

TWENTY-FIFTH EDITION, 2018

LIST OF LEAK DETECTION EVALUATIONS FOR STORAGE TANK SYSTEMS

January 10, 2018

WWW.NWGLDE.ORG

DISCLAIMER

GENERAL

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

This list of Leak Detection Evaluations was prepared by a work group consisting of State and EPA members and is limited to evaluations of leak detection equipment and procedures or systems, conducted by an "independent third-party evaluator" (see Appendix "Glossary of Terms") and reviewed by the work group. This list includes evaluations conducted in accordance with either [EPA Standard Test Procedures for Evaluating Leak Detection Methods](#) (EPA/530/UST-90/004 through 010) or other test procedures accepted by the NWGLDE as equivalent to the EPA standard test procedures (see Part III "Acceptable Test Protocols").

The National Work Group on Leak Detection Evaluations (NWGLDE) does not guarantee the performance of any leak detection method or equipment appearing on this List, nor does it warrant the results obtained through the use of such methods or equipment.

SPECIFIC

- The NWGLDE does not evaluate methods or equipment and appearance on this List does not mean they are automatically acceptable for use in any particular state or local jurisdiction.
- The NWGLDE List is not an EPA List, nor does appearance on this list constitute endorsement or approval by the NWGLDE or EPA. Anyone claiming that a device or method is "EPA approved" because it appears on this list is making a false claim.
- The NWGLDE makes no representations concerning the safe operation of any method or equipment. Users of any method or equipment appearing on this List assume full responsibility for the proper and safe operation of said equipment and assume any and all risks associated with its use.
- On each data sheet, this List reports parameters and data values for methods, equipment, and software that are specific to the most current third-party evaluation submitted to the NWGLDE. Subsequent modifications or changes to the method, equipment, or software may produce parameters and data values that are significantly different than the listed third-party evaluation parameters and data values. It is the responsibility of the local implementing agency to accept or reject those modifications or changes.
- NWGLDE Listings apply to leak detection functionality only and not material compatibility. Since long term material compatibility with the product stored is not addressed in test procedures and evaluations, the NWGLDE makes no representations as to the compatibility of leak detection equipment with the product stored.
- Unless specifically indicated on the individual data sheets, performance with alternative fuels has not been demonstrated **with the following exception:**

Biodiesel B6 through B20 meeting ASTM D7467 and biodiesel B100 meeting ASTM D6751 may be used with all equipment listed for diesel whether or not these alternative fuels are included on individual data sheets. This exception **DOES NOT APPLY** to leak detection test methods using Out-Of Tank Product Detection (Vapor Phase) for B6-B20, and Out-Of Tank Product Detection (Liquid and Vapor Phase) and any tracer-based test methods for B100. For these methods, individual data sheets will have to be referenced to determine applicability.

- Measurements derived for minimum detectable water level and minimum water level change for automatic tank gauge method, continuous automatic tank gauge method, and certain non-volumetric tank tightness test method listings were calculated in 100% hydrocarbon fuels, unless otherwise noted.
- NWGLDE listed leak detection equipment may be applicable for use with additional liquids after consultation with the manufacturer and/or third party evaluator and subject to approval by the implementing agency.

The National Work Group on Leak Detection Evaluations (NWGLDE) is proud to publish our 25th Edition, 2018 of the "List of Leak Detection Evaluations for Storage Tank Systems." Please note, the NWGLDE has significantly changed the format of this list. All of our listings are kept current on our webpage: <http://www.nwglde.org>. As this webpage has the current listings and most users access our information through the much easier-to-navigate webpage, the NWGLDE will no longer be maintaining a full, printed list of all of the NWGLDE evaluations. Instead, the new "list" will simply be a list of the changes made to the evaluations and methods within the past year. Attached, please find only those listings that are new or updated since the previous publication (24th Edition, January 2017). Please use our webpage to access current information, listings, and methods.

For help with accessing anything on our web site, please contact our webmaster, David Wilson, at djwilson@utah.gov, or give him a call at (801) 536-4138.

If you need to contact members of the work group, information is included for contacting them (see next page). Also, the work group team and team leaders are listed herein to help you determine the appropriate contacts; however, this information is more likely current on our web site (see "Group Members" and "Team Members").

Vendors should send new third-party evaluations, which were performed by an "independent third-party evaluator" (see Glossary of Terms), to be reviewed by the work group to the team leader and all of the members of the team. Please follow all requirements and policies for submittals and include all documentation for a more prompt review (available on our web site).

Please note, all reviews and listings are conducted and prepared the NWGLDE, an independent work group consisting of state and EPA members. It is not a workgroup specifically affiliated with EPA or any specific state. The NWGLDE does not "approve" leak detection equipment or procedures. The "List" includes leak detection equipment/procedures that the work group has reviewed. The review confirms that the leak detection equipment/procedures were third-party evaluated in accordance with an acceptable protocol and in accordance with the EPA performance standards under appropriate test conditions. Implementing agencies must approve leak detection equipment and procedures, ensure appropriate installation, and determine compliance with UST regulations.

Thank you and we look forward to working with you soon.

Heather Peters, Chair
National Work Group on Leak Detection Evaluations (NWGLDE)





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What's New Since The 24th Edition List, 2017 (01/3/2017)

MOST RECENT WEBSITE ADDITIONS/REVISIONS:

- ◆ **NWGLDE Testing Method Name Change:**
 - [Line Leak Detection Method for Airport Hydrant and Field Constructed Systems](#)
(Changed from "Large Diameter Line Leak Detection Method (6 inches diameter or above)")
Changed January 3, 2017
- ◆ **Revised Table for SIR Test Method (Quantitative)**
 - [Statistical Inventory Reconciliation Test Method \(Quantitative\)](#)
(Revised the SIR Methods table to include the minimum number of days required for analysis)
Changed January 4, 2017
- ◆ **FAFNIR GmbH**
 - [VISY-X Systems](#)
Added to Volumetric Tank Tightness Tests Method (Underfill) March 13, 2017
- ◆ **Veeder-Root**
 - [Series 8590 DPLLD with 8600 Series System \(Veeder-Root TLS-450\) for Rigid, Semi-Rigid and/or Flexible Pipelines](#)
Revised listing June 29, 2017
- ◆ **Simmons Corp. and Acquisitions**
 - [SIR 5.7 LM](#)
Revised listing July 12, 2017
- ◆ **Franklin Fueling Systems**
 - [Incon TS-1001/2001, TS-5, TS-550, TS-5000, TS-550 evo, TS-5000 evo, EVO400, EVO200, and S940 Alarm Console with FMP-ULS Universal Liquid Sensor, FMP-UHS Universal Hydrostatic Sensor, FMP-ULS-C Universal Liquid Sensor Chemical, FMP-ULS-PS Universal Liquid Sensor Position Sensitive sensors](#)
Added to Interstitial Detector (Liquid-Phase) Method August 7, 2017
- ◆ **Franklin Fueling Systems**
 - [Franklin Fueling Systems EVO400, EVO200 with FMP-DDS-U Discriminating Dispenser Sump Sensor and FMP-DTS-U Discriminating Turbine Sump Sensor](#)
Added to Interstitial Detector (Liquid-Phase) Method August 7, 2017
- ◆ **Franklin Fueling Systems**
 - [Franklin Fueling Systems EVO400, EVO200 with FMP-DIS-U Discriminating Interstitial Sensor and FMP-EIS-U Electro-Optical Interstitial Sensor](#)
Added to Interstitial Detector (Liquid-Phase) Method August 7, 2017
- ◆ **Franklin Fueling Systems**

— FUTURE EVENTS —

NWGLDE MEETING:

The NWGLDE Spring meeting will be held April 11-13, 2018 in Raleigh, North Carolina, at the Sheraton Raleigh Hotel.

