



**STATE OF WISCONSIN**  
Department of Safety and  
Professional Services

**Approval # 20120008**  
(Supersedes 20090008)

Environmental & Regulatory Services Division  
Bureau of Petroleum Products and Tanks  
201 West Washington Avenue  
P.O. Box 7837  
Madison, WI 53707-7837

## **Wisconsin SPS 310 Material Approval**

**Equipment:** TS-504 and TS-508 Inventory Control Systems; TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000 and Colibri Leak Detection Systems; SCALD Continuous Automatic Leak Detection System; TS-LLD and TS-LS500 Line Leak Detection System; SLLD Continuous Pressurized Piping Leak Detection System; and TSP Series Sensors

**Manufacturer:** Franklin Fueling Systems  
3760 Marsh Rd.  
Madison, WI 53718

**Expiration of Approval:** December 31, 2014

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### **SCOPE OF EVALUATION**

The Franklin Fueling Systems TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, and TS-5000 Automatic Tank Gauging (ATG) Systems manufactured by Franklin Fueling Systems, were evaluated as a means of monthly monitoring in accordance with **s. SPS 310.510(3)(a)** and **10.515 (5)**, and as a means of tank tightness testing in accordance with **s. SPS 310.515 (4)** of the Wisconsin Flammable and Combustible Liquids Code.

The Franklin Fueling Systems Colibri Automatic Tank Gauging (ATG) Systems manufactured by Franklin Fueling Systems, was evaluated as a means of monthly monitoring in accordance with **s. SPS 310.510(3)(a)** and **310.515 (5)**.

The Franklin Fueling Systems Statistical Automatic Continuous Leak Detection (SCALD) system was evaluated as a means of continuous statistical leak detection for underground tanks in accordance with **s. SPS 310.510(3)(a)** and **310.515 (5)**.

The Franklin Fueling Systems TS-LLD and TS-LS500 Electronic Line Leak Detection Systems, were evaluated as a means of automatic line leak detection and line tightness testing for both rigid and flexible piping in accordance with **s. SPS 310.510(4)** and **310.515 (8)**. The TS-LS500 system was also evaluated for use in hybrid systems containing both flexible and rigid piping.

The Franklin Fueling Systems TS-LS500 SLLD Continuous Pressurized Piping Leak Detection System was evaluated as a means of line monthly monitoring testing for both rigid and flexible piping in accordance with **s. SPS 310.510(4)** and **310.515 (8)**. The TS-LS500 SLLD Continuous Pressurized Piping Leak Detection System was also evaluated for use in hybrid systems containing both flexible and rigid piping.

Franklin Fueling Systems sensor models TSP-EIS, TSP-ULS, TSP-DIS, TSP-DDS, TSP-DTS, and TSP-HIS, were evaluated as a means of interstitial and/or containment sump monitoring in accordance with **s. SPS 310.510(3)(a)**, **310.510(4)(a)3.** and **310.515 (7)**. Franklin Fueling Systems sensor model TSP-HLS was evaluated as a high-level overflow protection sensor to be installed in accordance with **s. SPS 310.505(2)(b)**.

This evaluation summary is condensed to provide the specific installation, application and operation parameters necessary to maintain the subject systems in compliance with the Wisconsin Administrative Code – SPS 310.

## **DESCRIPTION AND USE**

The various Franklin Fueling Systems Tank Sentinel ATG systems with or without SCALD may be used on tanks that contain gasoline, diesel, aviation fuel, #4 fuel oil, and some solvents. Other liquids with a known coefficient of expansion and density may be tested after consultation with and approval from Franklin Fueling Systems.

### **Tank Sentinel Inventory Control System<sup>1</sup>**

The Franklin Fueling Systems TS-504 and TS-508 Inventory Control system consist of a console and probe combination that measure inventory levels in underground and aboveground tanks. The system consists of either the TS-504 or TS-508 console; the TSP-LL2-NNNI (NNN

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<sup>1</sup> The Franklin Fueling Systems TS-504 and TS-508 Inventory Control Systems are approved for use as part of a valid leak detection methodology for UST systems that use either Manual Tank Gauging, Inventory Control, or Statistical Inventory Control (SIR) only. The TS-504 and TS-508 systems are not capable of performing any tank tightness testing.

Due to the variation in liquid levels caused by dynamic environmental conditions that AST's experience, the TS-504 and TS-508 systems are not approved for use as a leak detection methodology for AST's. At the present time, there is no requirement for leak detection systems on AST's, other than interstitial monitoring on double wall tanks.

= shaft length) or TSP-LL2 magnetostrictive probe; and the appropriate float for the product type.

#### Tank Sentinel and Colibri Leak Detection System

The Franklin Fueling Systems TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri Automatic Tank Gauging (ATG) Systems, consist of a console and probe combination that can be used as either a monthly monitoring or tightness testing leak detection system in underground tanks. The ATG probe is a magnetostrictive probe that senses the liquid level. Each probe has temperature sensors that are used to correct the volumetric level reading for temperature effects. Each probe contains a water sensor for the purpose of detecting water ingress, with an optional density float available for measuring product density and mass calculation.

The **TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri** with the **TSP-LL2 magnetostrictive probe** can perform both tightness testing (0.1 gph) and automatic tank gauging (0.2 gph) on tanks with a capacity up to 15,000-gallons.

