

# 300/400 UNITS -MODULAR CONFIGURATION

## 300/400装置-模块化配置

### TRITIUM MONITORS

#### 氚监测器

#### ESSENTIAL CHARACTERISTICS, FEATURES AND OPTIONS

##### 基本特征，功能和选项

These are line powered tritium monitors for continuous unattended operation.

They can be configured to serve a variety of purposes, including environmental surveillance in rooms, stacks or power plants, as well as glove boxes and process piping in tritium handling facilities.

此AC线电源氚监测器用于连续自动监测，可用于各种不同监测目的，包括室内、烟囱道或电站环境监测，也可用于处理氚的手套箱和工艺管道。



#### FOREWORD 前言

The 300/400 series tritium monitors are a family of instruments that share a common basic ionization chamber and electronics design philosophy.

300/400系列氚监测器为同一类别，基本电离室和电子学的设计理念相同

Any specific model, to suit different applications, can be configured from a large selection of options.  
任何一款专用型号，为了适合不同应用要求，可以从众多选项中进行配置

All line powered tritium monitors for installation are grouped into the 300 and 400 series of instruments, and are categorized into four basic according to whether they use single or dual ionization chambers, or if automatic range switching for wide range of measurement has been incorporated.

所有线路供电安装型氚监视器分为300和400系列仪器，根据使用单或双电离室或是否对宽量程进行自动量程转换功能，分为四个基本型号。

Complexity, hence cost, is related to the number and nature of the associated ionization chambers, and the number of measurement ranges over which the instrument will function.

其复杂性，因此价格与相关电离室的数量和类型，仪器的测量范围相关。

#### MODEL 311 (SINGLE CHAMBER, SINGLE RANGE) 型号311 (单电离室，单量程)

Highest sensitivity of 1  $\mu\text{Ci}/\text{m}^3$ , with single ionization chambers from 10 cc to 2 liters. Four decade measurement range, with general application for glove box monitoring, process monitoring, chromatography and similar applications.

最高灵敏度1  $\mu\text{Ci}/\text{m}^3$ 。单电离室，10cc-2L，4量程，基本用于手套箱监测，过程监测，色层分析或相似的应用



#### HIGHER SENSITIVITY 高灵敏度

Increased sensitivity to 0.1  $\mu\text{Ci}/\text{m}^3$  is attained through ionization chambers with larger volumes .



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通过增加电离室容积，将灵敏度增加到0.1  $\mu\text{Ci}/\text{m}^3$

**MODELS AVAILABLE: (but not limited to) 供应型号 (但不限定)**

311 series single range, with single ionization chamber  
311系列，单量程，单电离室

321 series single range, with dual ionization chamber  
321系列，单量程，带双电离室

411 series multi-range, with single ionization chamber  
411系列，多量程，带单电离室

421 series multi-range, with dual ionization chamber  
421系列，多量程，带双电离室

**MODEL 411 (SINGLE CHAMBER, MULTIRANGE)  
型号411 (单电离室，多量程)**

Multi-range version of Model 311, for wider measurement ranges up to 7 decades.  
型号311多量程，较宽测量范围达到7个量级

**TRITIUM SPECIFIC IONIZATION CHAMBER RESPONSE  
氚专用电离室响应**

Monitors made to respond only to tritium, or tritium oxide, even in the presence of competing radioactive airborne agents. The 321 and 421 series instruments use balanced ionization chambers, which, together with specialized sample preparation systems are immune to competing radio-gases, responding only to tritium or its oxide.

监测器只对氚或其氧化物反应，即使在辐射气溶胶物质出现的情况下，321和421系列仪器使用补偿电离室，加上专用取样系统，对其它放射性气体抑制，只对氚和其氧化物响应。

**SENSITIVITY 灵敏度**

Depending on chamber size, 300/400 tritium monitors will measure tritium from  $10^{-7} \mu\text{Ci}/\text{cc}$  to pure tritium.  
视电离室容量而定，300/400氚监测器将测量从 $10^{-7} \mu\text{Ci}/\text{cc}$ 到纯氚。

