



MODEL 1925

Low-Level Automated, Real-Time Tritium in Water Monitor

The **Model 1925** has been designed for real time, low-level detection of tritium in water in the industrial environment of nuclear power plants.

Low MDA, reliability, ruggedness (suitable for HWR, PWR, BWR), and simplicity of operation is what sets this monitor apart from other equipment. The initial purpose of the Model 1925 was to detect the leak of heavy water in nuclear power plants that utilize CANDU reactors; however, it can be used for other purposes such as monitoring changes in tritium content of ground water, drinking water, and waste water.

LOW MINIMUM DETECTABLE ACTIVITY (MDA)

The unit detects tritium decay using an automated liquid scintillation counting system. Dual photomultiplier tubes (PMT) are surrounded by multi-element shielding and work in coincidence counting mode to reject system noise and only count pulses from tritium. Use of highly-effective PMTs, specially designed sampling cell to minimize cosmic radiation and Cherenkov effects, and 1" of lead shielding all provide for low background noise of only one **count per second with a counting efficiency of 30%**. Pulse shaping and discrimination selects only recognizable tritium decay events to further improve sensitivity, rejecting large amplitude or long duration gamma effects and system noise.

Sensitivity: 3.7 kBq/L (0.10 µCi/L) in 9 minutes or less

The unit can be equipped with 1 to 6 inputs for sampling up to 6 individual lines. The response time from when the sample enters the system until the unit starts to respond is 3 minutes. In 9 minutes the full value of the concentration is shown on the screen. For multiple inputs: each sample line is sampled for 10 minutes so that the effect of residual activity from the previous line is minimized.

FULLY INTEGRATED PACKAGE

The Model 1925 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.

Liquid scintillator is connected to the unit externally and it is stored inside of the polyurethane drum of 23 liters. This quantity of liquid scintillator is sufficient for 60 days of continuous, 24/7 operation.

The main subassemblies are:

1. Sample water input lines
2. External cooling loop input/output lines
3. Internal cooling loop complete with chiller, chiller pump and plumbing
4. PRV and RV system with manifolds
5. Water purification system (oil-in-water and micron filter)
6. Sample water pump
7. Detection module
8. Data acquisition electronics module
9. System control module
10. Waste water output line, RV output line and sample bypass output lines



Highly Sensitive	to 3.7 kBq/L (0.10 µCi/L) for tritium in water
Smart Electronics	Onboard computer, Custom software, Internal data-logging
Gamma Compensated	Automatic Gamma Background subtract
Ease of Operation	Automated operation
No Zero Drift	Long term zero stability

The **Overhoff Model 1925** utilizes proven liquid scintillation counting technology in an automated, real-time system to provide ultra low level tritium in water measurements.

Overhoff Technology Corporation

1160 U.S. Highway 50, Milford, Ohio, 45150-9705 USA
 Telephone: 513 248 2400 Fax: 513 248 2402
 Email: sales@overhoff.com www.overhoff.com



MODEL 1925

Low-Level Automated, Real-Time Tritium in Water Monitor

COOLING SYSTEM

In order to have maximum efficiency of the liquid scintillator, solution that is tested inside of the sample cell is kept between 12°C and 20°C. This is achieved by internal cooling loop system, which is a closed loop cooling system with its own pump and chiller unit. If the unit operates in extreme temperatures (more than 45°C) external cooling loop is provided, where user shall provide chilled water from its own source.

PRESSURE REGULATING EQUIPMENT

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 a Class 6 Nuclear Device.

PLC CONTROL

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.

ROUTINE MAINTENANCE

Scheduled maintenance of consumables is required. Liquid scintillator 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.

ANNUAL INSPECTION AND SERVICE

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.

DOCUMENTATION

All OTC equipment is accompanied by complete documentation, which includes the following:

1. User and Maintenance Manual that contains:
 - a. Theory of operation
 - b. Installation instructions
 - c. Operation instructions
 - d. Calibration procedure
 - e. Suggested maintenance
 - f. Repair instructions
 - g. Drawings, diagrams and schematics



MODEL 1925

Low-Level Automated, Real-Time Tritium in Water Monitor

TECHNICAL SPECIFICATIONS

DETECTION CABINET:

MEASUREMENT RANGE:	3.7 to 130 kBq/L
RESOLUTION:	1.0 kBq/L
MINIMUM DETECTABLE LIMIT:	3.7 kBq/L at a confidence level of 95%
DISPLAY:	LCD Color Touch Screen; units of display user-settable (i.e., kBq/L, μ Ci/L)
RESPONSE RATE:	3 minutes– beginning of response 9 minutes full valued displayed
MEASUREMENT METHOD:	Liquid scintillation counting
DETECTOR:	Dual PMT coincidence counters surrounded by multi-element shielding
SIGNAL PROCESSING:	Electronic signal processing of coincident pulses for tritium specific wave shapes (height and duration)
ALARM SETPOINT:	Can be manually adjusted
DATA RECORDING/OUTPUT:	Insertable USB flash drive; Data communication via TCP/IP. Standard data output is Ethernet and USB.
SAMPLING/MIXING SYSTEM:	Dual head, low flow rate pump. Liquid scintillator and sample mixed at the sample cell.
SAMPLE CELL:	Stainless steel cell, volume 5cc with fused silica windows and Viton O-rings for sealing.
WASTE MANAGEMENT:	Unused water output lines with Swagelok® fittings are provided, user to provide recycling system or waste collection system.
TEMPERATURE:	0°C to 50°C
HUMIDITY:	0 to 95 % R. H.
SEISMIC:	Withstands modest shock
ELECTRICAL:	Power 110/230VAC, 5A
MECHANICAL:	Self contained, mounted on a steel frame with lifting eyes for easy transport.
DIMENSIONS:	31.5in x 23.6in x 84.0in (800mm x 600mm x 2133mm)
WEIGHT:	1100 lb (500 kg)

Released 4/28/21