The **TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri** with the **TSP-LL2 magnetostrictive probe** can perform only automatic tank gauging, **not tightness testing**, on tanks with a capacity up to 30,000-gallons.

*Note: For all models, monthly and annual testing can only be performed on individual tanks. If several tanks are manifolded together, an isolation valve has to be installed so as to separate the tanks individually during testing.*

#### Tank Sentinel and Colibri Leak Detection System w/SCALD

The Franklin Fueling Systems TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri Automatic Tank Gauging (ATG) Systems with Statistical Continuous Automatic Leak Detection (SCALD), consist of a console and probe combination (TSP-LL2 series) that can be used as a continuous monthly monitoring leak detection system in underground tanks. With the SCALD system, up to 3 tanks can be manifolded together, however, total aggregate capacity of all tanks cannot exceed 49,336 gallons. Maximum monthly throughput for a single tank is limited to 304,620 gallons.

When used for continuous statistical leak detection (monthly monitoring), the system determines when the tank is stable enough to begin data collection. At the beginning of each month, the Tank Sentinel activates its "quiet time" search. This is performed continuously until enough valid data is acquired to calculate a leak rate on the data collected. If it passes the 0.2 gph test, the test is recorded, and the test cycle is started over. At the end of the 30-day period the last good test result is recorded in the permanent tank testing record. If the leak rate does not pass, or if the data was insufficient for performing the calculation, the testing continues until a passing test occurs. A report can be generated either automatically or manually every 30 days showing the final results.

## Electronic Line Leak Detectors

### TS-LLD:

The TS-LLD system may be used on pipelines containing gasoline, diesel, aviation fuel, and fuel oil #4.

The TS-LLD system is available in two configurations, either as a stand-alone system or interfaced directly with the TS-1001 or TS-2001 Tank Sentinel ATG. Regardless of which configuration, both are connected to a thermally activated flowmeter that is installed in the submersible pump. The control console contains a microprocessor that utilizes information provided by the flowmeter and an algorithm to determine whether or not a leak is present. The TS-LLD system has three leak detection modes - Hourly, Monthly, and Annual.

Hourly Tests for 3 gal/h leaks are automatically initiated each time that the pump is turned off. The Hourly Tests last for 3 minutes. If the line fails the Hourly Test, the system will automatically disable the pump and the control console will indicate that a leak has been detected. If the line passes the Hourly Test, the system begins conducting a Monthly Monitoring Test.

Monthly Monitoring for 0.20 gal/h leaks is automatically initiated each time that the pump is turned off and as soon as an Hourly Test has passed. Monthly Monitoring Tests can typically vary in length from 50 minutes to 8 hours depending upon line and product conditions. If the pump is turned on while the monthly Monitoring test is in progress, the test will abort. The control console indicates the number of days that have passed since a Monthly Monitoring test has been passed. If a line fails the monthly test, the control console will indicate this.

The Annual Line Tightness Test for 0.10 gal/h leaks must be manually started. Franklin Fueling Systems specifies that an 8 hour waiting period must occur after the pump has been turned off before a valid annual test can be conducted. An annual test lasts for exactly 40 minutes. If a line fails the annual test, the control console will indicate this.

### TS-LS500:

The TS-LS500 system may be used on pipelines containing gasoline, diesel, bio-diesel, aviation fuel, kerosene, fuel oil #4, alcohols, solvents, and used oil. The TS-LS500E series is an explosion proof version of the original TS-LS500 series.

The TS-LS500 system is part of the TS-550, TS-550 evo, and TS-5000 Automatic Tank Gauging (ATG) Systems. The TS-LS500 system consists of a pressure transducer in the line and a microprocessor in the ATG to evaluate the data from the transducer. The functional element is set above the pump operating pressure so that when the pump is shut off, the system will be able to detect a leak based on the pressure drop. The TS-LS500 has an auto learn capability which records the system characteristics during initial start-up testing, thus allowing for variations in system parameters such as piping bulk modulus and configuration such as the amount of rigid vs. flexible piping in a hybrid system.

For rigid or flexible or hybrid piping systems consisting of both rigid and flexible piping, the TS-LS500 has three leak detection modes - Hourly, Monthly, and Annual.

Hourly tests for 3 gal/h leaks are initiated after each dispense cycle or after 45 minutes of quiet time. The test consists of 3 consecutive tests, timed at 5-minute intervals. If one of the three tests pass, the line is determined to have no gross leak. If there is a failure, the test will continue until three consecutive tests fail. Three failures will cause the alarm light to blink, the alarm horn to sound, and the pump to shut down. If there is dispensing from the line during the testing process, the testing will restart as soon as dispensing is complete. During dispensing inactivity the gross (3 GPH) test will repeat every 45 minutes after passing tests, or until there has been no dispensing (line inactive) for 2 hours.

Monthly Monitoring for 0.20 gal/h leaks is automatically initiated each time the line has been inactive for 2 hours. This test will be performed every 5 minutes until a test has passed. If there are three consecutive failures, with no passes, the alarm light will flash, and the horn will sound, indicating that there is a precision leak in the system. This alarm indication will not shut down the pump unless the user selects that option.

The Annual Line Tightness Test for 0.10 gal/h leaks is initiated after the line has been inactive for 3.5 hours. This test will be performed every 5 minutes until a test has passed. If there are three consecutive failures, with no passes, the alarm light will flash, and the horn will sound, indicating that there is a precision leak in the system. This alarm indication will not shut down the pump unless the user selects that option.

