



MODEL TRIMARAN—H₂O Ultra Low-Level Automated Tritium in Water Monitor

型号 TRIMARAN—H₂O
极低值自动水氚监测器

PRESSURE REGULATING EQUIPMENT

压力调节设备

Pressure of input sample streams can be up to 103 kPa. This pressure is immediately reduced to 2-3psi via Pressure Regulating Valves (PRV). Each PRV is associated with Pressure Relieve Valve set to open at 100 kPa, therefore, the pressure in the system can never be more than 100 kPa, which makes it safe to handle. This also makes the instrument Class 6 Nuclear Device.

样品流输入管线压力可达103 kPa., 通过压力调节阀可立即减小到2-3psi, 每个调节阀配有一个最大100 kPa的压力释放阀, 因此系统中的压力从不会超过100 kPa., 这样操作起来安全, 也使得这款仪器成为6级核设备。

FULLY INTEGRATED PACKAGE

完全一体集成

Model Trimaran-H₂O is a completely self-contained instrument for real time observation of tritium concentration in water. The instrument is mounted inside of the 200cm tall steel enclosure with reinforced anchoring feet and locked access.

Trimaran H₂O是一款完全一体的仪器, 用于实时观察水氚浓度。仪器安装在高200cm钢结构外壳内带加固锚脚和锁

P-10 gas (90% Argon, 10% Methane, non-combustible) cylinder is connected to the unit externally. This quantity is sufficient for 60 days of continuous operation.

P-10 气瓶 (90%氩, 10%甲烷, 不可燃) 外接到仪器上, 量足够连续操作 60 天

The main subassemblies are:

主要部件有:

1. Sample water input lines
水样输入管线
2. External cooling loop in case of hot samples
外接冷却回路以防热样
3. PRV and RV system with manifolds
带歧管阀 PRV 和 RV 系统
4. Water purification system (oil-in-water and micron filter)
水净化系统 (水中油和微米过滤器)
5. Sample water pump
样品水泵
6. Detection module
探测模块
7. Data acquisition electronics module
数据收集电子模块
8. System control module
系统控制模块
9. Waste water output line, RV output line and sample bypass output lines
废水输出管线, RV 输出管线和样品旁路输出管线
10. Pre-filter
前置滤网
11. Sample Enrichment assembly
样品浓缩装置



PLC CONTROL

PLC 控制

Sampling of input lines and control of alarms and pumps is done by PLC unit placed inside of the System Control Module. There is an alarm provided in case of PLC failure as well as manual override so that the operation can be continued manually until PLC is replaced. Manual operation is a backup system; the unit normally operates in automatic mode.

样品输入管路和报警与泵的控制由安装在系统控制模块内部的PLC装置完成，一旦PLC故障则触发报警，在PLC被更换之前手动操控。手动操作是备用系统，仪器正常自动模式操作。

ROUTINE MAINTENANCE

日常维护

Scheduled maintenance of consumables is required. P-10 gas cylinder needs to be replenished every 2 months and sample water filters need to be replaced. Also, periodic check of the efficiency and background is recommended if there is a possibility of increased background contamination and due to standard life cycle of electronics components.

要求对消耗品定期维护，P-10气体瓶需要每两月续填，样品水滤网需要被更换，还有，由于电子组件正常使用寿命周期原因及本底污染有增加的可能性，推荐定期检查效率和本底。

ANNUAL INSPECTION AND SERVICE

年检与检修

It is recommended that the instrument be inspected and serviced on an annual basis to ensure continuing trouble free operation. All components of the instrument should be inspected and instrument re-calibrated.

推荐仪器每年检修以确保持续无故障工作。仪器所有组件都应检查并重新校准

REPAIR

维修

Equipment failures of a minor nature can be repaired under local supervision by the operator of the equipment. When necessary, the manufacturer (Overhoff Technology Corporation (OTC)), or its agents can dispatch service personnel for quick remediate action.