**SENSITIVITY AND RANGE OF MEASUREMENT, 300 SERIES  
灵敏度和测量范围  
300系列**

Single range monitors, the 300 series instruments, can be configured to measure over 3 to 5 decades selected anywhere between  $10^{-7} \mu\text{Ci}/\text{cc}$  to pure tritium.  
单量程监测器，300系列仪器可配置为测量范围3-5个量级，在 $10^{-7} \mu\text{Ci}/\text{cc}$ 和纯氚之间

**SENSITIVITY AND RANGE OF MEASUREMENT, 400 SERIES  
灵敏度和测量范围，400系列**

Multi-range monitors, the 400 series instruments, will measure over much wider ranges, covering seven decades of displayed measurement.  
多道监测器，400系列仪器，将测量更宽量程，测量显示高达7个量级

A wide range of measurement places extreme demands on ionization chamber design with regard to contamination effects of tritium oxide. Proper design ensures linearity over the full range and minimum offset at the low end of the measurement range. Wider measurement ranges, such as 7 decades may use



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switched ionization chambers, using one ionization chamber only for low signal levels, and a second chamber only for high values.

宽量程测量对电离室氚氧化物污染影响设计要求极高，合理的设计确保整个量程线性，下限测量时最小偏移，更宽量程，如7个量级可能会切换电离室，其中一个电离室仅用于测量低信号，另一个电离室仅用于测量高信号

There are special designs for ionization chambers which resist plate out.

电离室专门设计防污染

### KEY PERFORMANCE CHARACTERISTICS OF OTC TRITIUM MONITORS

#### OTC氚监测器主要性能特性

OTC devotes a very significant portion of its budget to ongoing research and development to continuously improve instrument performance, to reduce costs, and improve the quality and maintainability

OTC很大一部分预算用于研发，以不断提供产品性能，降低成本提高质量和可维护性。

### 300/400 UNITS MODULAR CONFIGURATION

#### GAMMA RESPONSE

##### 伽马响应

The 311 and 411 series of tritium monitors employ single ionization chambers, which respond not only to tritium but will also respond to external gamma and X ray fields.

Typically, a flux of 1 mR/hr will produce instrument response equivalent to about  $90\mu\text{Ci}/\text{m}^3$ . Lead shielding can be supplied to mitigate gamma sensitivity.

311/411系列氚监测器使用单电离室，其不仅对氚反应而且对外部伽马和X射线辐射场反应，1mR/hr的通量可产生仪器响应相当于 $90\mu\text{Ci}/\text{m}^3$ 。提供铅屏以减缓伽马灵敏度。

In contrast, the 321 and 421 series of tritium monitors feature dual ionization chambers, the two chambers being of identical geometry and are used to cancel gamma response. Instruments with four ionization chambers are specified for optimum gamma suppression under challenging field gradient and energy conditions.

相反，321/421系列氚监测器使用双电离室，两个电离室相同的几何形状，用来取消伽马影响，配备四个电离室的仪器在具有挑战性场梯度和能量条件下实现最佳伽马抑制

#### MEASUREMENT DISPLAY

##### 测量显示

All fixed 300/400 series instruments use  $3\frac{1}{2}$ ,  $4\frac{1}{2}$ , even  $3\frac{3}{4}$  or 5 full displays.

Selection depends on the range and units of measure each particular application.

所有固定式300/400系列仪器使用 $3\frac{1}{2}$ ,  $4\frac{1}{2}$ , 甚至  $3\frac{3}{4}$  或全5位数显示

每种特殊应用依据量程和测量单位而定

#### STABILITY AND NOISE LEVEL

##### 稳定性和噪音水平

The measurement sensitivity is specified in terms of stability and noise level under fully operational conditions, and not just to the electronic system performance alone.

测量灵敏取决于完全操作条件下稳定性和噪音水平，而不仅仅取决于电子系统性能



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For example, an instrument designed to measure to one micro Curie per cubic meter will exhibit a noise level and stability of better than  $1 \mu\text{Ci}/\text{m}^3$  for one standard deviation. Normally, the stability of the electronic circuitry itself is better by an order of magnitude.

