Department of Environmental Protection

2600 Blair Stone Road ♦ Tallahassee, Florida 32399-2400

DEP Form: 62-761.900(9)
Form Title: Storage Tank Equipment Registration Form
Effective Date: July 2019
Incorporated in Rule 62-761.850, F.A.C.

Storage Tank System Equipment Registration Form

Fill out completely

General Information

Company Name: Dover Fueling Solutions
Contact Name: Gene Pope
Company Address: 3814 Jarrett Way #1212
City, State: Austin, Texas Zip: 78728
E-mail: gpope@popeasc.com
Contact Number: 813-431-2009
Product Name: DFS ProGauge Maglink LX Series Automatic Tank Gauging & Leak Detection Systems
Model Number(s): LX Plus & Ultimate Consoles, FM Series Invento
Product Type: Leak Detection / Continuous Automatic Tank Ga
Rule(s) citation that registration is being requested within Chapter 62-761 (UST), and/or 62-762 (AST),
62.761.600 Release Detection Requirement & 62.762.601 Release Detection for Shop Fabricated Storage Tanks
F.A.C.: Write a brief description of equipment registration request including product limitations:

This request is being submitted to amend EQ987 issued on 10/20/22. This request is to change the Product Type to "Leak Detection / Continuous Automatic Tank Gauging & Leak Detection / Line Leak Detector with Automatic Shut-off & UST/AST Overfill Prevention. This amendment includes an additional console model, the LX Ultimate, as well as approvals for CSLD, SLD, and Automatic line leak detection with automatic shut-off.

Information Checklist (Choose Yes, No, or N/A - Not Applicable):

		Yes	No	N/A
1.	Third-party Certification by a Nationally Recognized Testing Laboratory? (Required)	✓		
2.	Documentation of third-party evaluation that the equipment meets DEP Rules?	✓		
3.	Documents included about the qualifications of the Nationally Recognized Testing Laboratory?	✓		
4.	Technical information and drawings included?	✓		
5.	Installation instructions included?	✓		
6.	Annual Operability Testing Requirements (Rules 62-761.500, 62-762.501, & 62-762.502 F.A.C.)?	✓		
7.	Integrity Testing Requirements (Rules 62-761.700, 62-762.701, & 62-762.702, F.A.C.)?	✓		
8.	Compatible with fuel blends containing >10% ethanol or >20% biodiesel?	✓		
9.	Has the product been approved or registered in other countries or states? (If so provide list)	✓		
10.	Any requirements for company-certified installers or trainers?	✓		
11.	Was this product(s) previously approved or registered by the Department? If yes, EQ- 987	✓		
12.	Any changes or modifications to the equipment since the last submittal to DEP?	✓		

Document Information: Provide supporting documents indicated as "Yes" above including this form via email to Tanknotify@floridadep.gov, or documents can be sent to FDEP, Division of Waste Management, 2600 Blair Stone Road, MS 4560, Tallahassee, FL 32399.

Write a brief description of equipment installation and performance in the U.S.:

The Dover Fueling Solutions(DFS) ProGauge LX Series Automatic Tank Gauging & Leak Detection systems provide inventory & leak detection management for UST & AST applications. The systems are EPA third party approved for SLD, CSLD, and Automatic Line Leak Detection. The systems can also provide overfill prevention alarms. DFS has sold the LX series systems globally since 2019.

Equipment Registration Certification:

To the best of my knowledge and belief, all information submitted on this form is true, accurate and complete.

Gene Pope - Manufacturer's Representative
Printed Name and Title

Gene Pope
Digitally signed by Gene Pope
Date: 2026.02.12 10:49:04 -05'00'
Signature (right click to sign)

02/12/2026
Date

For Department Use Only:

Date Application Received: 02/12/2026
Application complete: Yes: ☒ No: ☐

EQ- 987
Date of complete or incomplete letter sent: 03/16/2026
Date Equipment Requires Renewal: 03/16/2031

Storage tank system equipment requires renewal every 5 years in accordance with subsection 62-761.850(2), F.A.C.

ProGauge

Gauge The Possibilities

ProGauge MagLink LX Plus®

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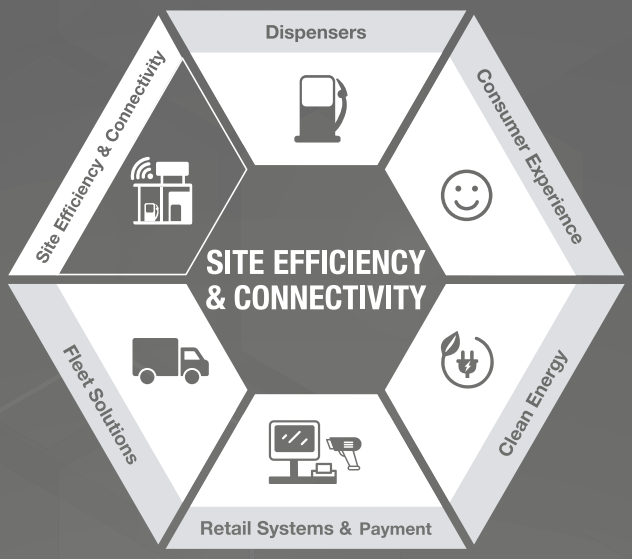
DOVER FUELING SOLUTIONS

