



**STATE OF WISCONSIN**  
Department of Agriculture,  
Trade and Consumer Protection

**Approval #20140004R1**  
(Revised 20140004)

Bureau of Weights and Measures  
Storage Tank Regulation  
P.O. Box 7837  
Madison, WI 53707-7837

## **Wisconsin ATCP 93 Material Approval**

Equipment: PAL-AT and LiquidWatch Leak Detection  
Systems

Manufacturer: PermAlert ESP, Inc.  
7720 N. Lehigh Avenue  
Niles, IL 60714

Expiration of Approval: December 31, 2023

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### **SCOPE OF EVALUATION**

The PAL-AT, LiquidWatch, and LiquidWatch II Leak Detection Systems manufactured by PermAlert ESP, Inc., were evaluated as a means of monthly tank and piping monitoring in accordance with **s. ATCP 93.130, ATCP 93.510(3), ATCP 93.515(7), and ATCP 93.515(8).**

This evaluation summary is condensed to provide the specific installation, application, and operational parameters necessary to maintain the subject systems in compliance with the Wisconsin Administrative Code – ATCP 93.

## **DESCRIPTION AND USE**

### **Consoles**

The PAL-AT Leak Detection System consists of a console, leak sensing cable and/or sensor probes for the detection of liquids. The sensor probes and cable are capable of detecting multiple types of liquids (non-discriminating) or hydrocarbons (discriminating). The system is designed for use within secondarily contained piping, tanks and sumps. The system works by transmitting an energy pulse out the sensor cable (and to the probes if so equipped), which is then reflected back to the console where a map of the reflected energy for each point on the sensor cable and/or probe(s) are recorded and stored (learn mode). During monitoring mode, the presence of a liquid in sufficient quantities to wet the cable (or probe) will alter its electrical properties. This alteration will cause a change of the reflection at that location, which after comparison to the learned map will cause the system to go into alarm and display a location of the liquid. The system can be interfaced with pipe pump systems to provide for auto-shutoff upon alarm initiation.

The LiquidWatch and Liquid Watch II Leak Detection Systems consists of a console and sensor probes for the detection of liquids. The sensor probes are capable of detecting multiple types of liquids including hydrocarbons. The system is designed for use within secondarily contained tanks and sumps. The system can provide alarms for probe active, short, and break conditions; and can be interfaced with pipe pump systems to provide for auto-shutoff upon alarm initiation. The monitoring units can also monitor any switch (float, thermostat, high level, dry contact, etc.) using the optional probe adapter.

### **Cables**

PAL-AT AGW-Gold and AGT-Gold sensor cables have the ability to detect both water-based and hydrocarbon liquids. Each of these PAL-AT sensor cables can be dried and reused after a water-based or volatile hydrocarbon leak has been cleaned up.

PAL-AT TFH hydrocarbon sensor cable uses a hydrocarbon permeable jacket to detect hydrocarbon liquids while ignoring water-based liquids. In some cases, the sensor cable can be dried and reused after a volatile hydrocarbon leak has been cleaned up.

### **Probes**

The PFS probe is a hermetically sealed reed float switch which signals the presence of liquids. The probe resets immediately after the liquid drops below the activation level. A PFS probe is available for the PAL-AT or LiquidWatch systems. Applications include sumps and manways.

The PSTV probe is a hermetically sealed reed float switch which signals the presence of liquids. It is designed to fit into a double-walled tank's 1½ " standpipe. The probe resets immediately after the liquid is removed. Applications include sumps, manways, tank interstitials, monitoring wells, and high/low level alarms.

The PTHL probe is a hermetically sealed reed float switch which signals the presence of liquids. It is designed to be a high level alarm for single and double-walled tanks. Typically, the probe is located to activate when the tank is 90% full. The probe resets immediately after the liquid drops

below the activation level. Applications include sumps, manways, tank interstitials, monitoring wells, and high/low level alarms.

The PHL probe's patented solid-state construction allows it to respond to most liquid hydrocarbons but ignore vapors, thus virtually eliminating false alarms due to vapors. The PHL probe is composed of a carbon black impregnated polymer that expands on contact with hydrocarbon liquids which changes the conductivity characteristics of the probe circuit, thereby initiating an alarm response. The PHL probe is responsive to a broad range of fuels and solvents. The probe resets quickly after removal from exposure to most volatile hydrocarbons, however with some liquids the probe will need replacement. Applications include tank and piping interstitials, and sealed trenches.