#### TS-LS500 SLLD Continuous Pressurized Piping Leak Detection System

The TS-LS500 SLLD Continuous Pressurized Piping Leak Detection System (CPPLDS) consists of an add-in module to the existing TS-LS500 Automatic Line Leak Detector (ALLD). The ALLD still performs the 3.0 gph tests, and with enough quiet time, the 0.2 gph and 0.1 gph tests; the SLLD is only used for 0.2 gph leak detection if the ALLD did not have enough quiet time to perform that test.

The system continually collects data (pressure readings) which it evaluates with internal software to identify time intervals when there is no activity in the pipeline and the data is stable enough for analysis. An algorithm then combines data from a number of such periods until there is enough evidence to make a determination about the leak status of the pipeline. This type of system functions like an electronic line leak detector except that it reduces the time required that the pipeline has to be taken out of service whenever a test is to be performed. Instead, it compiles data from shorter stable time periods and using statistical methods combines the results to estimate a leak rate.

Test data records may cover 10 days for ST (short term) CPPLDS to 30 days for LT (long term) CPPLDS dependent on dispensing cycles. The ST array continuously contains 10 days of data, and the LT array continuously contains 30 days of data that are rolled over as additional data is acquired. Precedence is given to the standard ALLD test result, if present. If not present, it defaults to SLLD and prints the ST result. It will only print the LT report if there is no ST test available for the month. If, at the end of the month, data of sufficient quality or quantity has not been obtained to calculate a result for the ST or LT CPPLDS or the standard ALLD test, the system automatically defaults to performing a standard or shut down pipeline test (requiring the pipeline to be out of service for a few hours). Pump shutdown, indicator light and alarm activation occurs if leak is declared for 3.0 gph or 0.2 gph tests.

### Liquid Sensors

The Franklin Fueling Systems TS-504, TS-508, TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, and TS-5000 systems have the ability to work with all of the sensors that are described in this section unless otherwise indicated.

The model **TSP-EIS** electro-optic point liquid sensor is used for monitoring the dry interstitial space of double wall fiberglass and steel tanks. It is also suitable for use in containment sump spaces. When the sensor comes in contact with a liquid, it sends a signal to the console that will warn of the presence of a liquid. In fiberglass tank interstitial spaces, the sensor is fished around the outside of the inner wall of the tank and located on the bottom. In steel double wall tanks, the sensor is lowered down to the bottom of the 2" riser pipe that provides access to the interstitial space. If the sensor is used in containment sumps, it is placed on the bottom of the sump.

The model **TSP-ULS** is a universal liquid sump sensor used in monitoring containment sumps to detect for the presence of a liquid. It is also used as an interstitial sensor on steel double wall tanks. When the sensor comes in contact with a liquid, it sends a signal to the console that warns it of the presence of a liquid. It is based on a float switch technology. In containment sumps, the sensor is placed on the bottom of the sump. In steel double wall tanks, the sensor is lowered down to the bottom of the 2" riser pipe that provides access to the interstitial space.

The model **TSP-HLS** is a high level overflow prevention sensor. It is used to prevent the overflow of underground and aboveground storage tanks. It installs in a 2" NPT opening in the top of the tank. It is based on float switch technology.

The model **TSP-DIS** is a discriminating liquid sensor, which may be used to monitor the interstitial space of double wall tanks, sumps or other locations where the presence of liquid indicates a leak. The sensor discriminates between petroleum and water, issuing different alarms for each. In fiberglass tank interstitial spaces, the sensor is fished around the outside of the inner wall of the tank and located on the bottom. In steel double wall tanks, the sensor is lowered down to the bottom of the 2" riser pipe that provides access to the interstitial space. If the sensor is used in containment sumps, it is placed on the bottom of the sump.

The model **TSP-DDS** is a discriminating liquid sensor that provides reliable monitoring of dispenser pans and containment sumps. The TSP-DDS combines magnetic float switch sensors with an innovative polymer strip that reacts to hydrocarbons. The sensor discriminates between water and hydrocarbons, issuing different alarms for each. Three different alarms are generated by the sensor; water in the sump, product detected, and sump full. The sensor is installed in dispenser and containment sumps using a uni-strut bracket assembly that mounts to the sump piping. The sensor is mounted vertically in the sump with the bottom of the sensor touching the bottom of the sump.

The model **TSP-DTS** is a discriminating liquid sensor that provides reliable monitoring of turbine and containment sumps. The TSP-DTS combines magnetic float switch sensors with an innovative polymer strip that reacts to hydrocarbons. The sensor discriminates between water and hydrocarbons, issuing different alarms for each. The sensor generates three different alarms; water in the sump, product detected, and sump full. The sensor is installed in turbine

and containment sumps using a uni-strut bracket assembly that mounts to the sump piping. The sensor is mounted vertically in the sump with the bottom of the sensor touching the bottom of the sump.

The model **TSP-HIS** is a hydrostatic interstitial sensor used to monitor the brine level in double wall fiberglass tanks. The sensor contains two floats; one for a low brine condition and one for a high brine condition. The console will generate a low brine alarm in the event the brine level drops below the bottom float and a high brine alarm if the brine level goes above the top float. The sensor is mounted vertically in the reservoir area and rests on the bottom of the reservoir.