Wayne OPW ClearView AvaLAN Bulloch TOKHEIM ProGauge fairbanks LIQAL



Experience the Best

The ProGauge MagLink LX Plus®, the latest tank gauge console from Dover Fueling Solutions® (DFS), comes with a brilliant 7" color display with intelligent "touch and swipe" technology. The MagLink LX Plus joins the well-established MagLink LX console family with enhanced scalability, flexibility and connectivity. What are you waiting for? Transform your fuel management and inventory and compliance monitoring capabilities, today!

Flexible. Scalable. Interactive. Global.

It's Flexible

The MagLink LX Plus not only supports simple 'on/off' sensors; it also interfaces seamlessly with intelligent sensors, such as those built on IntelliSense™ technology. This gives you even more flexibility when it comes to connecting your console to your forecourt equipment, and even greater monitoring coverage made visible through a single user interface. Unlike its younger brothers, the MagLink LX Plus is also manufactured with the inbuilt capability to support all legacy probes from DFS, including OPW® Fuel Management Solutions (FMS) models.

It's Scalable

The MagLink LX Plus is a console designed to be scaled up. With base monitoring capabilities of up to 12 probes (coupled with patented multi-drop technology, which reduces installation costs), this console can be easily enhanced to add Continuous Statistical Leak Detection (CSLD), Electronic Pressurized Line Leak Detection (PLLD), relays or input connections, and up to 48 sensors.

It's Interactive.

The MagLink LX Plus' touchscreen enables you to effortlessly move between screens to easily view all of your tank data through its new and improved graphical display. This, alongside with a brighter screen, faster processor and simplified reporting capabilities makes it one of the most advanced tank gauge consoles on the market.

It's Global.

Utilizing a robust global platform, the MagLink LX Plus console personifies global consistency, while still being able to provide the regionally specific features you need, including meeting your environmental and compliance needs.

It's Environmentally Concious.

The MagLink LX Plus' highly precise and well-calibrated line leak detection system ensures your site is protected 24/7. With this console pressure lines are continuously monitored and site owners have the ability to perform leak tests on up to eight pressure lines directly via the console.

Features and Functions

- User-friendly interface with new intelligent 'touch and swipe' navigation
- Calendar feature for deliveries, alarms and warnings, which can be filtered by event and/or tank
- Supports up to 12 probes (up to 6 of the 12 probes can have CSLD enabled)
- Supports both wired and wireless probes on the same system*
- Probe types supported: DFS DMP Magnetostrictive, OPW FMS 924B and 924A probes
- Can monitor manifolded or grouped tanks
- Automatic Calibration and Reconciliation (ACR) to reconcile fuel use and deliveries (point-of-sale (POS) interface required)
- Displays tank volume, TC volume, ullage, water, density (additional density float required) product level and water level, and product temperature for individual tanks
- Automatic leak detection (POS connection not required)
- EPA certified for 0.1 gph and 0.2 gph static tank leak detection
- EPA certified for 0.2 gph Continuous Statistical Leak Detection (CSLD)
- EPA certified for 0.1 gph, 0.2 gph and 3.0 gph pressurized line leak detection (PLLD). Up to 8 pressure lines are supported
- Leak detection scheduling by day/week/month
- Local or remote PC connection
- IFSF support (additional external interface required)
- Audio, visual, email and printed alarm notifications
- Console configured through a web interface. No added hardware or proprietary software needed
- Web interface-optimised for handheld devices (mobile and tablet)
- Network connectivity: DHCP and static addressing
- 2 x relays on board
- Optional input/output module expands functionality adding a maximum of 32 relays or 32 input connections*
- Monitoring sensors supported (wired and wireless)*
- Reports include: inventory, deliveries, tank history, leak test, shifts, reconciliation and sales
- Configurable to meet local settings (date/time formats and metric/imperial units)
- Communicates with most industry-standard third-party POS protocols (Serial and/or Ethernet)
- Optional aqueous ethanol float (AEF) detects potential phase separation
- Product density support via optional Density kit
- Systems updates can be applied via USB (or remotely)
- Enabled for wetstock monitoring services (Fairbanks, ClearView or DX Wetstock™)
- Driver display option, external display for tanker drivers
- Printer options: USB or Serial
- Communication ports
  - RS 232 communication port
  - RS 485 communications port
  - Ethernet port
  - USB port

Certifications

** Subject to regional availability*

ProGauge | DOVER FUELING SOLUTIONS

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ProGauge™

Ultimate Interaction. Ultimate Possibilities.