Additional details are available by downloading the following Memo and Agenda:

[VENDOR INVITATION MEMO](#)

EPA, Regulator, Interested Parties

[INVITATION MEMO](#)

[MEETING AGENDA](#)

[\(Click to view & download\)](#)

Contact [Heather Peters](#) for more information.

- [Franklin Fueling Systems EVO400, EVO200 with FMP-HIS-U Hydrostatic Interstitial Float Sensor, and FMP-HIS-XL-U Hydrostatic Interstitial Float Sensor](#)
Added to Interstitial Detector (Liquid-Phase) Method August 7, 2017
- ◆ **Franklin Fueling Systems**
 - [INCON T5 Series, TS-5, TS-550, TS-5000, TS-550evo, TS-5000evo, Colibri, EVO 200 and EVO 400 consoles with SCALD 3 \(INCON TSP-LL2 and FMP-LL3 Magnetostrictive Probe\)](#)
Revised listing October 17, 2017
- ◆ **Leak Detection Technologies, LLC**
 - [Differential Pressure Leak Test – DPlak™ Leak Detection and Leak Location Test Method](#)
Added to Secondary and Spill Containment Test Methods October 24, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Sump Sensor 794380-208, Sump Sensor 794380-209](#)
Added to Interstitial Detector (Liquid-Phase) November 27, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Single-Point Hydrostatic Sensor 794380-301, Dual-Point Hydrostatic Sensor 794380-303, Single-Point Mini Hydrostatic Sensor 794380-304](#)
Added to Interstitial Detector (Liquid-Phase) November 27, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Position Sensitive Pan/Sump Sensor 794380-323, Position Sensitive Interstitial Sensor for Steel Tanks- 333](#)
Added to Interstitial Detector (Liquid-Phase) November 27, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Interstitial Sensor for Steel Tanks with 4' to 12' I.D. with 16' cable 794390-420, Interstitial Sensor for Steel Tanks 794380-430, Interstitial Sensor for Steel Tanks with 4' to 12' I.D. with 30' cable 794390-460](#)
Added to Interstitial Detector (Liquid-Phase) November 27, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Mag Sump Sensor 857060-XXX, Mag Sump Sensor 857080-XXX](#)
Added to Interstitial Detector (Liquid-Phase) November 27, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Discriminating Groundwater Sensor for 7' to 10' Well Depths 794380-621, Discriminating Groundwater Sensor for 10' to 15' Well Depths 794380-622, Discriminating Groundwater Sensor for 15' to 20' Well Depths 794380-624](#)
Added to Out-Of-Tank Product Detector (Liquid-Phase) November 27, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Monitoring Well Vapor Sensor 794390-700](#)
Added to Out-Of-Tank Product Detector (Vapor-Phase) November 27, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Solid-State Discriminating Dispenser Pan Sensor 794380-320, Discriminating Dispenser Pan Sensor 794380-322](#)
Added to Interstitial Detector (Liquid-Phase) December 21, 2017

- ◆ **Veeder-Root**
 - [8601 Series with Solid-State Discriminating Interstitial Sensor for Fiberglass Tanks \(4' to 10' I.D.\) 794380-343, Solid-State Interstitial Sensor for Double-wall Fiberglass Tanks 794380-345](#)
Added to Interstitial Detector (Liquid-Phase) December 21, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Solid-State Discriminating Containment Sump Sensor 794380-350, Discriminating Containment Sump Sensor 794380-352](#)
Added to Interstitial Detector (Liquid-Phase) December 21, 2017
- ◆ **Veeder-Root**
 - [8601 Series with Solid-State Dispenser Pan Sensor 794380-321, MicroSensor 794380-344, Solid-State Containment Sump Sensor 794380-351](#)
Added to Interstitial Detector (Liquid-Phase) December 21, 2017
- ◆ **ATMOS International**
 - [Atmos Portable Tightness Monitor \(ATPM\) - for Bulk Piping and Hydrant Fuel Systems](#)
Added to Line Leak Detection Method for Airport Hydrant and Field Constructed Systems December 29, 2017
- ◆ **Revised Table for Line Leak Detection Method for Airport Hydrant and Field Constructed Systems**
 - [Line Leak Detection Method for Airport Hydrant and Field Constructed Systems](#)
(Revised the Methods into 2 tables. A table with methods which were evaluated at leak rates which are now in 40 CFR 280.252 of the 2015 EPA UST regulations and a table with methods which were **not** evaluated at these leak rates.)
Changed December 29, 2017



Issue Date: March 13, 2017

FAFNIR**VISY-X Systems****VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)**

Certification	Leak rate of 0.1 gph with PD = 97.95% and PFA = 2.05%.
Leak Threshold	0.05 gph. A tank system should not be declared tight if the test result indicates a loss or gain that equals or exceeds this threshold.
Applicability	Gasoline, diesel, aviation fuel, fuel oil #4, solvents. All chemicals compatible with sensors.
Tank Capacity	Maximum of 20,000 gallons. Tank must be minimum 90% full.
Waiting Time	Minimum of 8 hours between delivery and testing. No wait time between "topping off" and testing.
Test Period	Minimum of 4 hour. Testing is conducted at night. Total time needed to test, waiting time plus testing time, is 12 hours. Test data are acquired and recorded by system's computer.
Temperature	Temperature of added product should not differ more than +7oF from existing product temperature.
Groundwater	Depth to groundwater in tank excavation backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide net pressure of at least one (1) psi outward differential pressure at bottom of tank.
Comments	Not evaluated using manifolded tank systems.