例如，一款设计测量1毫居每立方米的仪器一个标准偏差显示噪音水平和稳定性优于 $1\mu\text{Ci}/\text{m}^3$ 。正常情况下，电子电路本身的稳定性要优于一个数级

OTC tritium monitors feature long term zero stability under all environmental conditions.

OTC氚监测器特点是在所有环境条件下长期零点稳定

OTC pioneered proprietary methods to eliminate tritium monitor sensitivity to environmental effects including the disintegration of ambient radon, and of natural terrestrial and cosmic radiation.

OTC率先专利方法清除受环境对氚监测器灵敏度的影响，包括对环境氡，地球和宇宙辐射消除，

### **SPAN ACCURACY AND LINEARITY**

#### **量程精度与线性**

All OTC tritium monitors are calibrated to high levels of accuracy. OTC tritium monitors can be factory adjusted to a precision of as high as 5% in terms of equivalent electrical signal, or better than 15% when using certified tritium gas.

所有OTC氚监测器高精度校准，OTC氚监测器可以工厂调整的精度达电子信号当量的5%，或使用带证书氚源优于15%。

Measurement errors at low signal levels arise from tritium plate out, foreign radioactive material such as radon or cosmic radiation. At high levels, measurement errors are attributed to recombination effects which can be eliminated, or greatly mitigated by careful ionization chamber design.

氚污染，外来辐射物质如氡或宇宙辐射会使得低信号水平产生测量误差。在高信号水平测量时，测量误差归于复合影响，而这些影响可以通过精心电离室设计清除或极大减少。

### **FEATURES 功能**

#### **RESPONSE RATE**

##### **响应率**

The measurement signal level and the rate (time constant) are inherently interrelated. High measurement levels demand fast response, whereas low measurement levels demand long time constants, in order to smooth out noise and to provide a stable display. To accommodate this contradictory requirement, three distinct time constants have been incorporated into the instruments.

测量信号水平和响应率（时间常数）之间有固有的相互联系，为了减缓噪音和提供稳定显示，测量高值要求快速响应，然而测量低值要求长时间常数，为了满足这个矛盾的要求，仪器中嵌入了三个不同的时间常数。

3 second for measurement above  $1000\text{mCi}/\text{m}^3$

3秒测量在 $1000\text{mCi}/\text{m}^3$ 以上

5 to 10 second time constant for measurement of  $80 - 1000\text{mCi}/\text{m}^3$

5-10秒时间常数测量 $80 - 1000\text{mCi}/\text{m}^3$

20 seconds or more for measurement below  $80 \text{mCi}/\text{m}^3$

20秒或更长测量在 $80\text{mCi}/\text{m}^3$ 以下

Time constants usually switch automatically, although manual switching as well as different break points can be incorporated as requested.

时间常数通常自动切换，尽管根据要求，可选择手动切换和不同断点功能。

#### **COMMON FEATURES**



## 一般特点

All 300 and 400 series instruments are equipped with a number of basic common features.  
所有300和400系列仪器都具有若干基本共同特征

## ICI/ICR Internal/Remote Ionization Chambers ICI/ICR内置/远程电离室

The ionization chambers are normally furnished as separately or remote mounted, CODE ICR. Upon special request, chambers can be mounted inside the main electronics cabinet, use CODE ICR.

电离室正常单独或远程安装，代码ICR。根据特殊要求，电离室可安装在主电子机箱内，使用代码ICR

## Measurement, Ranges and Sensitivity 测量，量程和灵敏度

A configuration with dual 8 liter chambers features a 0.1  $\mu\text{Ci}/\text{m}^3$  (1 s.d.) sensitivity.  
带双室8升配置为0.1  $\mu\text{Ci}/\text{m}^3$  (1 s.d.)灵敏度

## Alarms, Measurement 报警，测量

Single or two independent alarms with visual and acoustic signals. Front panel mounted potentiometers are used to adjust the level set point. 400 series multi-ranging instruments are further equipped with range selector switches so that alarm setting can be made over the entire range of measurement.