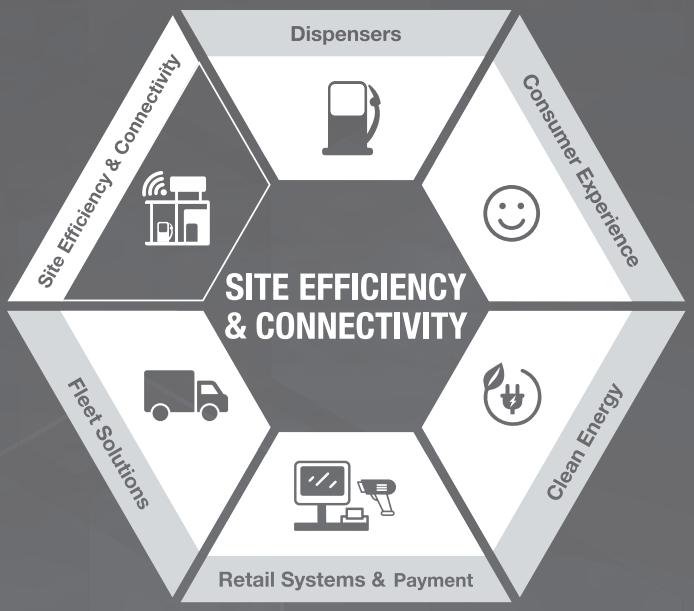
ProGauge MagLink LX Ultimate® Console

Visit Website

DFS *Worldwide* Brands

DOVER FUELING SOLUTIONS

Wayne™ OPW™ ClearView™ AvaLAN Bulloch™ TOKHEIM ProGauge™ fairbanks LIQAL™



Paramount Performance, Every Single Time

Introducing the ProGauge MagLink LX Ultimate console, the next-generation tank gauge console from Dover Fueling Solutions® (DFS). This exceptional automatic tank gauge (ATG) console joins the already well-established MagLink LX® family, alongside the MagLink LX Plus® and MagLink LX 4® models. Available globally, this brand-new console has the functionality of both the OPW Fuel Management Systems (OPW FMS) SiteSentinel® Integra and ProGauge MagLink LX consoles combined, making it the pinnacle in ATG. The MagLink LX Ultimate console has more computing power, a large responsive touchscreen, and increased connectivity to probes and sensors. Simply put, the MagLink LX Ultimate is bigger and better.

In fact, the MagLink LX Ultimate is DFS' most advanced console yet. Precise, scalable, global, and connected. Wherever you are in the world, whatever your needs, and whatever your forecourt set up, the MagLink LX Ultimate is all you will ever need. It's the all-in-one tank gauge console. Peak performance at your fingertips. Next level monitoring. What are you waiting for? Transform your fuel management and monitoring capabilities, today!

DFS *Worldwide* Brands

DOVER® FUELING SOLUTIONS

Wayne™ OPW™ ClearView™ AvaLAN Bulloch™ TOKHEIM ProGauge™ fairbanks LIQAL™

The Console That Has and Does Everything

It's Connected

Much like the MagLink LX Plus, the MagLink LX Ultimate also has the inbuilt capability to support all legacy probes from DFS, including OPW FMS models. The MagLink LX Ultimate console not only supports multiple simple 'on/off' sensors, it also interfaces seamlessly with intelligent sensors, such as those built on IntelliSense™ technology. This gives you even more flexibility and precision when connecting your console to your forecourt equipment, and even greater monitoring coverage made visible through a single user interface.

It's Scalable

The MagLink LX Ultimate is a console designed to be scaled up. With base monitoring capabilities of up to **12 probes** and **48 sensors**, this console can be easily enhanced to deliver monitoring of up to **48 probes** and **480 sensors** across a fuel network. This, coupled with patented multidrop technology, which reduces installation costs, makes the MagLink LX Ultimate console the ideal ATG solution for fuel retail sites of all sizes.

It's User-Friendly

The MagLink LX Ultimate touchscreen is, well, Ultimate. With a 12" display, users are able to effortlessly swipe between screens to easily view tank data – it can display tank status for up to 9 tanks simultaneously – through its enhanced graphical display. This, alongside a brighter screen, faster processor and simplified reporting capabilities makes it one of the most advanced tank gauge consoles on the market.

It's Environmentally Concious

The MagLink LX Ultimate console features precise algorithms to ensure sites are monitored and protected, 24/7. In fact, sites are continuously monitored according to the most stringent industry standards. Both tank static and continuous statistical leak detection (SLD and CSLD), as well as pressure line leak detection (PLLD) are available as standard with every system. Site owners can perform leak tests on pressure lines, directly via the console. Advanced PLLD features monitor pressure in the product lines during fueling cycles and idle periods.

