999 $\mu\text{Ci}/\text{m}^3$ ，高量程上限报警，带3位数指轮电位计，预设范围2 – 200 mCi/m^3 。拨动开关选择器用于高或低量程值设定点。报警条件激活视觉（红色LED）、声音指示器，自动防故障继电器。棒式开关选择器选择“上锁-解锁-模式”和“重新设定”；报警触发后可通过按确认按钮使声音指示器静音。

Malfunction 故障

Failure of any one of 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.

三种情况中任何一种故障都将启动非卡锁目视指示器和防故障安全继电器闭合 1. 直流电源监视器验证所有内部直流电源符合规格。2. 验证静电计线路处于连接状态。3. 样品流受压差开关监控。

NUCLEAR POWER PLANT TRITIUM MONITOR, MODEL 421 NPPM VERSION, continued 核电站氚监测器，型号421 NPPM版

IONIZATION CHAMBER INTERNALLY MOUNTED

内置电离室

Measuring volume: 测量容积	1,200 cm^3 each 每个1,200 cm^3
Total wetted volume: 总湿量	2,000 cm^3 each 每个2,000 cm^3
Electrodes 电极	Wire Grid, contamination resistant 丝壁式，防污型
Pressure 压力	0.1 to 2 atmospheres 0.1 – 2 大气压
Ports 接口	1/4" stainless steel Swagelok 1/4" Swagelok 不锈钢接口

SAMPLE FLOW SYSTEM INTERNALLY MOUNTED 内置样品流系统

Pump 泵	diaphragm type 115/230 VAC 50/60 Hz 膜片式115/230 VAC 50/60 Hz
Flow Rate 流量	14 LPM maximum @ 0 psia 00 psia 条件下最大14 LPM



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Flow meter 流量表	0 - 10 LPM adjustable 0 - 10 LPM 可调整
Dust Filter 滤尘器	HEPA respirator type HEPA呼吸式
Connection 连接	1/4" stainless steel Swagelok tube fittings 1/4不锈钢Swagelok管件
Low Flow Sensor 低流感应器	Differential pressure switch 压差开关

ENVIRONMENTAL 环境

Temperature 温度	-	40° C to +65° C storage 存储 -40° C 至 +65° C 0° C to +55° C operating 工作温度0° C - +55° C
Humidity 湿度		0 - 95 % RH 0 - 95 % RH
Air Conditioning 温控		Ventilation or air conditioning is not required. 无需通风或温控

PHYSICAL, MAIN CABINET 主机箱

Size 尺寸:	29.37" [747mm] High x 23.63"[600mm] Wide x18.62" [473mm] Deep wall mounted NEMA 12 painted steel enclosure with key lockable door 高747mmx宽600mmx深473mm上漆不锈钢外箱带锁门
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Power 电源	115/230 VAC, 50/60 Hz, 50 W including pump and up to 4 remote indicators 115/230 VAC, 50/60 Hz, 50 W包括泵和多达4个遥控指示器
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Weight 重量	186 lbs [84kg] 186 磅 (84 公斤)
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RECYCLING DRYER UNIT 循环干燥装置

Desiccant 干燥剂	dual copper tube coaxial columns containing desiccant agent. Columns are equipped with internal heaters for the regeneration of the desiccant 双铜管含有干燥剂同轴柱，管柱配有内置加热器用于干燥剂再生
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Cycling System 循环系统

Motor driven cam timer controls solenoid valves and the heaters for sequential operation of each column
电机驱动凸轮定时器控制电磁阀和加热器用于每个管柱顺序操作



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Column A 管柱 A	Column B 管柱 B
In use 使用中	1. heat column 加热管柱
In use 使用中	2. Purge vapor 冲洗气体
In use 使用中	3. Cool column 冷却干燥柱

The sequence of events takes six hours for completion, whereupon the sequence recommences for the opposite column. 整个顺序循环需要6小时完成，两个干燥柱交替开始