The **TSP-HFS** horizontal float switch sensor is a 2-wire non-discriminating liquid sensor which may be used with the S940 alarm console. The TSP-HFS is designed primarily for liquid detection in fiberglass tank dry interstitial spaces.

The **TSP-UHS** Universal Hydrostatic Sensor uses float switch technology to continuously monitor liquid filled double wall containment sumps. Normally submerged, the single float TSP-UHS will provide an indication if there is a loss of monitoring liquid.

## **TESTS AND RESULTS**

Testing of the Franklin Fueling Systems TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri systems for monthly monitoring and tank tightness testing was conducted in accordance with the EPA Automatic Tank Gauging Systems protocol. When using leak declaration thresholds of 0.05 gph and 0.10 gph, the probabilities of detection of a leak of 0.10 and 0.20 gph, respectively, were certified to within the 95-5 ranges required by the EPA protocols.

Testing of the Franklin Fueling Systems TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri Automatic Tank Gauging (ATG) Systems with Statistical Continuous Automatic Leak Detection (SCALD) was conducted in accordance with a modified version of the EPA Automatic Tank Gauging Systems protocol. When using a leak declaration threshold of 0.10 gph, the probabilities of detection and false alarm to a leak rate of 0.20 gph were certified to within the 95-5 ranges required by the EPA protocols.

### **Electronic Line Leak Detector**

Testing of the TS-LLD for hourly, monthly, and annual pipeline tightness testing was conducted in accordance with either the EPA Pressurized Pipeline Leak Detection Systems protocol (rigid piping) or a modified version of same protocol adapted for flexible piping. When using leak declaration thresholds of 1.5 gph, 0.10 gph, and 0.05 gph, the probabilities of detection for a leak of 3.0, 0.20 and 0.10 gph, respectively, were certified to within the 95-5 ranges required by the EPA protocols.

The TS-LS500 Electronic Line Leak Detector for hourly, monthly, and annual pipeline tightness testing was conducted in accordance with either the EPA Pressurized Pipeline Leak Detection Systems protocol (rigid piping) or modified versions of same protocol adapted for flexible piping or for a hybrid combination of rigid and flexible piping. When using leak declaration thresholds of 1.5 gph, 0.10 gph, and 0.05 gph, the probabilities of detection for a leak of 3.0, 0.20 and 0.10 gph, respectively, were certified to within the 95-5 ranges required by the EPA protocols.

Testing of the TS-LS500 SLLD Continuous Pressurized Piping Leak Detection System (CPPLDS) for monthly pipeline tightness testing was conducted in accordance with a modified version of the EPA Pressurized Pipeline Leak Detection Systems protocol adapted for the evaluation of Continuous Pressurized Piping Leak Detection Systems. When using leak declaration thresholds of 0.8 gph, the probability of detection for a leak of 0.2 gph was certified to within the 95-5 ranges required by the EPA protocols.

#### Liquid Sensors

Testing of the liquid and brine sensors were conducted in accordance with a modified version of the EPA Standard "Liquid-Phase Product Detectors" protocol.

**MONITORING SYSTEM OUTPUT**

Detailed here are examples of the typical Alarm Report, Tank Leak Report, Tank Auto Leak Report, and Line Leak Test Report for the TS-750, TS-1000, TS-1001, TS-2001.

<p>INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722</p> <p>08/13/1998 10:16 AM</p> <p style="text-align: center;">LEAK TEST REPORT</p> <p>(TANK NAME) 5014.3 GAL (PRODUCT NAME)</p> <p>LEAK TEST 0.100 G/H LEAK THRESHOLD 0.050 G/H CONFIDENCE LEVEL 99.0% TEST STARTED 21:45 TEST STARTED 10/17/98 GROSS CAPACITY 56.12% BEGIN GROSS 2814.2 GAL BEGIN NET 2808.8 GAL BEGIN LEVEL 52.630 BEGIN TEMP 62.720 F BEGIN WATER 0.0130 IN END TIME 2:39 END DATE 10/19/98 END GROSS 2814.3 GAL END NET 2808.6 GAL END LEVEL 52.632 IN END TEMP 62.878 F END WATER 0.4 GAL END WATER 0.131 IN</p> <p style="text-align: center;">HOURLY DATA</p> <table border="0"> <thead> <tr> <th>TIME</th> <th>DEG F</th> <th>GAL</th> </tr> </thead> <tbody> <tr> <td>22:44</td> <td>62.721</td> <td>2809.23</td> </tr> <tr> <td>23:44</td> <td>62.751</td> <td>2808.78</td> </tr> <tr> <td>0:44</td> <td>62.885</td> <td>2809.07</td> </tr> <tr> <td>1:44</td> <td>62.883</td> <td>2809.9</td> </tr> </tbody> </table> <p>SLOPE -0.04 GAL/HR SLOPE LOW -0.04 GAL/HR SLOPE HIGH -0.04 GAL/HR TEST RESULTS PASSED SLOPE EQUALS CALCULATED LEAK RATE</p>	TIME	DEG F	GAL	22:44	62.721	2809.23	23:44	62.751	2808.78	0:44	62.885	2809.07	1:44	62.883	2809.9	<p>INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722</p> <p>08/13/1998 10:16 AM</p> <p style="text-align: center;">LINE COMPLIANCE REPORT</p> <p>LINE NO. 1 REGULAR</p> <p style="text-align: center;">PASSED MONTHLY TESTS</p> <p>TEST TIME 1:42 AM TEST DATE 08/12/1998 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH</p> <p>TEST TIME 11:12 PM TEST DATE 07/14/1998 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH</p> <p>LINE NO. 2 MID GRAD</p> <p style="text-align: center;">PASSED MONTHLY TESTS</p> <p>TEST TIME 8:15 AM TEST DATE 08/11/1998 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH</p> <p>TEST TIME 4:41 AM TEST DATE 07/14/1998 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH</p>
TIME	DEG F	GAL														
22:44	62.721	2809.23														
23:44	62.751	2808.78														
0:44	62.885	2809.07														
1:44	62.883	2809.9														
<b>Tank Leak Report Example</b>	<b>Line Leak Report Example: Monthly</b>															