Features and Functions

- User-friendly interface, via 12” screen, with new intelligent ‘touch and swipe’ navigation
- Calendar feature for deliveries, alarms and warnings, which can be filtered by event and/or tank
- Supports up to 12 probes (48 with additional barriers)
- Supports both wired and wireless probes on the same system*
- Probe types supported: DFS DMP™ Magnetostrictive probe(s), OPW FMS 924B and 924A probes
- Can monitor manifolded or grouped tanks
- Automatic Calibration and Reconciliation (ACR) to reconcile fuel use and deliveries (point-of-sale (POS) interface required)
- Displays tank volume, TC volume, ullage, water, density (additional density float required) product level and water level, and product temperature for individual tanks
- Automatic leak detection (POS connection not required)
- EPA certified for 0.1 gph and 0.2 gph static tank leak detection
- EPA certified for 0.1 gph, 0.2 gph and 3.0 gph pressurized line leak detection (PLLD). Up to 8 pressure lines are supported
- EPA certified for 0.2 gph Continuous Statistical Leak Detection (CSLD)
- Leak detection scheduling by day/week/month
- Local or remote PC connection

Certifications

- IFSF support (additional external interface required)
- Audio, visual, email and printed alarm notifications
- Console configured through a web interface. No added hardware or proprietary software needed
- Web interface-optimised for handheld devices (mobile and tablet)
- Network connectivity: DHCP and static addressing
- 2 x relays on board (expandable with additional modules)
- Optional input/output module expands functionality adding a maximum of 32 relays or 32 input connections*
- Monitoring of up to 480 sensors supported (wired and wireless)
- Reports include: inventory, deliveries, tank history, leak test, shifts, reconciliation and sales
- Configurable to meet local settings (date/time formats and metric/imperial units)
- Communicates with most industry-standard third-party POS protocols (Serial and/or Ethernet)
- Optional aqueous ethanol float (AEF) detects potential phase separation
- Product density support via optional Density kit
- Systems updates can be applied via USB (or remotely)
- Enabled for wetstock monitoring services (Fairbanks, ClearView or DX Wetstock®)
- Driver display option, external display for tanker drivers
- Printer options: USB or Serial
- Communication ports;
  - RS 232 communication port
  - RS 485 communications port
  - Ethernet port
  - USB port

**Subject to regional availability*

ProGauge™

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ProGauge | DOVER FUELING SOLUTIONS

Half the Price, Twice the Warranty, All the Features

The Pinnacle of Automatic Tank Gauging

- Setup quickly and navigate easily with a touch-and-swipe screen.
- Save money with multi-drop installations.
- Save time with self-identifying smart sensors.
- Setup quickly and monitor remotely with laptop configuration.

Your business can trust third-party certification of leak detection capabilities, including: PLLD, CSLD, SLD.

Scalable solutions mean you can invest once, and grow your footprint over time.

2-year Warranty

on entire system, including:

- **Consoles**
- **Probes**
- **Sensors**
- **Floats**

c UL us

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Or scan the QR to visit the website

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Dover Fueling Solutions
MagLink LX
(Dover Fueling Solutions 924B probe with 2 inch dia Floats)

AUTOMATIC TANK GAUGING METHOD

Certification
Leak rate of 0.2 gph with PD = 99.70% and PFA = 0.30%
Leak rate of 0.1 gph with PD = 95.56% and PFA = 4.41%.

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.

Applicability
Gasoline, diesel, aviation fuel, fuel oil #4, solvents, waste oil, other bio-diesel and ethanol blends compatible with probe floats.

Tank Capacity
Maximum of 20,650 gallons.
Tank must be minimum 14% full for leak rate of 0.2 gph.
Tank must be minimum 15% full for leak rate of 0.1 gph.

Waiting Time
Minimum of 8 hours between delivery and testing for leak rate of 0.2 gph.
Minimum of 12 hours between delivery and testing for leak rate of 0.1 gph.
There must be no delivery during waiting time.

Test Period
Minimum collection time of 2 hours for leak rate of 0.2 gph.
Minimum collection time of 4 hours for leak rate of 0.1 gph.
Test data are acquired and recorded by system's computer.
There must be no dispensing or delivery during test.

Temperature
Average for product is determined by a probe containing 5 thermistors.

Water Sensor
Minimum detectable water level that can be detected is 1.016 inch.
Minimum detectable change in water level that can be detected is 0.0098 inch.

Calibration
Thermistors and probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.

Comments
Not evaluated using manifolded tank systems. Therefore, this certification is only applicable when there is a probe used in each tank and the siphon is broken during testing.
Evaluated with 2" diameter OPW fuel floats and 2" diameter DMP water floats.
Tests only portion of tank containing product.
As product level is lowered, 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.

Dover Fueling Solutions
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200
E-Mail: atg@doverfs.com
URL: www.doverfuelingsolutions.com

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 09/15/2021; 9/21/2021

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. For full details, please refer to our expanded "DISCLAIMER" page.