VISUAL INDICATORS 视觉指示

Status Indicator 状态指示:	Rotary pointer knob indicates different states of the sample/regenerate process for both desiccant columns 旋转指示旋钮指示不同样品状态/两个干燥柱的再生过程
Low Flow 低流	Indicates when purge pump flow is <2 LPM 当冲洗泵流量小于2 LPM时发出指示
Power 电源	115/230 V, 50/60 Hz, 1500 Watts
Circuit Protection 电路保护	Circuit breaker/power ON/OFF switch 断路器/电源ON/OFF开关
Physical Size 尺寸	30" [762mm] W x 46.75" [1187.5mm] H x 13.5" [343mm]D wall mounted painted steel enclosure 30" [762mm] 宽 x 46.75" [1187.5mm] 高 x 13.5" [343mm]深 壁装式上漆不锈钢外壳
Weight 重量	245 lbs [111 kg]

TRITIUM SAMPLING UNIT (OPTIONAL) 氚采样装置

Pump 泵	115/230 VAC, 50/60 Hz
Flow Rate 流量	89 LPM Maximum at 0 psia
Flow Meter 流量表	10-100 LPM
Dust Filter 滤尘网	HEPA respirator type HEPA呼吸式



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Pressure 压力	0.1 – 2 atmospheres
Connections 连接	1/4" stainless steel Swagelok tube fittings 1/4" 不锈钢Swagelok管件
Low Flow Sensor 低流感应器	differential pressure switch 压差开关
Vacuum Sensor 真空传感器	vacuum switch 真空开关
CONTROLS 控制	
Power Control 电源控制	Pushbutton switch for power 按钮
Pump Control 泵控制	Maintained pushbutton switch for power to pump 持续按住按钮直至接通泵电源
Sample Control 样品控制	maintained pushbutton switch for MAIN/REMOTE control 持续按住按钮直到启动主/远程控制
Valve Selection 阀选择	controlled by a rotary switch 旋转开关控制
VISUAL INDICATORS 视觉指示器	
Manifold Low Flow 歧管阀低流	red LED, "on" when purge pump flow fails or falls below 2 LPM. 当吹扫泵流停止或低于2 LPM时，红LED指示 "on"
Connections 连接	1/4" stainless steel Swagelok tube fittings 1/4" 不锈钢 Swagelok 管件
ENVIRONMENTAL 环境	
Temperature 温度	-40° C to +65° C Storage 储存温度 0° C to +50° C Operating 操作温度
Humidity 湿度	0 – 95 % RH
Air Conditioning 空调	Ventilation or air conditioning is not required. 无需空调和通风
PHYSICAL	
Physical Size 尺寸	23.62"[600mm]Wide x 25.75" [654mm] High x 15.16" [385mm] Deep, NEMA 12 Enclosure 23.62"宽 x 25.75"高 x15.16" 深, NEMA 12 机箱
Power 电源	120VAC, 60Hz, 1Ph, 15A
Weight 重量	101 lbs [46 kg] 101 磅 (46 千克)



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REMOTE DISPLAY / CONTROL UNIT (OPTIONAL)

远程显示/控制单元 (选购)

Power Control 电源控制	ON/OFF toggle switch for power to unit ON/OFF拨动开关控制装置电源
Pump Control 泵控制	ON/OFF maintained pushbutton switch for power to pump “开/关”持续按住电源开关直到启动泵
Sample Control 样品控制	MAIN/REMOTE maintained pushbutton switch for control unit selection “主/远程”持续按住控制装置选择开关
Valve Selection 阀选项	Valve selection controlled by PLC touch screen 阀选项由PLC触摸屏控制

VISUAL INDICATORS

视觉指示器

PLC Touch Screen Displays Tritium Concentration
PLC触摸屏 显示氚浓度

Power 120VAC, 60Hz, 1Ph, 2A
电源

ENVIRONMENTAL

环境

Temperature -40° C to +65° C Storage
温度 存放温度-40° C to +65° C
0° C to +50° C Operating
工作温度0° C to +50° C

Humidity 0 – 95 % RH
湿度

Air Conditioning not required.
空调 不需要

PHYSICAL

Physical Size 23.62" [600mm] Wide x 25.75" [654mm] High x
实际尺寸 15.16" [385mm] Deep Excluding Hardware

NEMA Rating NEMA 12
NEMA级别

Power 120VAC, 60Hz, 1Ph, 2A
电源

Weight 66 lbs [30 kg]
重量 66 磅 (30 千克)



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