单/双独立报警，带视频和音频信号，安装了电位计的前板被用来调整设定点。400系列多任务仪器装有量程选择器开关以便在全量程范围内设定报警。

## OPTIONS 选项

### Digital Displays 数字显示

A variety of digital displays are available.  
各种位数显示均有提供

DD3.5	3½ Digit Display, max reading is 1999 3½位数显示，最大读数1999
DD3.75	3¾ Digit Display, max reading is 3999 3¾位数显示，最大读数3999
DD4 4	Digit Display, Programmable, max reading is 9999 数字显示，可编程，最大读数9999
DD4.5	4½ Digit Display, max reading is 19999 4½位数显示，最大读数19999
DD5	5 Digit Display, Programmable, max reading is 99999 5位数显示，可编程，最大读数99999

Use CODE DDxx depending on the number of digits required.

使用代码DDxx,视要求数字数量而定

300 series single range instruments are typically equipped with 4½ digit panel meters, and with 5 decade analog logarithmic output signals.

300系列单量程仪器通常带4½数字面板表和5个量级的对数输出信号。



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400 series employ moving decimal points on the panel meter and may include additional range indicating lights to identify the measurement decade in operation. Logarithmic analog outputs for 400 series instruments have scales of up to seven decades. Range switching is automatic and is not visible to the instrument operator.

400系列面板仪表上带移动小数点儿，可以包含附加量程指示灯，在工作状态下确认量程数级。

400系列仪器对数模拟输出可达7个数级，量程切换自动，仪器操作者不可视。

## Electrical Interfaces

### 电接口

All 300 and 400 series instruments have rear panel connections suitable for remote display, control or computer interface.

所有300/400系列仪器都有后板连接，适合远程显示，控制或计算机接口

These include, as a minimum,

至少包括，

Analog signal (0 - 10 V)

模拟信号(0 - 10 V)

Alarm functions, including remote acknowledge

报警功能，包括远程通知

Supply voltage

电源电压

Range information (400 series)

量程信息（400系列）

## ELECTRONIC AND PNEUMATIC OPTIONS

### 电子学和气动选择

The standard 300/400 series instruments can be furnished with a variety of electronic options. A master "mother" board has room for several discretionary "plug-in" cards whose output interface connections protrude through the rear of the cabinet. OTC offers a number of standards as well as custom designed interface cards. 标准300/400系列仪器可以具备各种电子学选项，原版母板提供几个任意卡插卡空间，其输出接口通过机柜后部探出，OTC提供各种标准接口卡，或客户自行设计。

### APS Alpha Pulse Suppression

#### APS α 脉冲抑制

Noise free measurements of airborne tritium are only possible by suppressing response to alpha decay due to environmental radon. With circuitry which inhibits instrument response to radon and large cosmic ray pulses, measurement sensitivities as low as 0.1  $\mu\text{Ci}/\text{m}^3$  can be attained.

由于环境氡存在，只有通过抑制对阿尔法衰变响应才能使得无噪音测量气氛成为可能。有了抑制对氡和大的宇宙射线脉冲响应的电路，测量精度可低至0.1  $\mu\text{Ci}/\text{m}^3$

### LOG Logarithmic Converters

#### LOG 对数转换器

Circuits to convert instrument output signals to a logarithmic form for the purpose of logarithmic meter displays or for chart recorders with logarithmic scales. Useful for signal compression when used with 4-20 ma or digital interfaces.

转换仪器输出信号为对数形式的电路，其目的为了对数仪表显示或带对数刻度图表记录。当和4-20mA信号电流或数字接口使用时用于信号抑制。

### TZ Totalizer 流量累计器



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An 8 digit LCD display for time-integrated tritium activity release. Very useful for the determination of inventory passage through stacks or hoods. A battery ensures retention of data during periods of line power loss.  
一个8位数的LCD显示时间积累氚活度释放，对通过烟囱道和风罩通道存量测定非常有用。电池确保断电时数据保存。

### **PFA Pump and Flow-meter Assembly**

#### **泵和流量表组件**

A complete assembly consisting of HEPA filter, pump and adjustable flowmeter.

一套完整组件包括HEPA滤网，泵和可调节流量表

### **SFM System Failure Monitor**

#### **系统故障监测**

This supervisory circuit detects and signals failure of all d.c. power supplies, and verifies the integrity of the ionization chamber/electrometer.