The PHLR probe is a resettable hydrocarbon probe that is composed of reusable sensor elements which swell upon exposure to hydrocarbon liquids and activate a sealed switch, thereby initiating an alarm response. The probe's patented construction allows it to detect liquid fuels and many hydrocarbon solvents but ignore vapors, thus virtually eliminating false alarms due to vapors. The sensor elements can be easily removed, cleaned and reused numerous times after exposure. This enables the system to be quickly reset after testing. Applications include tank and piping interstitials, and sealed trenches.

The PWS probe detects all conductive liquids - water, acid, bases, chemicals, etc. Its solid-state, stainless steel construction allows it to be used in corrosive environments and reset quickly after removal from a liquid. Applications include tank and piping interstitials, sumps, manholes, and sealed trenches.

## **TESTS AND RESULTS**

Testing of the PAL-AT leak detection system was conducted in accordance with the EPA protocol for evaluation of liquid-phase out-of-tank product detectors with respect to liquid contact product detectors. The probabilities of detection and false alarm of a leak were certified to within the 95-5 ranges required by the EPA protocols. The cables and probes were tested with gasoline (with up to 10% ethanol), synthetic fuel, diesel fuel, #2 heating oil, and water-dependant on sensor.

Testing of the LiquidWatch and LiquidWatch II leak detection systems was conducted in accordance with the EPA protocol for evaluation of liquid-phase out-of-tank product detectors with respect to liquid contact product detectors. The probabilities of detection and false alarm of a leak were certified to within the 95-5 ranges required by the EPA protocols. The probes were tested with gasoline (with up to 10% ethanol), diesel fuel, and water.

## **LIMITATIONS / CONDITIONS OF APPROVAL**

### **General**

- All monitoring equipment shall be installed, calibrated, operated, and maintained in accordance with the manufacturer instructions, and certified every 12 months for operability, proper operating condition, and proper calibration. Records of sampling, testing, or monitoring shall be maintained in accordance with **ATCP 93.500(9)**.

- The manufacturer shall submit for a revision to this Wisconsin Material Approval application if any of the functional performance capabilities of this equipment are revised. This would include, but not be limited to changes in software, hardware, or methodology.
- All equipment shall be installed, operated and maintained in accordance with procedures specified by PermAlert ESP, Inc.
- Standard probes are designed for non-pressurized applications; probes with a “-P” designation are designed for use in pressurized environments.

**PAL-AT**

- PAL-AT sensor cables must be contained in a carrier pipe to be able to detect a hydrocarbon leak within the 3.0 gph catastrophic leak detection requirement.
- Critical performance parameters for the PAL-AT leak detection system:

Model Number	Cable Capacity	Maximum Cable Range (ft.)
AT20C	1	2,000
AT30C	1	3,000
AT50C	1	5,000
AT75C	1	7,500
AT40K	8	5,000
AT20K	2	7,500
AT30K	4	7,500
AT80K	8	7,500

NOTES:

- Effective length is the total length of sensor cable, and effective length of jumper cable and probes that are connected together to form the "sensing string". For cables longer than 5,000 ft, an additional effective length of 50 ft is added for each connector exceeding 1 connector per 500 ft of cable.
- The actual length or the effective length of a sensor string cannot exceed the maximum cable range for the selected Leak Detection System.

- For the PAL-AT leak detection system:
  - A "-S" probe integrator must be connected in the first 5,000 ft (1500 m) of sensing string.
  - A "-L" probe integrator must be connected more than 5,000 ft (1500 m) from the PAL-AT panel.

**LiquidWatch**

- For the LiquidWatch and LiquidWatch II systems, probes can be a maximum of 10,000 ft away from the console.

This approval will be valid through December 31, 2023 unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The Wisconsin Material Approval Number must be provided when plans that include this product are submitted for review.

**DISCLAIMER**

The Department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement unless specified in this document.

Effective Date: September 10, 2019

Reviewed by: Signature on File

Erik Otterson  
Environmental Specialist  
Storage Tank Regulation  
Bureau of Weights and Measures

Approved by: Signature on File Date: 9/11/2019

Greg Bareta, P. E.  
Section Chief  
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