<p style="text-align: center;">INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722</p> <p>08/13/1998 10:16 AM</p> <p style="text-align: center;">SCALD TEST REPORT</p> <p>TANK 1 11882.3 GAL (PRODUCT NAME)</p> <p>LEAK TEST 0.200 GPH LEAK THRESHOLD 0.100 GPH EXTENT 18.0 HRS VOL QUALIFY 0.0% TEST STARTED 12:22 PM TEST STARTED 08/07/1998 SALES RATE 54.731 GPH EVAPORATED 1.781 GAL LOST 0.327 GAL DUTY FACTOR 0.31 UPDATED 12:40 AM UPDATED 08/10/1998</p> <p>SLOPE -0.002 GAL/HR TEST RESULT PASSED SLOPE EQUALS CALCULATED LEAK RATE</p>	<p style="text-align: center;">INCON INTELLIGENT CONTROLS, INC SACO, ME 04072</p> <p>08/11/1998 8:27 PM</p> <p>ACTIVE ALARMS</p> <p>08/11/1998 8:26 PM LOW BRINE LEVEL SENSOR 8 SENSOR NO. 8</p> <p>08/11/1998 8:26 PM PRINTER OUT OF PAPER</p> <p>08/11/1998 8:26 PM STANDARD SENSOR SENSOR 7 SENSOR NO. 7</p> <p>08/11/1998 7:05 PM HIGH PRODUCT LIMIT TANK NO. 1</p>
<p><b>Auto Leak Report Example:</b> Current status of 24-hour leak detection (SCALD).</p>	<p><b>Sensor Status Report Example</b></p>

INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722		
08/13/1998		10:16 AM
REGULATORY REPORT		
HARDWARE STATUS		
TS-CIM		NOT INSTALLED
TS-ROM		NOT INSTALLED
TS-SEM 1		NOT INSTALLED
IO MOD 1		NOT INSTALLED
PRINTER		OPERATIONAL
FAX/MOD		OPERATIONAL
PROBES		
PROBE 1		OPERATIONAL
PROBE 2		OPERATIONAL
SENSORS		
SENSOR 1		OPERATIONAL
SENSOR 2		OPERATIONAL
SENSOR 3		OPERATIONAL
LINES		
LINE NO. 1		OPERATIONAL
LINE NO. 2		OPERATIONAL
AUXILIARY INPUTS		
AUX IN 1		OPERATIONAL
AUX IN 2		OPERATIONAL
PASSED LEAK TESTS		
TANK 1		
08/26/1998		7:42 PM
LEAK TEST		0.20
SLOPE		-0.03
(PASSED LEAK TESTS, PASSED SCALD TESTS, and PASSED LINE TEST REPORT results are all presented in the format used for the PASSED LEAK TEST for TANK 1, shown above)		

Regulatory Report Example

Detailed here are examples of the typical Alarm Report, Tank Leak Report, Tank Auto Leak Report, and Line Leak Test Report for the TS-5XXX series.

<pre>Site ID 1 Site ID 2 Site ID 3 Site ID 4 Site ID 5 Date      Time  <b>Tank Test Report</b> Specified Time Frame  Volume: (gal) programmed Length: (in) programmed Temperature: (F) programmed TANKS  Tank # Product # Maximum Capacity ### Begin Time Date      Time Begin Gross ## Begin Net ## Begin Level ## Begin Temperature ## Begin Water Level ## Begin Water Vol ## End Time Date      Time End Gross ## End Net ## End Level ## End Temperature ## End Water Level ## End Water Vol ## Last Delivery  <b>Test Type</b> Monthly Threshold ### Leak Rate ### Result Pass/Fail/Abort/Incomplete Capacity ###  <b>Details</b> Time Date      Time Net Volume ## Temperature ## Level ## Time Date      Time Net Volume ## Temperature ## Level ##</pre>	<p><b>Gross</b></p> <pre>Site ID 1 Site ID 2 Site ID 3 Site ID 4 Site ID 5  <b>LINE LEAK REPORT</b>  <b>GROSS TEST</b> Line # Gross Leak test Passed Line # Gross Leak test Passed mm/dd/yyyy hh:mm:ss:23</pre> <p><b>Monthly</b></p> <pre>Site ID 1 Site ID 2 Site ID 3 Site ID 4 Site ID 5  <b>LINE LEAK REPORT</b>  <b>MONTHLY TEST</b> Line # Monthly Leak test Passed Line # Monthly Leak test Passed mm/dd/yyyy hh:mm:ss:23</pre> <p><b>Annual</b></p> <pre>Site ID 1 Site ID 2 Site ID 3 Site ID 4 Site ID 5  <b>LINE LEAK REPORT</b>  <b>ANNUAL TEST</b> Line # Annual Leak Test Passed Line # Annual Leak Test Passed mm/dd/yyyy hh:mm:ss</pre>
<p><b>Tank Test Report Example</b></p>	<p><b>Line Leak Report Example: Gross, Monthly, Annual</b></p>