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1125 Valley Ridge Dr.
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Tel: (816) 443-2494
Date of Evaluation: 10/29/2009



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Issue Date: March 31, 2015
Revision Date: June 29, 2017

Veeder-Root

Series 8590 DPLLD with 8600 Series System (Veeder-Root TLS-450) for Rigid, Semi-Rigid and/or Flexible Pipelines

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification	<p>Leak rate of 3.0 gph at 10 psi* with PD = 100% and PFA = 0%.</p> <p>Leak rate of 0.2 gph at operating pressure with PD = 100% and PFA = 0%.</p> <p>Leak rate of 0.1 gph at 1.5 times operating pressure* with PD = 100% and PFA = 0%.</p> <p>*Since leak rate varies as a function of pressure, this leak rate and pressure were certified using an equivalent leak rate and pressure, in accordance with an acceptable protocol.</p>
Leak Threshold	<p>1.5 gph for leak rate of 3.0 gph.</p> <p>0.1 gph for leak rate of 0.2 gph.</p> <p>0.05 gph for leak rate of 0.1 gph.</p> <p>A pipeline system should not be declared tight if the test result indicates a loss that equals or exceeds this threshold.</p>
Applicability	Gasoline, diesel, aviation fuel, ethanol blends up through E100, biodiesel blends B6-B20 meeting ASTM D7467, biodiesel B100 meeting ASTM D6751.
Specification	<p>System tests pressurized rigid, flexible, and combinations of rigid and flexible pipelines.</p> <p>Tests are conducted at operating pressure.</p> <p>System will not function with a mechanical line leak detector installed in the pipeline.</p>
Pipeline Capacity	<p>For 3.0 gph (hourly) leak rate test and 0.2 gph (monthly):</p> <p>Maximum of 425.84 gallons for rigid pipelines.</p> <p>Maximum of 109.84 gallons for flexible pipelines.</p> <p>Maximum of 643 gallons for semi-rigid pipelines.</p> <p>Maximum of 1178.68 gallons for combination piping systems.</p> <p>For 0.1 gph (annual) leak rate test:</p> <p>Maximum of 165.08 gallons for rigid pipelines.</p> <p>Maximum of 109.84 gallons for flexible pipelines.</p> <p>Maximum of 267.84 gallons for combination piping systems.</p>
Waiting Time	<p>None between delivery and testing.</p> <p>Minimum between dispensing and testing.</p>
Test Period	<p>Response time is 1 to 5 minutes for leak rate of 3.0 gph.</p> <p>Response time is 48 minutes to 270 minutes for leak rate of 0.2 gph.</p> <p>Response time is 48 minutes to 489 minutes for leak rate of 0.1 gph.</p> <p>Test data are acquired and recorded by a microprocessor.</p> <p>Calculations are automatically performed by the microprocessor.</p>
System Features	<p>8600 Series console used in this evaluation with Series 8590 DPLLD.</p> <p>Permanent installation on pipeline.</p> <p>Automatic testing of pipeline.</p> <p>Preset threshold.</p> <p>Pump shutdown (optional), message display and alarm activation if leak is declared.</p>
Calibration	System must be checked annually and, if necessary, calibrated in accordance with manufacturer's instructions.
Comments	<p>System was evaluated on a pipeline consisting of rigid and flexible piping, and the resulting combined bulk modulus was determined by physical measurement at evaluator's facility.</p> <p>The bulk modulus of the piping system in which the device is installed can be calculated so that the</p>

software can be programmed to monitor various configurations of rigid/flexible combination piping systems at the facility.

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Tel: (816) 443-2494
Date of Evaluation: 10/23/14, 9/16/16



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Issue Date: April 18, 1997
Revision Date: July 12, 2017

Simmons Corp.

SIR 5.7 LM

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

- Certification** Leak rate of 0.2 gph with PD > 99.9% and PFA = 0.0%.
Leak rate of 0.1 gph with PD > 99.0% and PFA < 1.0%.
- Leak Threshold** 0.1 gph for leak rate of 0.2 gph.
0.05 gph for leak rate of 0.1 gph.
A tank system should not be declared tight if the test result indicates a loss or gain that equals or exceeds this threshold.
Gains (water ingress) are analyzed and evaluated on an individual basis.
- Applicability** Gasoline, diesel , new crank oil, used crank oil, aviation fuel, kerosene, waste oil.
- Tank Capacity** Maximum of 60,000 gallons for single tank.
Maximum of 60,000 gallons cumulative capacity for manifolded tank systems with no more than 5 tanks in system.
- Data Requirement** Minimum of 27 days of product level and flow through data.
- Comments** 61% of data sets evaluated were from manifolded tank systems.
17% of data sets evaluated used data collected by Automatic tank gauges.
Of 41 data sets submitted for evaluation, all were analyzed with conclusive results.
Median monthly throughput of tanks evaluated was 55,791 gallons.
Leak rates of 0.05, 0.1 and 0.2 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

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Evaluator: S.S.G. Associates
Tel: (662) 234-1179
Dates of Evaluation: 10/28/95, 02/15/00, 09/03/01



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Issue Date: August 07, 2017

Franklin Fueling Systems

Incon TS-1001/2001, TS-5, TS-550, TS-5000, TS-550 evo, TS-5000 evo, EVO400, EVO200, and S940 Alarm Console with FMP-ULS Universal Liquid Sensor, FMP-UHS Universal Hydrostatic Sensor, FMP-ULS-C Universal Liquid Sensor Chemical, FMP-ULS-PS Universal Liquid Sensor Position Sensitive sensors

INTERSTITIAL DETECTOR (LIQUID-PHASE)

Detector:

Output Type: qualitative
 Sampling Frequency: continuous
 Operating principle: float/reed switch

Test Results:

	unleaded gasoline	Diesel*	Biodiesel*	Water	E85	Brine
FMP-ULS						
Detection time (min)	<1	<1	<1	<1	<1	
Fall time (min)	<1	<1	<1	<1	<1	
Threshold Level (in)	1.0155	0.9944	0.9925	0.8775	1.0198	
FMP-UHS						
Detection time (min)	<1	<1	<1	<1	<1	<1
Fall time (min)	<1	<1	<1	<1	<1	<1
Threshold Level (in)	0.9602	0.9144	0.9218	0.9397	0.9397	0.7561
FMP-ULS-PS						
Detection time (min)	<1	<1	<1	<1	<1	
Fall time (min)	<1	<1	<1	<1	<1	
Threshold Level (in)	1.4915	1.4882	1.4758	1.3770	1.4962	
	<u>Lubrizol**</u>	<u>Afton**</u>				
FMP-ULS-C						
Detection time (min)	<1	<1				
Fall time (min)	<1	<1				
Threshold Level (in)	1.1707	1.1281				
FMP-ULS-PS						
Detection time (min)	<1	<1				
Fall time (min)	<1	<1				
Threshold Level (in)	1.4959	1.4290				

*Evaluations determined these sensors' responses to the liquids shown above. Biodiesel blends B6-B20 meeting ASTM D7467 and biodiesel B100 meeting ASTM D6751 would also produce an alarm if the sensor threshold is exceeded. Responses to these fuels were not determined, but would be expected to be very similar to the diesel responses.