Dover Fueling Solutions
MagLink LX
(Dover Fueling Solutions DMP probe with 2 inch dia Floats)

AUTOMATIC TANK GAUGING METHOD

Certification
Leak rate of 0.2 gph with PD = 97.49% and PFA = 2.51%.
Leak rate of 0.1 gph with PD = 97.10% and PFA = 2.90%.

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.

Applicability
Gasoline, diesel, aviation fuel, fuel oil #4, solvents, waste oil, other bio-diesel and ethanol blends compatible with probe floats.

Tank Capacity
Maximum of 20,650 gallons.
Tank must be minimum 14% full for leak rate of 0.2 gph.
Tank must be minimum 15% full for leak rate of 0.1 gph.

Waiting Time
Minimum of 8 hours between delivery and testing for leak rate of 0.2 gph.
Minimum of 12 hours between delivery and testing for leak rate of 0.1 gph.
There must be no delivery during waiting time.

Test Period
Minimum collection time of 2 hours for leak rate of 0.2 gph.
Minimum collection time of 4 hours for leak rate of 0.1 gph.
Test data are acquired and recorded by system's computer.
There must be no dispensing or delivery during test.

Temperature
Average for product is determined by a probe containing 5 thermistors.

Water Sensor
Minimum detectable water level that can be detected is 0.681 inch.
Minimum detectable change in water level that can be detected is 0.0098 inch.

Calibration
Thermistors and probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.

Comments
Not evaluated using manifolded tank systems. Therefore, this certification is only applicable when there is a probe used in each tank and the siphon is broken during testing.
Evaluated with 2″ diameter OPW fuel floats and 2″ diameter DMP water floats.
Tests only portion of tank containing product.
As product level is lowered, 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.

Dover Fueling Solutions
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200
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Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
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Dover Fueling Solutions

ProGauge MagLink LX ATG with CSLD

(924B and DMP Magnetostrictive Probes)

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

Certification

Single tanks - Leak rate of 0.2 gph with PD = 99.42% and PFA =0.58%
Manifold tanks - Leak rate of 0.2 gph with PD = 98.555% and PFA=1.445%

Leak Threshold

Tank category	Threshold	PFA	PD (at 0.2 gal/hr)
Single	0.1 gal/hr	0.58%	99.42%
Manifold	0.1 gal/hr	1.445%	98.555%

Applicability

Gasoline, diesel, aviation fuel, fuel oil #4, solvents and biodiesel blends B6-B20 meeting ASTM D7467, biodiesel B100 meeting ASTM D6751 and other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer. Ethanol and ethanol-gasoline blends

Tank Capacity

Maximum of 25,215 gallons for the leak thresholds shown above.
Maximum tank capacity listed is for single tanks and up to 4 tanks manifolded together.
The minimum product level required to test is 14% full.

Throughput

Monthly maximum of 351,190 gallons for leak thresholds shown above.

Waiting Time

None. The algorithm tests the data for stability and discards those collected before the tank is stable.

Test Period

Data collection can range up to 31 days. The minimum number of days to make a leak rate estimate is 8 days, with a maximum of 31 days in which to acquire it. The more qualified test time available the higher confidence the leak rate estimate.
Data sampling frequency is at least once per minute.

Temperature

Average for product is determined by a probe with 5 thermistors.

Water Sensor

The minimum water level (threshold) in the tank that the CITLDS can detect is 1.016 inches with a 924B probe and 0.681 inch with a DMP probe. The minimum change in water level that can be detected by the CITLDS is 0.0098 inch with a 924B probe or DMP probe

Calibration

Probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.

Comments

System reports a result of "pass" or "fail."
Evaluated using both single and manifolded tank systems with probes in each tank.
For valid monthly testing, a conclusive test report must be produced for each tank every month.
System warns operator if there are no "passing" tests completed during the month.
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 included sites with vapor recovery and blending dispensers.
Tanks used in this evaluation contained gasoline and diesel.

Dover Fueling Solutions
3814 Jarrett Way
Austin, TX 78778

Tel: (708) 485-4200
E-Mail: atg@doverfs.com
URL: www.doverfuelingsolutions.com

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 09/26/2023

Dover Fueling Solutions

MagLink LX Electronic Line Leak Detector for Rigid, Semi-Rigid, Flexible and/or Combination Pipelines

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification

Leak rate of 3.0 gph at 10 psi* with PD = 100% and PFA = 0%.
Leak rate of 0.2 gph at operating pressure with PD = 100% and PFA = 0%.
Leak rate of 0.1 gph at 1.5 times operating pressure* with PD = 100% and PFA = 0%.
*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.

Leak Threshold

1.5 gph for leak rate of 3.0 gph.
0.1 gph for leak rate of 0.2 gph.
0.05 gph for leak rate of 0.1 gph.
A pipeline system should not be declared tight if the test result indicates a loss that equals or exceeds this threshold.