<p>Site ID 1 Site ID 2 Site ID 3 Site ID 4 Site ID 5 Date      Time</p> <p><b>SCALD Report</b></p> <p><i>Specified Time Frame</i></p> <p>Volume: (gal) <i>programmed</i> Length: (in) <i>programmed</i> Temperature: (F) <i>programmed</i> TANKS</p> <p>Tank # Product # Maximum Capacity ### Started Date      Time Result (Pass) Slope ##### Status ## Ended Date      Time Vol % ### Type (Monthly)</p>	<p>USA 03/10/2010 09:24</p> <p>Sensor Report</p> <p>Last Available</p> <p>3 WIRE SENSOR</p> <p>DISPENSER 1/2 SUMP Status: Ok State: Ok Date: 03/09/2010 12:00:00</p> <p>UNLEADED SUB SUMP Status: Ok State: Ok Date: 03/09/2010 12:00:00</p>
<p><b>SCALD Report Example:</b> Current status of 24-hour leak detection.</p>	<p><b>Sensor Status Report Example</b></p>

<p>Site ID 1 Site ID 2 Site ID 3 Site ID 4 Site ID 5</p> <p><b>Regulatory Report</b> Passed Tests From: mm/dd/yyyy To: mm/dd/yyyy Flow: gph</p> <p><b>TANKS (MONTHLY)</b></p> <p>Device Tank # Name Tank# Type Monthly Slope #.# Start Date mm/dd/yyyy hh:mm:ss End Date mm/dd/yyyy hh:mm:ss</p> <p><b>LINES (MONTHLY)</b></p> <p>Device Line # Name Line# End Date mm/dd/yyyy hh:mm:ss</p> <p><b>LINES (ANNUAL)</b></p> <p>Device Line # Name Line# End Date mm/dd/yyyy hh:mm:ss</p> <p><b>2-WIRE SENSOR (MONTHLY)</b></p> <p>Name Sensor Name End Date mm/dd/yyyy hh:mm:ss</p> <p><b>3-WIRE SENSOR (MONTHLY)</b></p> <p>Name Sensor Name End Date mm/dd/yyyy hh:mm:ss</p>	<p>FFS TS-550 evo - LINE LEAK REPORT <span style="float: right;">http://71.86.228.170/2106861/fms_reports.htm</span></p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p><b>LINE LEAK REPORT</b> Last Available <span style="float: right;">05/21/2012 16:20:02</span></p> </div> <p style="text-align: center;"><b>GROSS TESTS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Name</th> <th style="width: 50%;">Result</th> <th style="width: 30%;">Test Date</th> </tr> </thead> <tbody> <tr> <td colspan="3">Unleaded Line</td> </tr> <tr> <td></td> <td>Gross Leak Test Passed</td> <td>05/21/2012 16:05:01</td> </tr> <tr> <td colspan="3">Premium Line</td> </tr> <tr> <td></td> <td>Gross Leak Test Passed</td> <td>05/21/2012 15:56:09</td> </tr> <tr> <td colspan="3">Ethanol Line</td> </tr> <tr> <td></td> <td>Gross Leak Test Passed</td> <td>05/21/2012 15:37:57</td> </tr> </tbody> </table> <p style="text-align: center;"><b>MONTHLY TESTS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Name</th> <th style="width: 40%;">Result</th> <th style="width: 10%;">Type</th> <th style="width: 30%;">Test Date</th> </tr> </thead> <tbody> <tr> <td colspan="4">Unleaded Line</td> </tr> <tr> <td></td> <td>Monthly Leak Test Passed</td> <td>Normal</td> <td>05/21/2012 02:47:21</td> </tr> <tr> <td colspan="4">Premium Line</td> </tr> <tr> <td></td> <td>Monthly Leak Test Passed</td> <td>Normal</td> <td>05/21/2012 15:55:23</td> </tr> <tr> <td colspan="4">Ethanol Line</td> </tr> <tr> <td></td> <td>Monthly Leak Test Passed</td> <td>Normal</td> <td>05/21/2012 10:59:25</td> </tr> </tbody> </table> <p style="text-align: center;"><b>ANNUAL TESTS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Name</th> <th style="width: 50%;">Result</th> <th style="width: 30%;">Test Date</th> </tr> </thead> <tbody> <tr> <td colspan="3">Unleaded Line</td> </tr> <tr> <td></td> <td>Annual Leak Test Passed</td> <td>05/15/2012 03:16:11</td> </tr> <tr> <td colspan="3">Premium Line</td> </tr> <tr> <td></td> <td>Annual Leak Test Passed</td> <td>05/20/2012 07:47:09</td> </tr> <tr> <td colspan="3">Ethanol Line</td> </tr> <tr> <td></td> <td>Annual Leak Test Passed</td> <td>05/20/2012 08:52:43</td> </tr> </tbody> </table> <p style="font-size: small;">Copyright © 2004-2012 Franklin Fueling Systems. All rights reserved. <span style="float: right;">Tank Sentinel AnyWare 2.1.0.6861 *UNRELEASED*</span></p>	Name	Result	Test Date	Unleaded Line				Gross Leak Test Passed	05/21/2012 16:05:01	Premium Line				Gross Leak Test Passed	05/21/2012 15:56:09	Ethanol Line				Gross Leak Test Passed	05/21/2012 15:37:57	Name	Result	Type	Test Date	Unleaded Line					Monthly Leak Test Passed	Normal	05/21/2012 02:47:21	Premium Line					Monthly Leak Test Passed	Normal	05/21/2012 15:55:23	Ethanol Line					Monthly Leak Test Passed	Normal	05/21/2012 10:59:25	Name	Result	Test Date	Unleaded Line				Annual Leak Test Passed	05/15/2012 03:16:11	Premium Line				Annual Leak Test Passed	05/20/2012 07:47:09	Ethanol Line				Annual Leak Test Passed	05/20/2012 08:52:43
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## **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 **s. SPS 310.625**.
- 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.
- While 3<sup>rd</sup> party testing does determine a required minimum tank level, EPA leak detection regulations require testing of the portion of the tank system which routinely contains product. Consistent testing at low levels could allow a leak to remain undetected.