设备小故障可在当地监管下由设备运营商维修，有必要时，制造商（OVERHOFF）可派遣服务人员快速维修。

DOCUMENTATION

资料

All OTC equipment is accompanied by complete documentation, which includes the following:
所有OTC设备配有完整资料，包括如下：

1. User and Maintenance Manual that contains:
用户维护手册包括：
 - a. Theory of operation
操作理论
 - b. Installation instructions
安装说明
 - c. Operation instructions
操作说明
 - d. Calibration procedure
校准程序
 - e. Suggested maintenance
建议维护
 - f. Repair instructions
维修说明
 - g. Drawings, diagrams and schematics
图纸，图表和示意图



1160 US ROUTE 50
MILFORD, OHIO 45150-9705
TELEPHONE (513) 248-2400
FACSIMILE (513) 248-2402
E-MAIL sales@overhoff.com
WEB www.OVERHOFF.com

Training will be provided by the manufacturer, at this factory, free of charge. Assistance with commissioning is also available by the manufacturer (OTC).
制造商(OTC)提供工厂培训，免费，提供现场协助。

ADVANTAGES OF PROPORTIONAL COUNTING SYSTEM VERSUS LIQUID SCINTILLATION 与液体闪烁相比，正比计数系统优势

Until recently, the only detectors capable of measuring very low levels of tritium in water were Liquid Scintillation Counting (LSC) based. However, the LSC approach has some obvious disadvantages, such as: the LSC fluid must be constantly refilled at a significant cost in labor, money, and space; LSC fluid is also hazardous material and mixing with tritium results in 'liquid mixed waste,' which must be carefully stored, transported and disposed of.

直到最近，唯一能够测量极低水氚的探测器为液闪计数技术，然而，液闪方法有明显缺点，如：LSC 液体必须持续续满，费工，费钱和占用空间，LSC 液体也是有毒物质，与氚混合导致“液体混合废液”，废液必须小心存储，运输和降解。

By utilizing proportional counting technology, the user only has to acquire a compact standard steel tank of proportional gas, which will last for more than a month and is available from a variety of suppliers. The P-10 counting gas is 90% Argon and 10% Methane, and is not toxic or combustible. Measurement via this method achieves same or better low-end sensitivity, without having to deal with LSC fluid and waste.

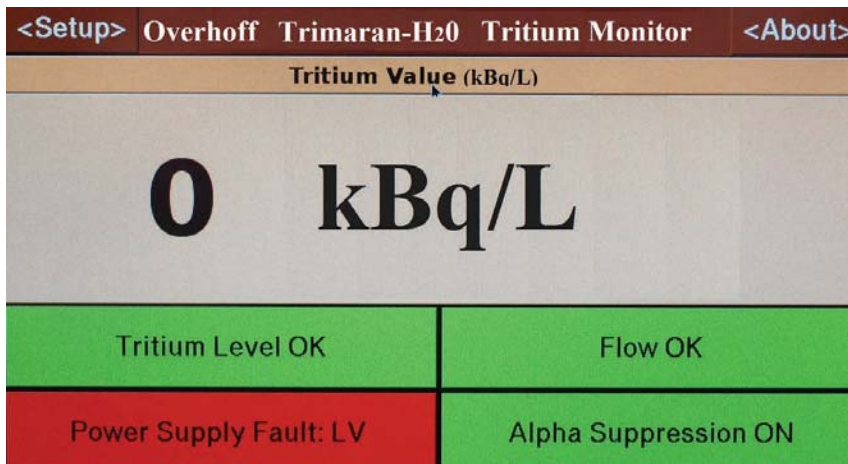
使用正比计数技术，用户需要一个紧致的标准的正比气体钢容器，可用一个多月，供货方便，P-10 计数气体 90%氩气，10%甲烷，无毒不易燃。通过这种方法测量可达到相同或更好的低值敏感度，而且不用处理 LSC 液体和废物。

SAMPLE ENRICHMENT

样品浓缩

With LSC and proportional counting detectors, Overhoff has pushed tritium detection to the most sensitive limit. However, samples can be so dilute, even with large multi-liter detectors, there are not enough disintegrations per second for good measurements. This issue is overcome by concentrating or enriching the sample. This may be accomplished using iterative processes to concentrate the tritium in water using phase change or other physical differences (not chemical processes since 1H, 2H, and 3H are chemically identical.) Overhoff scientists have developed their own iterative sample enrichment cycle, creating system sensitivities far beyond other automated flow-through systems.