Applicability

Gasoline, diesel, aviation fuel, #4 and #6 fuel oil, solvents, used oil, ethanol blends up through E100, biodiesel blends B6-B20 meeting ASTM D7467, biodiesel B100 meeting ASTM D6751.

Specification

System tests pressurized rigid, flexible, and combinations of rigid and flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity

For 3.0 gph (hourly), 0.2 gph (monthly) and 0.1 gph (annual) leak rate test:
Maximum of 124 gallons flexible or semi-rigid pipe
Maximum of 559 gallons for combination (flex, semi-rigid, rigid) pipelines with a minimum bulk modulus of 21,987 psi.

Waiting Time

None between delivery and testing.
None between dispensing and testing.

Test Period

Response time is 13 to 14 minutes (average test time of 14 minutes) for a leak rate of 3.0 gph.
Response time is 5 to 6 hours (average test time of 5.5 hours) for a leak rate of 0.2 gph.
Response time is 5 to 15 hours (average test time of 14.25 hours) for leak rate of 0.1 gph.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features

Maglink LX console used in this evaluation with Dover ELLD.
Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Pump shutdown (optional), message display and alarm activation if leak is declared.

Calibration

System must be checked annually and, if necessary, calibrated in accordance with manufacturer's instructions.

Comments

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.
During initial setup, it is necessary to program the console by activating the consoles "learn" mode in order for the console to gather data on the pipeline with a Dover supplied leak orifice installed. Once the "learn" mode is finished, the system is ready to monitor the pipeline and will not need to be re-programmed unless the line characteristics change.

3814 Jarret Way
Austin, TX 78278
Tel: (708) 485-4200
E-Mail: atg@doverfs.com
URL: www.doverfuelingsolutions.com

Tel: (816) 443-2494
Date of Evaluation: 07/08/2022

Department of Environmental Protection

2600 Blair Stone Road ♦ Tallahassee, Florida 32399-2400

DEP Form: 62-761.900(9)
Form Title: Storage Tank Equipment Registration Form
Effective Date: July 2019
Incorporated in Rule 62-761.850, F.A.C.

Storage Tank System Equipment Registration Form

Fill out completely

General Information

Company Name: Dover Fueling Solutions
Contact Name: Gene Pope
Company Address: 3814 Jarrett Way, #1212
City, State: Austin, TX Zip: 78728
E-mail: gpope@popeasc.com
Contact Number: 813-431-2009
Product Name: DFS ProGauge MagLink LX PLUS Tank Gauges, Probes, and Sensors
Model Number(s): LX PLUS Console, 30-BXXX & 30-FBXXX Inventor
Product Type: UST/AST Overfill Protection & Leak Detection/L
Rule(s) citation that registration is being requested within Chapter 62-761 (UST), and/or 62-762 (AST),
62.761.600 Release Detection Requirement, 62-762.601 Release Detection For Shop Fabricated Storage Tanks

F.A.C.: Write a brief description of equipment registration request including product limitations:

Dover Fueling Solutions(DFS) ProGauge MagLink LX PLUS Console Tank Gauge System is an automatic tank gauging system that offers inventory management (utilizing DFS & OPW FMS inventory probes), leak detection(utilizing DFS & OPW FMS leak detection sensors), and overfill alarm protection. The LX PLUS system is used in underground and aboveground tank systems. The LX PLUS is EPA 3rd party approved for .1 and .2 Static Leak Tests for tanks up to 20,650 gallon capacities.

Information Checklist (Choose Yes, No, or N/A - Not Applicable):

		Yes	No	N/A
1.	Third-party Certification by a Nationally Recognized Testing Laboratory? (Required)	✔		
2.	Documentation of third-party evaluation that the equipment meets DEP Rules?	✔		
3.	Documents included about the qualifications of the Nationally Recognized Testing Laboratory?	✔		
4.	Technical information and drawings included?	✔		
5.	Installation instructions included?	✔		
6.	Annual Operability Testing Requirements (Rules 62-761.500, 62-762.501, & 62-762.502 F.A.C.)?	✔		
7.	Integrity Testing Requirements (Rules 62-761.700, 62-762.701, & 62-762.702, F.A.C.)?	✔		
8.	Compatible with fuel blends containing >10% ethanol or >20% biodiesel?	✔		
9.	Has the product been approved or registered in other countries or states? (If so provide list)	✔		
10.	Any requirements for company-certified installers or trainers?	✔		
11.	Was this product(s) previously approved or registered by the Department? If yes, EQ- _____		✔	
12.	Any changes or modifications to the equipment since the last submittal to DEP?			✔

Document Information: Provide supporting documents indicated as "Yes" above including this form via email to Tanknotify@floridadep.gov, or documents can be sent to FDEP, Division of Waste Management, 2600 Blair Stone Road, MS 4560, Tallahassee, FL 32399.