During leak testing, a minimum level of product in tank shall be maintained so as to ensure testing of the portion of the tank and/or piping that routinely contains product, regardless of testing system capability. For instance, if product levels are routinely maintained at 60%, but the leak detection system is capable of testing at 15% product level, then testing shall be performed at 60% levels.

- If performing a tank tightness test, minimum tank level shall be 95%, regardless of leak detection system capability, in accordance with **s. SPS 310.515(4)**.
- Automatic tank gauges shall be programmed to provide an audible and visual alarm in the event of a tank test fail, periodic monthly tank test not performed within a 30-day interval, or tank interstitial sensor actuation. Silencing of the alarm shall require manual operator action.
- Electronic line leak detection shall be programmed to provide an audible and visual alarm in addition to providing shut-down of the submersible pump in the event of a line test fail. The ELLD shall also be programmed to provide an audible and visual alarm in the event a periodic monthly line test was not performed within a 30-day interval. Silencing of either alarm shall require manual operator action.
- Sensors used for interstitial line monitoring shall be programmed to provide an audible and/or visual alarm in addition to providing shut-down of the submersible pump or individual dispenser(s) in the event of a sump/interstitial monitoring sensor actuation. Silencing of the alarm shall require manual operator action.

**Tank Sentinel TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri ATG's** (static 0.2 gph monthly monitoring and 0.1 gph tightness testing)

- Critical performance parameters for the TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001 TS-5000, and Colibri ATG's with the **TSP-LL2 probes**:

Parameter	Value
Maximum Tank Size <sup>1</sup>	<b>Up to 15,000 gallons</b>
Software Version	<b>N/A</b>
Minimum Tank Level	Minimum product level is based on tank diameter as follows: <b>24" dia/min 9";</b> <b>36" dia/min 10.5";</b> <b>48" dia/min 12";</b> <b>52" dia/min 12.5";</b> <b>64" dia/min 14";</b> <b>72" dia/min 15";</b> <b>76" dia/min 15.5";</b> <b>84" dia/min 16.5";</b> <b>96" dia/min 17.5";</b> <b>108" dia/min 19";</b> <b>120" dia/min 21";</b> <b>126" dia/min 21.5";</b> <b>132" dia/min 22";</b> <b>144" dia/min 23.5";</b>
Waiting time between filling tank and test start <sup>2</sup>	<b>6 hours minimum</b>
Waiting time between dispensing and test start	<b>None</b>
Test Period <sup>3</sup>	<b>Variable based on quality of test data. Average times<sup>4</sup>:</b> <b>5 hrs. 10 min. (monthly-0.2 gph)</b> <b>5 hrs. 44 min. (annual-0.1 gph)</b>

- 1: Monthly and annual testing can only be performed on one tank at a time. If several tanks are manifolded together, an isolation valve will have to be installed so as to separate the tanks individually.
- 2: There must be no delivery during waiting time.
- 3: There must be no delivery or dispensing during testing.
- 4: System automatically determines minimum time based on test conditions being met. Test times will generally be longer for larger tanks.

**Tank Sentinel TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri ATG's** (static 0.2 gph monthly monitoring only)

- Critical performance parameters for the TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001 TS-5000, and Colibri ATG's with the **TSP-LL2 probes**:

Parameter	Value
Maximum Tank Size <sup>1</sup>	<b>Up to 30,000 gallons</b>
Software Version	<b>N/A</b>
Minimum Tank Level	Minimum product level is based on tank diameter as follows: <b>24" dia/min 9";</b> <b>36" dia/min 10.5";</b> <b>48" dia/min 12";</b> <b>52" dia/min 12.5";</b> <b>64" dia/min 14";</b> <b>72" dia/min 15";</b> <b>76" dia/min 15.5";</b> <b>84" dia/min 16.5";</b> <b>96" dia/min 17.5";</b> <b>108" dia/min 19";</b> <b>120" dia/min 21";</b> <b>126" dia/min 21.5";</b> <b>132" dia/min 22";</b> <b>144" dia/min 23.5";</b>
Waiting time between filling tank and test start <sup>2</sup>	<b>4 hours minimum<sup>3</sup></b>
Waiting time between dispensing and test start	<b>2 hours minimum</b>
Test Period <sup>4</sup>	<b>Variable based on quality of test data. Average time<sup>5</sup>: 6 hrs. 51 min.</b>

1: Monthly and annual testing can only be performed on one tank at a time. If several tanks are manifolded together, an isolation valve will have to be installed so as to separate the tanks individually.