** Manufacturer and evaluator claim that responses to Lubrizol 9888 and 9888C would be expected to be very similar to each other. Responses to Afton OTR 8332G. and OTR 8843G would be expected to be very similar to each other.

Comments:

Sensor TSP-UHS is the same as the TSP-ULS sensor except that the float has been inverted so that it may be used to monitor the brine reservoir of containment sumps. An alarm condition will occur when the fluid level drops below the end of the sensor. The FMP-ULS-PS is a position sensitive float switch that issues an alarm if not installed properly at the bottom of the interstitial or sump.

Sensors are reusable.

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 Tel: (816) 443-2494
 Dates of Evaluations: 05/02/2017



Issue Date: August 07, 2017

Franklin Fueling Systems

Franklin Fueling Systems EVO400, EVO200 with FMP-DDS-U Discriminating Dispenser Sump Sensor and FMP-DTS-U Discriminating Turbine Sump Sensor

INTERSTITIAL DETECTOR (LIQUID-PHASE)

Detector:

Output Type: qualitative
Sampling Frequency: continuous
Operating principle: float switch

Test Results:

	unleaded <u>gasoline</u>	<u>diesel*</u>	<u>E85</u>	water/E85 20%/80% <u>upper/lower</u>	water/E85 80%/20% <u>upper/lower</u>	water/E85 30%/70% <u>upper/lower</u>
FMP-DDS/DTS						
Detection time (min)	6.5	54.3	7.7	6.0	16.2	5.8
Fall time (min)	<20	<60	<20	<20	<20	<20
Lower Detection Limit (in)	0.125	0.125	0.125	0.125	0.125	0.125
	<u>water</u>					
FMP-DDS						
Detection time (min)	<1					
Fall time (min)	<1					
Threshold Level						
Low level (in)	1.0759					
High level (in)	7.4706					
FMP-DTS						
Detection time (min)	<1					
Fall time (min)	<1					
Threshold Level (in)						
Low level (in)	1.0678					
High level (in)	10.9636					

Manufacturer and evaluator claim that sensors will respond to any liquid. Evaluations determined these sensors' responses to the liquids shown above. *Biodiesel blends B6-B20 meeting ASTM D7467 and biodiesel B100 meeting ASTM D6751 would also produce an alarm if the sensor threshold is exceeded. Responses to these fuels were not determined, but would be expected to be very similar to the diesel responses.

Comments:

Sensors can be removed, cleaned and reinstalled if an alarm is triggered or if the sensor is periodically tested. The DDS and DTS sensors contain an identical product sensitive strip that triggers a product alarm when exposed to any type of fuel. The top and bottom floats of both types of sensors detect the presence of liquid and an alarm will be generated if the liquid rises above the threshold of either float. When the product sensitive strip was tested in each of the three mixtures of water/E85, the DDS and DTS sensors went into alarm when subjected to the top and lower layers of water/E85. For the upper layer containing hydrocarbon, the DDS sensor indicated a product alarm as designed for each of the 20%, 30% and 70% of the water/E85 mixture. For the lower layer of each of the 20%, 30% and 70% of the water/E85 mixtures, the 20% mixture indicated a product alarm after a short period of time, while the 30% and 70% mixtures indicated a water alarm when the threshold of the bottom float was exceeded but did not detect the presence of product after a period of 24 hours.

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Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
Dates of Evaluations: 06/19/2017



Issue Date: August 07, 2017

Franklin Fueling Systems

Franklin Fueling Systems EVO400, EVO200 with FMP-DIS-U Discriminating Interstitial Sensor and FMP-EIS-U Electro-Optical Interstitial Sensor

INTERSTITIAL DETECTOR (LIQUID-PHASE)

Detector:

Output Type: qualitative
 Sampling Frequency: continuous
 Operating principle: conductivity, electro-optic

Test Results:

	unleaded gasoline	diesel*	waste oil	water	E85
FMP-DIS					
Detection time (min)	<1	<1	<1	<1	<1
Fall time (min)	<1	<1	<1	<1	<1
Threshold Level (in)	0.4293	0.4397	0.4208	0.4594	0.4240
FMP-EIS					
Detection time (min)	<1	<1	<1	<1	<1
Fall time (min)	<1	<1	<1	<1	<1
Threshold Level (in)	0.4478	0.4430	0.4317	0.4566	0.4507

Manufacturer and evaluator claim that sensors will respond to any liquid. Evaluations determined these sensors' responses to the liquids shown above. *Biodiesel blends B6-B20 meeting ASTM D7467 and biodiesel B100 meeting ASTM D6751 would also produce an alarm if the sensor threshold is exceeded. Responses to these fuels were not determined, but would be expected to be very similar to the diesel responses.

Comments:

Sensors can be removed, cleaned and reinstalled if an alarm is triggered or if the sensor is periodically tested. The FMP-DIS sensor uses two conductive pins to detect whether the liquid is water or fuel. When tested in three mixtures of water/E85 (i.e., 20%/80%; 30%/70%; and 70%/30%), the FMP-DIS sensor went into alarm when subjected to the upper and lower layers of water/E85. For the upper layer containing hydrocarbon, the DIS sensor indicated a product or alarm as designed. For the lower layer of liquid, the DIS sensor indicated a "water" alarm.

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Issue Date: August 07, 2017

Franklin Fueling Systems

Franklin Fueling Systems EVO400, EVO200 with FMP-HIS-U Hydrostatic Interstitial Float Sensor, and FMP-HIS-XL-U Hydrostatic Interstitial Float Sensor

INTERSTITIAL DETECTOR (LIQUID-PHASE)

Detector:

Output Type: qualitative
Sampling Frequency: continuous
Operating principle: float switch

Test Results:

brine

FMP-HIS

Detection time (min)	<1
Fall time (min)	<1
Threshold Level	
Low level (in)	1.0167
High level (in)	7.3218

FMP-HIS-XL

Detection time (min)	<1
Fall time (min)	<1
Threshold Level	
Low level (in)	0.9895
High level (in)	10.8398

Manufacturer and evaluator claim that sensors will respond to any liquid. Evaluations determined these sensors' responses to the liquids shown above. *Biodiesel blends B6-B20 meeting ASTM D7467 and biodiesel B100 meeting ASTM D6751 would also produce an alarm if the sensor threshold is exceeded. Responses to these fuels were not determined, but would be expected to be very similar to the diesel responses.

Comments:

Sensors can be removed, cleaned and reinstalled if an alarm is triggered or if the sensor is periodically tested.