如果D.C 电源故障，此监控电路检测并发出信号，并验证电离室/静电计的完整性

### **FFA Low Flow Failure Alarm**

#### **低流故障报警**

Loss of flow sample stream switches are available on request.

如需要,可提供样品流丢失开关

### **CR Chart Recorder**

#### **图表记录器**

An electronic chart recorder can be linked with the instrument to store data. The recorder has color LCD touch screen, removable memory card and RS-232 output.

电子图表记录器被连接到仪器上以存储数据，记录器有彩色LCD触屏，移动内存卡和RS-232输出

### **ALX Customer selected Alarm Output Configuration**

#### **客户选择报警输出结构**

Special alarm configurations are available to fit into all 300/400 series instruments.

Consult the factory for available options.

提供特殊报警结构以兼容所有300/400系列仪器

### **GP Gold Plated Measurement Chamber**

#### **镀金测量室**

Gold Plating of Measurement Chamber to Help Reduce Plate-Out

镀金测量室减少污染

### **MP Mirror Polished Measurement Chamber**

#### **镜面抛光测量室**

Mirror Polishing of Measurement Chamber to Help Reduce Plate-Out

镜面抛光测量室帮助减少污染

### **RDU Remote Display Unit**

#### **远程显示装置**

Such options are designed to suit particular customer requirements and can include a variety of annunciators, visual and acoustic. Consult the factory for details.



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此选项为满足特殊客户要求而设计，包括各种声光报警器，详情咨询工厂

### RS-232/RS-485/Ethernet Computer Interfaces

#### RS-232/RS-485/以太网电脑接口

All conventional computer interfaces are available on plug in cards.  
提供所有常用的电脑插卡接口

### HTL Helium Leak Test Certificate

#### 氦泄漏测试证书

Certification that the ionization chambers have passed leak tests performed with a helium mass spectrometer.  
用氦质谱检漏仪检测证明电离室通过泄漏测试

### CALR Calibration Resistors

#### 校准电阻器

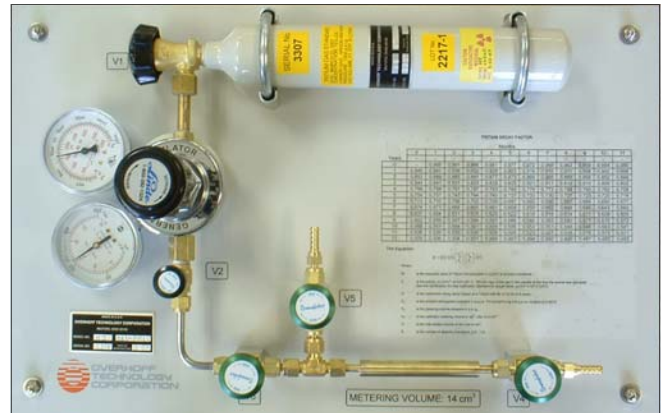
Ultra high meg ohm resistors, certified to about 2% precision for use for electrical calibration (or Verification ) of the tritium monitors response.  
极高兆欧电阻器，用于氚监测响应电校准精度可达到2%。

### CALG Calibration Gas

#### 校准气体

NIST traceable tritium gas calibrators. Gas is contained in a "lecture" bottle, the calibrator is supplied with all necessary components, including the regulator, gages, and valves.

NIST可追踪氚气校准器，气体装在气阀瓶里，校准器配有必要组件，包括调节器，量具和阀门



### E-I Voltage To Current Converter

#### 电压电流转换器

The 0 to 10 volt measurement signal can be converted to a standard 4 to 20 ma current signals. 400 series (multiranging) instruments can be equipped with a 4 to 20 ma signal which covers the entire range of operations.

0-10伏测量信号可以转换为标准4-20mA电流信号,400系列（多任务）仪器可配备4-20mA信号，覆盖整个操作范围。

Although not absolutely required, for better measurement resolution it is suggested that the 4 to 20 ma converter be preceded by a logarithmic conversion.

尽管没有绝对要求，为了更好测量分辨率，建议对数转换在 4-20mA 电流信号变流器之前进行

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