使用 LSC 和正比计数探头，OVERHOFF 已经将氚探测推到一个最灵敏的限值，然而，样品可能太稀释，即使用多升探测器，也没有足够的每秒衰变以达到良好的测量结果，这个问题通过浓缩样品被攻克，可以通过使用相变或其它物理差异（不是化学过程，因为 1H, 2H, 3H 化学性质相同）浓缩水中氚来完成。OVERHOFF 科学家已经研发出自己的迭代样品浓缩循环，使得系统灵敏度远远高于其它自动流过式系统。



MODEL TRIMARAN-H₂O TECHNICAL SPECIFICATION TRIMARAN-H₂O 技术规格

MEASUREMENT RANGE: 测量范围	0 kBq/L – 130kBq/L
RESOLUTION (SENSITIVITY): 分辨率 (灵敏度)	1.0kBq/L
MINIMUM DETECTABLE LIMIT: 最小检出值	40 Bq/L (in 1 Week) at confidence level of 95% 40 Bq/L (一周内) 置信度 95%
DISPLAY: 显示	LCD Color Touch Screen; units of display user- settable (i.e., pCi/cc, MBq/m ³ , MPCa, µCi/m ³) LCD 彩色触摸屏, 系统显示用户设定
RESPONSE RATE: 响应率	See Sensitivity Response Chart on Page 1 见第一页灵敏度响应图表
MEASUREMENT METHOD: 测量方法	Gas flow proportional counters 流气式正比计数器
PROPORTIONAL COUNTERS: 正比计数器:	Dual copper clad acrylic counter tubes, 2 liter active volume, 2.5 liter wetted volume, 0.001 inch tungsten collector anode 包铜亚克力双计数管, 有效容积 2 升, 湿容积 2.5 升, 钨阳极 0.001 英寸
COUNTER GAS: 计数气体:	P-10 or "MAGIC" gas for high performance Flow rate 250 cc/min, typical P-10 或高性能 "神奇" 气体, 流量一般为 250 cc/min
MEASUREMENT ALARM SET POINT: 测量报警设定点	Can be manually adjusted 可手动调整
DATA RECORDING/OUTPUT: 数据录入/输出	Insertable USB flash drive; Data communication via TCP/IP. Standard data output is USB & RJ-45 插入式 USB 闪存, 数据通信 TCP/IP, 标准数据输出 USB & RJ-45
SAMPLING/MIXING SYSTEM: 取样混样系统:	See diagram 1 on page 5. 见第 5 页图表 1
WASTE MANAGEMENT: 废液管理	Unused water output lines with Swagelok® fittings are provided, user to provide recycling system or waste collection system. 提供带 Swagelok®接头未用水输出线, 用户提供循环系统或废 水收集系统
TEMPERATURE: 温度	0°C to 50°C
HUMIDITY: 湿度	0 to 95 % R. H.
SEISMIC: 防震	Withstands modest shock 中度防震
ELECTRICAL: 电源	Power 110/230VAC, 5A 110/230VAC, 5A
MECHANICAL: 机械性	Self-contained, mounted on a steel frame with lifting eyes for easy transport. 一体, 安装在钢框内, 带吊环便于运输
DIMENSIONS: 尺寸	31.5in x 23.6in x 84.0in (800mm x 600mm x 2133mm)
WEIGHT: 重量	1100 lb (500 kg)



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