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Issue Date: November 16, 2015
Revision Date: October 17, 2017

Franklin Fueling Systems

INCON T5 Series, TS-5, TS-550, TS-5000, TS-550evo, TS-5000evo, Colibri, EVO 200 and EVO 400 consoles with SCALD 3 (INCON TSP-LL2 and FMP-LL3 Magnetostrictive Probe)

CONTINUOUS IN-TANK LEAK DETECTION METHOD (Continuous Automatic Tank Gauging)

Certification	Leak rate of 0.2 gph with PD > 95% and PFA < 0.001%.
Leak Threshold	0.17 gph for single tanks at 95% PD. 0.155 gph for manifolded tank systems at 95% PD. 0.16 gph for single tanks at 99% PD. 0.135 gph for manifolded tank systems at 99% PD. A tank system should not be declared tight and a message printed for the operator, if the test results indicate a loss or gain that exceeds this threshold.
Applicability	Gasoline, diesel, aviation fuel, fuel oil #4, biodiesel blends B6-B20 meeting ASTM D7467, biodiesel B100 meeting ASTM D6751.
Tank Capacity	Maximum of 32,891 gallons for single tanks and for all tanks manifolded together.
Throughput	Monthly maximum of 445,408 gallons.
Waiting Time	None. The algorithm tests the data for stability and discards those before the tank is stable.
Test Period	Data collection time ranges from 5 to 26 days. Data sampling frequency is at least once per minute. System collects data at naturally occurring product levels without interfering with normal tank operation, and discards data from unstable periods when system performs test.
Temperature	Average for product is determined by a minimum of 5 thermistors.
Water Sensor	Must be used to detect water ingress. Minimum detectable water level in the tank is 0.208 inch (0.44 inch using model TSP-IGF4P). Minimum detectable change in water level is 0.011 inch (0.013 inch using model TSP-IGF4P).
Calibration	Thermistors and probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.
Comments	The user configuring the system can select between 99% and 95% PD modes. System reports a result of "pass" or "fail". Evaluated using both single and manifolded tank systems with probes in each tank. Constant and variable leaks were mathematically induced into tight tank test records which were collected by systems installed at various active tank sites. The database for evaluation of the system includes sites with vapor recovery and blending dispensers. Tanks used in this evaluation contained gasoline and diesel. Tests only the portion of the tank containing product. As product level is lowered, the leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected. EPA leak detection regulations require testing of the portion of the tank system which routinely contains product. Data from periods when the tank volume is below 14% of maximum are not used for leak detection.

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Issue Date: October 24, 2017

Leak Detection Technologies, LLC Differential Pressure Leak Test – DPLeak™ Leak Detection and Leak Location Test Method

Patent Pending DPLeak™ Leak Detection and Leak Location Method

SECONDARY AND SPILL CONTAINMENT TEST METHOD

- Certification** Leak rate of 0.1 gph with PD = 100%, and PFA = 0%.
Leak rate of 0.005 gph with PD = 96%, and PFA = 0%.
Please be aware that the authority having jurisdiction in your particular state, territory, tribe or municipality may have set a minimum detectable leak rate for secondary and spill containment testing.
- Applicability** Gasoline, diesel, aviation fuel, fuel oil #4, fuel oil #6 (if above 60°), solvents, waste oil, air, water, LP gas, natural gas, toxic gases.
- Specification** Entire surface of sump wall must be observable by video camera.
Containment must be clean and empty.
- Waiting Time** No wait time.
- Test Period** For 0.1 gph: Less than 1 hour for sump test, 20 sec/ft² surface area.
For 0.005 gph: Less than 1 hour for sump test, 5 sec/ft² surface area.
- System Features** A leak is determined by detection of air or liquid ingress.
- Calibration** Re-calibration prior to each test.
- Comments** This method allows for detecting fluid ingress into the container at any point that can be observed. Observation is conducted by camera. A vacuum is applied to the container to induce the ingress of air or liquid.
Ingress of air is observed by the addition of an indicator solution. Liquid ingress is observed directly. Temperature is not a factor.
Some soil conditions may not be suitable for air ingress, such as saturated clay soils, impermeable flow of air or water.
Water table must be determined, by creating monitoring well if none present.
Internal surface must be clean and dry if the container is below groundwater. If the system is above groundwater the test pressure at the bottom of the container must be less than external pressure regardless of the level of liquid in the container.
If container is partially filled with liquid and groundwater is above the bottom of the container, test should not be conducted. Systems must be tested under a pressure less than atmospheric ambient or external pressure.

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Date of Evaluation: 06/01/2017

Issue Date: November 27, 2017

Veeder-Root**8601 Series
with Sump Sensor 794380-208, Sump Sensor 794380-209****INTERSTITIAL DETECTOR (LIQUID-PHASE)****Detector:**

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: float/reed switch

Test Results:**Sump Sensor 794380-208,
794380-209**

	<u>unleaded gasoline</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	<1	<1
Fall time (min)	<1	<1	<1
Threshold level (in)	1.3448	1.3860	1.1983

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794380-208 and 794380-209 sensors are sump sensors with a cable length of 12' and 30', respectively. These sensors detect the presence of fluid in sumps. If the liquid level in the sump rises above the threshold of the sensor, an alarm condition is generated. This would indicate there is liquid present in the area where the sensor is installed.

For both sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer). The alarm is also recorded as part of Alarm History Report

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Issue Date: November 27, 2017

Veeder-Root**8601 Series****with Single-Point Hydrostatic Sensor 794380-301, Dual-Point Hydrostatic Sensor 794380-303, Single-Point Mini Hydrostatic Sensor 794380-304****INTERSTITIAL DETECTOR (LIQUID-PHASE)****Detector:**

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: float/reed switch

Test Results:

30% by weight calcium chloride in water

Single-Point Hydrostatic Sensor 794380-301

	<u>high**</u>	<u>low**</u>
Detection time (min)	N/A	<1
Fall time (min)	N/A	<1
Threshold level (in)	N/A	1.7315

Single-Point Hydrostatic Sensor 794380-304

Detection time (min)	N/A	<1
Fall time (min)	N/A	<1
Threshold level (in)	N/A	0.8010

Dual-Point Hydrostatic Sensor 794380-303

Detection time (min)	<1	<1
Fall time (min)	<1	<1
Threshold level (in)	13.1263	1.2005

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794380-301 and 794380-304 sensors are single-point sensors that detect the loss of fluid anywhere they are mounted. If the liquid level falls below the threshold of these sensors, an alarm condition is generated. This would indicate there is no liquid present in the area where the sensor is installed.

The 794380-303 sensor is a dual-point sensor that detects both a loss and rise of fluid level anywhere that the sensor is mounted. If the liquid level drops below the threshold of the bottom position of the sensor, an alarm condition is generated. This would indicate there is a loss of liquid in the area where the sensor is installed. If the liquid level rises above the threshold of the top position of the sensor, an alarm is generated. This would indicate there is a rise in liquid level in the area where the sensor is installed.