2: There must be no delivery during waiting time.

3: This probe can only perform a 0.2 gph monthly test.

4: There must be no delivery or dispensing during testing.

5: System automatically determines minimum time based on test conditions being met. Test times will generally be longer for larger tanks.

**Tank Sentinel TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001, TS-5000, and Colibri ATG's w/SCALD** (24-hour, 0.2 gph monthly monitoring)

- Critical performance parameters for the using the Tank Sentinel TS-5, TS-550, TS-550 evo, TS-750, TS-1000, TS-1001, TS-2001 TS-5000, and Colibri ATG's w/SCALD and **TSP-LL2 probes** are:

<b>Parameter</b>	<b>Value</b>
Maximum Tank Size <sup>1</sup>	<b>Up to 49,336 gallons</b>
Maximum Number of Manifolder Tanks	<b>3</b>
Software Version	<b>N/A</b>
Minimum Tank Level <sup>2</sup>	<b>15%</b>
Maximum Monthly Throughput	<b>304,620 gallons</b>

1: For single or aggregate capacity of manifolded tanks.

2: The SCALD system will automatically check the tank level, and not perform a test if the tank level is below the minimum.

**Electronic Line Leak Detector**

- The Franklin Fueling Systems Electronic Line Leak Detector is approved for use on pipeline systems for underground storage tank facilities that contain petroleum or other chemical products. It is approved for use on rigid piping and flexible piping.
- An annual test of the operation of the leak detector shall be conducted in accordance with the manufacturer requirements for testing to the recognized leak thresholds by inducing a physical line leak as required by **s. SPS 310.515(8)(d)**. The individual performing the test must be qualified by the equipment manufacturer.
- The system may be used with trapped vapor present in the line.
- **Mechanical line leak detectors cannot be installed in the same line as the electronic line leak detector.**
- Critical performance parameters for the **TS-LLD Electronic Line Leak Detector**:

Parameter	Value
Total maximum allowable volume of product in any <b>flexible</b> test pipeline	<b>39.5 gallons or less</b>
Total maximum allowable volume of product in any <b>rigid</b> test pipeline	<b>163 gallons or less</b>

**Note:** All other critical parameters, such as test line pressure; minimum test times; minimum wait times between product dispensing and start of test are pre-programmed into the software and are not accessible for viewing.

- Critical performance parameters for the **TS-LS500 Electronic Line Leak Detector**:

Parameter	Value
Total maximum allowable volume of product in any <b>flexible</b> test pipeline	<b>95.5 gallons or less</b>
Total maximum allowable volume of product in any <b>rigid</b> test pipeline	<b>312.2 gallons or less</b>
Total maximum allowable volume of product in any <b>Hybrid</b> (rigid and flexible piping combination) test pipeline	<b>415.8 gallons or less<sup>1</sup></b>

1: The capacity of the flexible component cannot exceed 95.4 gallons

**Note:** All other critical parameters, such as test line pressure; minimum test times; minimum wait times between product dispensing and start of test are pre-programmed into the software and are not accessible for viewing.

- Critical performance parameters for the **TS-LS500 SLLD Continuous Pressurized Piping Leak Detection System (CPPLDS)**:

Parameter	Value
Maximum Monthly Throughput	<b>391,250 gallons</b>
Total maximum allowable volume of product in any <b>flexible</b> test pipeline	<b>95.5 gallons or less</b>
Total maximum allowable volume of product in any <b>rigid</b> test pipeline	<b>312.2 gallons or less</b>
Total maximum allowable volume of product in any <b>Hybrid</b> (rigid and flexible piping combination) test pipeline	<b>415.8 gallons or less<sup>1</sup></b>

1: The capacity of the flexible component cannot exceed 95.4 gallons

**Note:** All other critical parameters, such as test line pressure; minimum test times; minimum wait times between product dispensing and start of test are pre-programmed into the software and are not accessible for viewing.

### **Liquid Level Sensors**

The Liquid Sensors shall be placed such that a release from any portion of the tank or piping will be detected.

Part Number	Description	Application
<b>TSP-EIS</b>	Electro-optic Liquid Sensor	Fiberglass or Steel Tank Dry Interstitial and Containment Sumps
<b>TSP-HLS</b>	Liquid Level Sensor	Tank Overfill
<b>TSP-HIS</b>	Dual Float Liquid Level	Brine Filled Interstitial of Double Wall Fiberglass Tank and Sump
<b>TSP-ULS</b>	Float liquid Sensor	Steel Tank Interstitial and Containment Sumps
<b>TSP-DIS</b>	Discriminating Liquid Sensor	Fiberglass or Steel Tank Dry Interstitial and Containment Sumps
<b>TSP-DTS</b> <b>TSP-DDS</b>	Float Technology Liquid Sensor w/Hydrocarbon Sensing Strip	Containment Sumps

This approval will be valid through December 31, 2014, 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: May 1, 2012

Reviewed by: Signature on file  
Greg Bareta, P. E.  
Engineering Consultant  
Bureau of Petroleum Products and Tanks

Approved by: Signature on file Date: \_\_\_\_\_