

HEAVY WATER LEAK DETECTOR



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MODEL 1925 HEAVY WATER LEAK DETECTOR (HWLD)

LOW LEVEL REAL TIME TRITIUM-IN-WATER MONITOR

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.

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** with a counting **efficiency of 30%**. MDA is **3.7kBq/L**.

RESPONSE TIME

The unit is equipped with up to 6 inputs for sampling 6 individual lines. The response time from when sample enters the system until the unit starts to respond is 3 minutes and in 9 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).



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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 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.

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 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

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.



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

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–Digit Vacuum Fluorescent Display
RESPONSE RATE:	3 min beginning of the response, 9 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
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:	Waste water output lines with Swagelok® fittings are provided, user to provide 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)



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PARTS LIST FOR MODEL 1925 HEAVY WATER LEAK DETECTOR

<u>Qty Req'd</u>	<u>Part No.</u>	<u>Description</u>
1 each	614C359C2	Photo Multiplier Tube Ass'y
2 each	608F6370C2	Pre-Amplifier PCB Ass'y
1 each	609F6075C2	Comparator PCB Ass'y
1 each	614D6360C2	Display PCB Ass'y
1 each	686B6295C2	Alarm/Relay PCB Ass'y
2 kits	565C6289C2	Pump Kit
2 each	564F6852C2	Viton O-ring
2 each	564E6851C2	Viton O-ring
1 each	544E6165C2	Relief Valve
1 each	545A6259C2	3 way Solenoid Valve
1 each	601B533C2	Level Switch
1 each	601c6534C2	Level Switch
1 each	584A6217C2	Filter Cartridge
1 each	601D6535C2	Dual Pressure Switch
2 each	611C7017C2	Rtd, 3 Wire Class
2 each	584C6373C2	Filter Element
10 each	653D6010C2	Armature Brush
10 each	817D7186C2	Eprom
1 each	160F6019C2	Spray Can with Touch up paint