For all sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

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Issue Date: November 27, 2017

Veeder-Root**8601 Series
with Position Sensitive Pan/Sump Sensor 794380-323,
Position Sensitive Interstitial Sensor for Steel Tanks-333****INTERSTITIAL DETECTOR (LIQUID-PHASE)****Detector:**

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: float/reed switch

Test Results:**Position Sensitive Pan/Sump Sensor
794380-323**

	<u>unleaded gasoline</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	<1	<1
Fall time (min)	<1	<1	<1
Threshold level (in)	1.4419	1.3851	1.3665

**Position Sensitive Interstitial Sensor for
Steel Tanks 794380-333**

	<u>unleaded gasoline</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	<1	<1
Fall time (min)	<1	<1	<1
Threshold level (in)	1.364	1.281	1.231

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles. The 794380-323 sensor is a position sensitive pan/sump sensor. This sensor detects the presence of fluid in the dispenser pan or containment sump. If the liquid level rises above the threshold of the sensor in the dispenser pan or containment sump, an alarm condition is generated. This would indicate there is liquid present in the dispenser pan or containment sump. The sensor is also position sensitive, meaning that if the sensor is not placed on the bottom of the dispenser pan or containment sump, an alarm would be generated warning that the sensor is no longer in the proper installation position. The 794380-333 sensor is a position sensitive interstitial sensor for steel tanks. This sensor detects the presence of fluid in the interstice of a double-walled steel tank. If the liquid level rises above the threshold of the sensor in the interstice of a double-walled steel tank, an alarm condition is generated. This would indicate there is liquid present in the interstice area of the double-walled steel tank where the sensor is installed. The sensor is also position sensitive, meaning that if the sensor is not placed on the bottom of the dispenser pan or containment sump, an alarm would be generated warning that the sensor is no longer in the proper installation position.

For both sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

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Issue Date: November 27, 2017

Veeder-Root

8601 Serie

s with Interstitial Sensor for Steel Tanks with 4' to 12' I.D. with 16' cable 794390-420,
Interstitial Sensor for Steel Tanks 794380-430, Interstitial Sensor for Steel Tanks with 4' to
12' I.D. with 30' cable 794390-460

INTERSTITIAL DETECTOR (LIQUID-PHASE)

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: float switch

Test Results:

Interstitial Sensor for Steel Tanks with 4' to 12' I.D. with 16' cable 794390-420, Interstitial Sensor for Steel Tanks with 4' to 12' I.D. with 30' cable 794390-460

	<u>unleaded gasoline</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	<1	<1
Fall time (min)	<1	<1	<1
Threshold level (in)	1.3823	1.3500	1.1907

Interstitial Sensor for Steel Tanks 794380-430

	<u>unleaded gasoline</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	<1	<1
Fall time (min)	<1	<1	<1
Threshold level (in)	1.0437	0.9572	0.9169

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794390-420 sensor is an interstitial sensor with a 16' long cable for steel tanks with an inside diameter of 4' to 12'. The 794380-430 sensor is an interstitial sensor with a 15' long cable for steel tanks. The 794390-460 sensor is an interstitial sensor with a 30' long cable for steel tanks with an inside diameter of 4' to 12'. These sensors detect the presence of fluid in the interstice of a double-wall steel tank. If the liquid level rises above the threshold of these sensors in the interstice of a steel tank, an alarm condition is generated. This would indicate there is liquid present in the interstice area where the sensor is installed.

For all sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

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Dates of Evaluations: 12/5/2016, 12/16/16



Issue Date: November 27, 2017

Veeder-Root**8601 Series****with Mag Sump Sensor 857060-XXX, Mag Sump Sensor 857080-XXX****INTERSTITIAL DETECTOR (LIQUID-PHASE)****Detector:**

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: magnetostrictive probe with dual floats

Test Results:**Mag Sump**

Sensor
857060-XXX,
Mag Sump
Sensor
857080-XXX,

	<u>unleaded</u> <u>gasoline</u> <u>only</u>	<u>diesel</u> <u>only</u>	<u>unleaded</u> <u>on 7" water</u>	<u>diesel on</u> <u>7" water</u>	<u>water</u> <u>warning</u> <u>with water</u> <u>only</u>	<u>water</u> <u>alarm</u> <u>with</u> <u>water</u> <u>only</u>
Detection time (min)	<1	<1	<1	<1	<1	<1
Fall time (min)	<1	<1	<1	<1	<1	<1
Threshold level (in)	1.7547	1.7707	1.6395	1.3828	2.0706	5.067

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 857060-XXX and the 857080-XXX Mag Sump Sensors are based on the use of a short magnetostrictive probe that is equipped with two floats. The lower float will only float on water. The upper float will float on fuel as well as water. The system is capable of detecting either water only, fuel only, or fuel floating on water. If water rises above the threshold of the lower float on the sensor in the containment sump, a water alarm condition is generated indicating there is the presence of water in the containment sump. If fuel rises above the threshold of the upper float on the sensor in the containment sump, an alarm condition is generated indicating there is the presence of fuel in the containment sump. If both water and fuel rise above the threshold of the lower and upper float, alarms will be generated indicating the presence of both fuel and water.

Sensors are available in 12" and 24" lengths. Regardless of the length of the sensor, these sensors all perform identically for the sensor threshold. Currently, the following models are included: 857060-101, 102, 111, 112, 121, 122, 211, 212, 221, and 222.

For both sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

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 Dates of Evaluations: 12/16/2016, 12/21/16

Issue Date: November 27, 2017

Veeder-Root**8601 Series**

**with Discriminating Groundwater Sensor for 7' to 10' Well Depths 794380-621,
Discriminating Groundwater Sensor for 10' to 15' Well Depths 794380-622, Discriminating
Groundwater Sensor for 15' to 20' Well Depths 794380-624**

OUT-OF-TANK PRODUCT DETECTOR (LIQUID-PHASE)**Detector:**

Output type: qualitative
Sampling frequency: continuous
Operating principle: electrical conductivity

Test Results:

	<u>unleaded gasoline</u>	<u>synthetic gasoline</u>
Discriminating Groundwater Sensor for 7' to 10' Well Depths 794380-621, Discriminating Groundwater Sensor for 10' to 15' Well Depths 794380-622, Discriminating Groundwater Sensor for 15' to 20' Well Depths 794380-624		
Detection time (min:sec)	08:55	06:18
Fall time (min:sec)	54:50	26:02
Lower detection limit (cm)	0.02	0.02

Specificity Results (in addition to above):

Activated: n-hexane, diesel, jet-A fuel, toluene, xylene(s).

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794380-621 sensor is a discriminating groundwater sensor for 7' to 10' well depths. The 794380-622 sensor is a discriminating groundwater sensor for 10' to 15' well depths. The 794380-624 sensor is a discriminating groundwater sensor for 15' to 20' well depths. These sensors are designed to detect the presence of hydrocarbon product on the water table in monitoring wells. These sensors consist of a float switch to insure sensors are submerged in water as well as a product sensitive cable to detect the presence of hydrocarbon product. These sensors contain a product sensitive strip that will detect the presence of hydrocarbon product in the groundwater well. If hydrocarbon product is present in the groundwater well and it rises above the threshold of the product sensitive strip, a product alarm will be generated. For all sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

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Issue Date: November 27, 2017

Veeder-Root

8601 Series with Monitoring Well Vapor Sensor 794390-700

OUT-OF-TANK PRODUCT DETECTOR (VAPOR-PHASE)

Detector:

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: adsistor

Test Results:

	<u>unleaded</u> <u>gasoline</u>	<u>synthetic</u> <u>gasoline</u>	<u>JP-4 jet fuel</u>
Detection time (min:sec)	7:46	N/A*	17:01
Fall time (min:sec)	2:38	N/A	3:05
Lower detection limit (ppm)	500	>1000	500

*See Glossary.