Write a brief description of equipment installation and performance in the U.S.:

The Dover Fueling Solutions(DFS) LX PLUS Tank Monitor is installed in conjunction with either underground or aboveground tanks to provide inventory and leak detection management along with overfill prevention through an audible and visual alarm on the LX PLUS console, as well as an optional remote alarm console if installed. The LX PLUS can be monitored remotely through a web browser. The LX PLUS utilizes DFS & OPW FMS digital inventory probes and digital leak detection sensors which are individually serialized. The LX PLUS has been a globally sold product from Dover Fueling Solutions(DFS) since 2019.

Equipment Registration Certification:

To the best of my knowledge and belief, all information submitted on this form is true, accurate and complete.

Gene Pope - Manufacturer's Representative	Gene Pope — Digitally signed by Gene Pope Date: 2022.10.13 14:12:47 -04'00'	10/14/2022
Printed Name and Title	Signature (right click to sign)	Date

For Department Use Only:

Date Application Received: 10/14/2022 Application complete: Yes: ✔ No: ☐

EQ- 987 Date of complete or incomplete letter sent: 10/20/2022 Date Equipment Requires Renewal: 10/20/2027

Storage tank system equipment requires renewal every 5 years in accordance with subsection 62-761.850(2), F.A.C.

ProGauge

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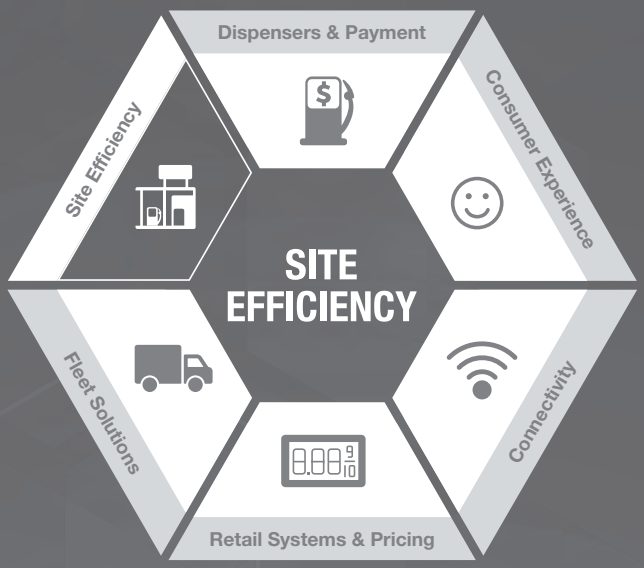

Experience the Best

Introducing the ProGauge MagLink LX Plus, the latest tank gauge console from Dover Fueling Solutions (DFS), with intelligent 'touch and swipe' technology. The premium MagLink LX Plus supersedes the MagLink LX 4 and MagLink LX models, with enhanced scalability, flexibility and connectivity. It's our most sophisticated, feature-rich console yet!

Flexible. Scalable. Interactive. Global.

It's Flexible

The MagLink LX Plus not only supports simple 'on/off' sensors; it also interfaces seamlessly with intelligent sensors, such as those built on IntelliSense™ technology. This gives you even more flexibility when it comes to connecting your console to your forecourt equipment, and even greater monitoring coverage made visible through a single user interface.

Unlike its younger brothers, the MagLink LX Plus is also manufactured with the inbuilt capability to support all legacy probes from DFS, including OPW Fuel Management Solutions models.

It's Scalable

The MagLink LX Plus is a console designed to be scaled up. With base monitoring capabilities of up to 12 probes, this console can be easily enhanced to deliver monitoring of up to 32 probes across your network. This, coupled with patented multidrop technology which reduces installation costs, makes the MagLink LX Plus the ideal solution for fuel retail sites of all sizes.

It's Interactive.

The MagLink LX Plus' touchscreen enables you to effortlessly move between screens to easily view all of your tank data through its new and improved graphical display. This, alongside with a brighter screen, faster processor and simplified reporting capabilities makes it one of the most advanced tank gauge consoles on the

It's Global.

Wherever you are in the world, whatever your needs, and whatever your forecourt set up, the MagLink LX Plus is all you will ever need.

