

**SENSITIVE ENOUGH TO DETECT RUNOFF
FROM SECRET NUCLEAR PLANTS**

**MODEL 1925
HEAVY WATER LEAK DETECTOR
(HWLD)**

**CONTINUOUS FLOW TRITIUM IN WATER
SURVEY MONITOR**

TRUCK OR TRAILER MOUNT AVAILABLE



MODEL 1925-HWLD



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MODEL 1925 - HWLD

MODEL 1925 - HEAVY WATER LEAK DETECTOR LOW

LEVEL REAL TIME TRITIUM-IN-WATER MONITOR

SENSITIVITY OF 1.0 kBq PER LITER

MINIMUM DETECTABLE ACTIVITY (MDA) OF 3.7kBq/L

FOR REGULATORY COMPLIANCE REQUIREMENTS

This monitor 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 and simplicity of operation is what sets this monitor apart from laboratory type of the equipment.

The primary purpose of the Model 1925 is 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, rivers, lakes or ocean currents.



LOW MINIMUM DETECTABLE ACTIVITY (MDA)

The unit detects tritium decay with Photo Multiplier Tubes (PMT) working in coincidence mode. Use of highly effective PMTs, specially designed sampling cell to minimize cosmic radiation and Cherenkov effects and 1" lead shielding provide for low background noise of only One **Count Per Second** and sample counting efficiency of 40%!!! Listed MDA is **3.7kBq/L**; however, the unit has been tested as low as **1.7kBq/L**.

FAST RESPONSE TIME

The unit is equipped with up to 6 inputs for sampling 6 individual lines. The response time from the moment when sample enters the system to the moment the unit starts to respond is 2.5 - 3.0 minutes and in 9.0 minutes the full value of tritium concentration in the sample is displayed on the screen. Each sample line is sampled for 10 minutes so that the effect of residual activity from the previous line is minimized.

REMOTE MONITORING AND ALARMING

The instrument is equipped with 4-20mA output for remote monitoring as well as with 2 alarm outputs and malfunction outputs in the form of dry, fail-safe, relay contacts. Alarms are adjustable and by default are set at 100kBq/L (Hi Alarm) and 110kBq/L (Hi-Hi Alarm).

Malfunction alarms activate in case of the electronics and/or mechanical failures in the system.

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DATA RECORDING

The instrument is equipped with Serial Data Recorder that utilizes Microdrive® card to store up to five years worth of readings in daily files. This information is in text format that is easily extractable to Excel for analysis and graphic presentation.

PRESSURE REGULATING EQUIPMENT

Pressure of input sample streams can be up to 15psi. 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 14.5psi, therefore, the pressure in the system can never be more than 14.5psi, which makes it safe to handle. This also makes the instrument Class 6 Nuclear Device.

FULLY INTEGRATED PACKAGE

Model 1925 is a completely self-contained instrument for real time observation of tritium concentration in water. The instrument is mounted inside of the 7' 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 65 gallons. Currently 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

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 can provide chilled water from its own source.



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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 lifecycle 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.

REPAIR

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)) can dispatch service personnel for quick remediate action.

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

Training will be provided by the manufacturer, free of charge. Assistance with commissioning is also available by the manufacturer (OTC).



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MODEL 1925 TECHNICAL SPECIFICATION

ELECTRONICS AND MEASUREMENT

MEASUREMENT RANGE:	3.7kBq/L - 130kBq/L
RESOLUTION (SENSITIVITY):	1 .0kBq/L
MINIMUM DETECTABLE LIMIT:	3.7kBq/L at confidence level of 95%
DISPLAY:	6 DIGITS FLUORESCENT DISPLAY
RESPONSE RATE:	2.5-3.0 min beginning of the response, 9.0 min full value displayed
MEASUREMENT METHOD:	Liquid Scintillation Counting
DETECTOR:	Dual PMT coincidence counter surrounded by multi-element shielding
SIGNAL PROCESSING:	Electronic signal processing of coincident pulses for tritium specific wave shapes (height and duration)
MEASUREMENT ALARM SET POINT:	Can be manually adjusted
DATA RECORDING:	Serial Data Recorded with Microdrive® card



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SAMPLING SYSTEM

SAMPLING/MIXING SYSTEM:

Dual head, single shaft low flow rate pump providing flow of sample and liquid scintillator. Mixing is done at the T-joint and at the entrance on the sample cell.

SAMPLE CELL: WASTE

Stainless steel cell, volume 5cc with fused silica windows and Viton O-rings for sealing.

MANAGEMENT:

Waste water output lines with Swagelok® fittings are provided, user to provide waste collection system.

ENVIRONMENTAL

TEMPERATURE:

0°C to 50°C

HUMIDITY:

0 to 95 % R. H.

SEISMIC:

Withstands modest shock

GENERAL:

Equipment to be sheltered from exposure to raw elements.

ELECTRICAL:

Power 110/230VAC, 5A main power, +24VDC for 4-20mA and connections for the remote alarms and monitoring

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)



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