Specificity Results:

Not Activated: n-hexane, toluene, xylene(s).

Comparison of TLS-450 with TLS-350 series console showed comparable results when evaluated with representative sensors.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794390-700 sensor is an out-of-tank monitoring well vapor sensor. The sensor detects the presence of product in the monitoring well. The sensor is a vapor sensor that detects fuel vapor in the monitoring well. If the fuel vapor level rises above the threshold of the sensor in the monitoring well, an alarm condition is generated indicating that there is product located in the monitoring well.

Console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

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Issue Date: December 21, 2017

Veeder-Root**8601 Series****with Solid-State Discriminating Dispenser Pan Sensor 794380-320,
Discriminating Dispenser Pan Sensor 794380-322****INTERSTITIAL DETECTOR (LIQUID-PHASE)****Detector:**

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: product permeable, float/reed switch

Test Results:

	<u>unleaded gasoline</u>	<u>diesel</u>	<u>high** level</u>	<u>low** level</u>
Solid-State Discriminating Dispenser Pan Sensor 794380- 320				
Detection time (min)	8.3	99.3	<1	<1
Fall time (min)	10.3	>24 hrs	<1	<1
Threshold level (in)	<0.125	<0.125	8.2496	1.0710
Discriminating Dispenser Pan Sensor 794380-322				
Detection time (min)	8.3	99.3	<1	<1
Fall time (min)	10.3	>24 hrs	<1	<1
Threshold level (in)	<0.125	<0.125	7.6523	1.3458

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794380-320 sensor is a solid-state discriminating sensor that detects the presence of fluid as well as whether the fluid is water or fuel. The sensor contains two solid-state sensors which are used to activate either a high level or low level alarm. The 794380-322 sensor is a discriminating sensor that detects the presence of fluid as well as whether the fluid is water or fuel. The sensor contains two float switches which are used to activate either a high level or low level alarm switch. The 793480-320 and 794380-322 sensors also contain a product sensitive polymer strip that discriminates between conducting liquids such as water and non-conducting liquids such as hydrocarbons. If the liquid level rises above the threshold of the lower sensor on either of the sensors in the dispenser pan, an alarm condition is generated indicating there is a low level liquid alarm in the dispenser pan. If the liquid level rises above the threshold of the upper sensor on either of the sensors in the dispenser pan, an alarm condition is generated indicating there is a high level liquid alarm in the dispenser pan. If fuel rises above the threshold of the discriminating polymer strip, a fuel alarm will be generated indicating that fuel is present in the dispenser pan.

For both sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer). The alarm is also recorded as part of Alarm History Report.

Discriminating sensors listed herein that come into contact with gasoline or diesel fuel require cleaning. For cleaning procedures, reference Veeder-Root Manual 577013-814 at: http://www.veeder.com/gold/download.cfm?doc_id=7871

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Issue Date: December 21, 2017

Veeder-Root**8601 Series**

**with Solid-State Discriminating Interstitial Sensor for Fiberglass Tanks (4' to 10' I.D.)
794380-343, Solid-State Interstitial Sensor for Double-wall Fiberglass Tanks 794380-345**

INTERSTITIAL DETECTOR (LIQUID-PHASE)**Detector:**

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: optical sensor and conductivity (794380-343), optical (794380-345)

Test Results:

**Solid-State
Discriminating
Interstitial Sensor
for Fiberglass Tanks
(4' to 10' I.D.)
794380-343**

	<u>unleaded gasoline</u>	<u>E85</u>	<u>E85 80%/ Water 20%</u>	<u>E85 70%/ Water 30%</u>	<u>E85 30%/ Water 20%</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	N/A	N/A	N/A	N/A	<1	<1
Fall time (min)	<1	N/A	N/A	N/A	N/A	<1	<1
Threshold level (in)	<1	N/A	N/A	N/A	N/A	<1	<1

**Solid-State
Interstitial Sensor for
Double-wall
Fiberglass Tanks
794380-345**

	<u>unleaded gasoline</u>	<u>E85</u>	<u>E85 80%/ Water 20%</u>	<u>E85 70%/ Water 30%</u>	<u>E85 30%/ Water 20%</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	<1	<1	<1	<1	<1	<1
Fall time (min)	<1	<1	<1	<1	<1	<1	<1
Threshold level (in)	0.1488	0.3564	0.3583	0.3599	0.3633	0.1276	0.1482

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794380-343 sensor is a solid-state discriminating interstitial sensor for fiberglass tanks (4' to 10' I.D.) with a 25' long cable. The sensor detects the presence of fluid in the interstice of a fiberglass tank and can determine whether the fluid is water or fuel. If the liquid level rises above the threshold of the sensor in the interstice of a fiberglass tank, an alarm condition is generated indicating whether the liquid is water or fuel.

The 794380-345 Solid-State Interstitial Sensor for Double-wall Fiberglass Tanks detects the presence of fluid in the interstitial space of double-wall fiberglass tanks. The sensor consists of an optical sensor for detecting hydrocarbons and water. If the liquid level rises above the threshold of the sensor in the interstice, an alarm condition is generated. This would indicate there is liquid present in the interstice where the sensor is installed.

For both sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

Discriminating sensors listed herein that come into contact with gasoline or diesel fuel require cleaning. For cleaning procedures, reference Veeder-Root Manual 577013-814 at: http://www.veeder.com/gold/download.cfm?doc_id=78711

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Issue Date: December 21, 2017

Veeder-Root**8601 Series****with Solid-State Discriminating Containment Sump Sensor 794380-350,
Discriminating Containment Sump Sensor 794380-352****INTERSTITIAL DETECTOR (LIQUID-PHASE)****Detector:**

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product permeable, solid-state (-350) product permeable, float/reed switch (-352)

Test Results:

	<u>unleaded gasoline</u>	<u>diesel</u>	<u>water</u>	
Solid-State Discriminating Containment Sump Sensor 794380-350			high** level	low** level
Detection time (min)	8.3	99.3	<1	<1
Fall time (min)	10.3	>24 hrs	<1	<1
Threshold level (in)	<0.125	<0.125	10.3427	1.1179
Discriminating Containment Sump Sensor 794380-352			<1	<1
Detection time (min)	8.3	99.3	<1	<1
Fall time (min)	10.3	>24 hrs	<1	<1
Threshold level (in)	<0.125	<0.125	12.2726	1.3671

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794380-350 sensor is a solid-state discriminating containment sump sensor. The sensor detects the presence of fluid in the containment sump and detects whether the fluid is water or fuel. The sensor contains two solid-state sensors which are used to activate either a high level or a low level alarm. The sensor also contains a product sensitive polymer strip that will discriminate between conducting liquids such as water and non-conducting liquids such as hydrocarbons. If the liquid level rises above the threshold of the lower sensor in the containment sump, an alarm condition is generated indicating that there is a low level liquid alarm in the containment sump. If the liquid level rises above the threshold of the upper sensor in the containment sump, an alarm condition is generated indicating that there is a high level liquid alarm in the containment sump. If fuel rises above the threshold of the discriminating polymer strip, a fuel alarm will be generated indicating that fuel is present in the containment sump.

The 794380-352 sensor is a discriminating containment sump sensor. The sensor detects the presence of fluid in the containment sump, the sensor and detects whether the fluid is water or fuel. The sensor contains two float switches which are used to activate either a high level or a low level alarm switch. The sensor also contains a product sensitive strip that will discriminate between conducting liquids such as water and non-conducting liquids such as hydrocarbons. If the liquid level rises above the threshold of the lower float on the sensor in the containment sump, an alarm condition is generated indicating that there is a low level alarm with the presence of either water or fuel in the containment sump. If the liquid level rises above the threshold of the upper float on the sensor in the containment sump, an alarm condition is generated indicating that there is a high level alarm with the presence of either water or fuel in the containment sump.

For both sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

Discriminating sensors listed herein that come into contact with gasoline or diesel fuel require cleaning. For cleaning

procedures, reference Veeder-Root Manual 577013-814 at: http://www.veeder.com/gold/download.cfm?doc_id=78711

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Issue Date: December 21, 2017

Veeder-Root**8601 Series****with Solid-State Dispenser Pan Sensor 794380-321, MicroSensor 794380-344, Solid-State Containment Sump Sensor 794380-351****INTERSTITIAL DETECTOR (LIQUID-PHASE)****Detector:**

Output type: qualitative
 Sampling frequency: continuous
 Operating principle: optical

Test Results:**Solid-State Dispenser Pan Sensor 794380-321**

	<u>unleaded gasoline</u>	<u>E85</u>	<u>E85 80%/ Water 20%</u>	<u>E85 70%/ Water 30%</u>	<u>E85 30%/ Water 20%</u>	<u>diesel</u>	<u>water</u>
Detection time (min)	<1	N/A	N/A	N/A	N/A	<1	<1
Fall time (min)	<1	N/A	N/A	N/A	N/A	<1	<1
Threshold level (in)	1.0193	N/A	N/A	N/A	N/A	1.0204	0.9708

MicroSensor 794380-344

Detection time (min)	<1	<1	<1	<1	<1	<1	<1
Fall time (min)	<1	<1	<1	<1	<1	<1	<1
Threshold level (in)	<1	<0.1	<0.1	<0.1	<0.1	<1	<1

Solid-State Containment Sump Sensor 794380-351

Detection time (min)	<1	N/A	N/A	N/A	N/A	<1	<1
Fall time (min)	<1	N/A	N/A	N/A	N/A	<1	<1
Threshold level (in)	1.0598	N/A	N/A	N/A	N/A	1.0622	1.0629

Specificity Results (in addition to above):

Sensors will respond to any hydrocarbon liquid after its threshold is exceeded.

Comments:

Sensors are reusable. Sensor is easily removed, cleaned, and reinstalled.

The consoles in the 8601 Series are identical other than their name for marketing purposes. Each of the consoles within the series will perform identically.

The 8601 Series consists of the following derivatives: TLS4, TLS4B, TLS4c, TLS4i, and TLS-S1 consoles.

The 794380-321 sensor is a solid-state dispenser pan sensor. The sensor detects the presence of fluid in the dispenser pan. If the liquid level rises above the threshold of the sensor in the dispenser pan, an alarm condition is generated. This would indicate there is liquid present in the dispenser pan.

The 794380-344 MicroSensor detects the presence of fluid in tight locations around underground storage tanks. The sensor is designed for use in contained risers and the interstitial space of double-wall steel tanks. If the liquid level rises above the threshold of the 794380-344 Microsensor where it is installed, an alarm condition is generated. This would indicate there is liquid present in the area where the sensor is installed. The 794380-351 sensor is a solid-state containment sump sensor. The sensor detects the presence of fluid in the containment sump. If the liquid level rises above the threshold of the sensor in the containment sump, an alarm condition is generated. This would indicate there is liquid present in the containment sump.

For all sensors, console alarm is indicated by an audible alarm, a displayed message and a printed message (if the console is equipped with a printer.) The alarm is also recorded as part of Alarm History Report.

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Issue Date: December 29, 2017

Atmos International Limited

Atmos Portable Tightness Monitor (ATPM) - for Bulk Piping and Hydrant Fuel Systems

Software Version 1.3

Line Leak Detection Method for Airport Hydrant and Field Constructed Systems

Certification	Leak rate of 0.0021% of pipeline volume per hour at separate defined pressures of 150 and 100 psi in pipeline segment being tested with PD = >95% and PFA = <5%.
Leak Threshold	0.00105% of pipeline volume. A pipeline system should not be declared tight if the test results indicate a loss that equals or exceeds the preset threshold.
Specification	System tests either single or double-walled fiberglass, plastic or steel piping. Diameter of piping ranged from 6 to 18 inches during the evaluation. The performance of the ATPM system is a function of pipeline capacity and is expressed in terms of a percent of the pipeline volume per hour.
Pipeline Capacity	Minimum of 2,000 gallons, maximum of 201,690 gallons.
Waiting Time	No waiting time between delivery and testing. 45 to 60 minutes between dispensing and testing .
Test Period	Test time durations during the evaluation averaged 30 minutes with stabilization times between 30 and 90 minutes following pressure adjustment.
System Features	Instrumentation consists of a pressure transmitter and data acquisition unit connected to a computer equipped with software. The system negates the effects of any product temperature changes that may occur during a test by comparing high and low pressure profile data from the pipeline to see if an actual leak is present in the pipeline. Its performance is defined in relation to the size of the pipeline that is used to test.
Calibration	System must be calibrated in accordance with manufacturer's instruction which is recommended every two (2) years.
Comments	This method has NOT been evaluated for the regulatory leak detection requirements now required in 40 CFR 280.252 of the 2015 EPA UST regulations for airport hydrant or field constructed pipeline systems. System designed for use on large underground bulk pipelines such as bulk piping and airport hydrant fueling systems. This system should not be used if trapped vapor is present in the pipeline. The third-party evaluation utilized a total of 24 tests. 18 of these tests were conducted with various induced leak rates.

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