ProGauge

Features and Functions

- User-friendly interface with new intelligent 'touch and swipe' navigation
- Calendar feature for deliveries, alarms and warnings, which can be filtered by event and/or tank
- Supports up to 12 probes (32 with optional external barriers)
- Supports both wired and wireless probes on the same system
- Supports legacy OPW FMS 924B probes
- Can monitor manifolded or grouped tanks
- Automatic Calibration and Reconciliation (ACR) to reconcile fuel use and deliveries (point-of-sale (POS) interface required)
- Displays tank volume, TC volume, ullage, water, density (additional density float required) product level and water level, and product temperature for individual tanks
- Automatic leak detection (POS connection not required)
- EPA certified for 0.1gph and 0.2 gph static leak detection
- Leak detection scheduling by day/week/month
- Local or remote PC connection
- IFSF support (additional external interface required)
- Audio, visual, email and printed alarm notifications
- Console configured through a web interface. No added hardware or proprietary software needed
- Web interface-optimised for handheld devices (mobile and tablet)
- Network connectivity: DHCP and static addressing
- 2 x relays on board
- Optional input/output module expands functionality adding a maximum of 32 relays or 32 input connections
- Monitoring sensors supported (wired and wireless)
- Reports include: inventory, deliveries, tank history, leak test, shifts, reconciliation and sales
- Configurable to meet local settings (date/time formats and metric/imperial units)
- Communicates with most industry-standard third-party POS protocols (Serial and/or Ethernet)
- Optional aqueous ethanol float (AEF) detects potential phase separation
- Product density support via optional Density kit
- Systems updates can be applied via USB (or remotely)
- Enabled for wetstock monitoring services ('Fairbanks On Board')
- Driver display option, external display for tanker drivers
- Printer options: USB or Serial
- Communication ports
  - RS 232 communication port
  - RS 485 communications port
  - Ethernet port
  - USB port

Certifications

ProGauge | DOVER FUELING SOLUTIONS

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CERTIFICATE OF COMPLIANCE

Certificate Number	UL-CA-2141541-0
Report Reference	MH64641-20211025
Date	27-Oct-2021
Issued to:	Start Italiana Srl Via Privata Giulio Natta 6 Lentate Sul Seveso, MB Italy 20823
This is to certify that representative samples of	EQXX7 - Control, Monitoring and Auxiliary Equipment Certified for Canada See Addendum Page for Product Designation(s). Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	CSA C22.2 NO. 61010-1, 3rd Ed., Issue Date: 2012-05-11, Revision Date: 2018-11-01
Additional Information:	See the UL Online Certifications Directory at https://iq.ulprospector.com for additional information

This Certificate of Compliance does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

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Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/aboutul/locations/

CERTIFICATE OF COMPLIANCE

Certificate Number UL-CA-2141541-0
Report Reference MH64641-20211025
Date 27-Oct-2021

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements

Model	Category Description
MagLink LX PLUS	Control, Monitoring and Auxiliary Equipment

Bruce Mahrenholz, Director North American Certification Program

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Evaluation of the MagLink LX by DFS Automatic Tank Gauging System with 924B Probe with 2-inch Floats for Monthly Monitoring for 0.2 gal/h on Underground Storage Tanks up to 20,650 gallons

Final Report Version 1

PREPARED FOR:

Dover Fueling Solutions

September 21, 2021

Ken Wilcox Associates, Inc.
1125 Valley Ridge Drive, Grain Valley, MO 64029, USA
Voice (816) 443-2494, Fax (816) 443-2495
E-mail cwilcox@kwaleak.com, Web http://www.kwaleak.com

Evaluation of the MagLink LX by DFS Automatic Tank Gauging System with 924B Probe with 2-inch Floats for Monthly Monitoring for 0.2 gal/h on Underground Storage Tanks up to 20,650 gallons

Final Report Version 1

PREPARED FOR:

Dover Fueling Solutions
6900 Santa Fe Drive
Hodgkins, IL 60525

September 21, 2021

Preface

This report describes testing conducted on the MagLink LX Automatic Tank Gauging System with a 924B magnetostrictive probe that utilized an OPW 2” fuel float and OPW 2” water float. This evaluation meets the requirements of the U.S. Environmental Protection Agency for Automatic Tank Gauging Systems for Monthly Monitoring for 0.2 gal/h leaks. This system can be installed on underground storage tanks up to 20,650 gallons in volume. The forms contained in this report are based on data collected using the US EPA protocol “Standard Test Procedures for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems”, May 2019.

The statistics included in this report were calculated by Dr. Jairus Flora and the report was prepared by Craig D. Wilcox, Ken Wilcox Associates, Inc. Technical Questions regarding this evaluation should be directed to Craig Wilcox at 816-443-2494

KEN WILCOX ASSOCIATES, INC

Craig Wilcox, President, KWA, Inc.
September 21, 2021

Jairus D. Flora, Jr., Ph.D.
September 21, 2021

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Attachment A.

Official Forms for the MagLink LX Automatic Tank Gauging Systems with 924B probe with 2” OPW fuel float and 2” OPW water float on Underground Storage Tanks up to 20,650 gallons

Section 1.0 Introduction

The Environmental Protection Agency requires that all tank testing equipment be capable of meeting certain performance standards. Automatic Tank Gauging Systems (ATGS) for monthly testing, are required to be capable of detecting leaks of 0.2 gal/h with a probability of detection of 95% or greater. At the same time, the method must not produce false alarms (declaring a leak when the tank is tight) more than 5% of the time. An ATGS can also be evaluated to the 0.1 gal/h standard for monthly monitoring which requires the ATGS to be capable of detecting leaks of 0.1 gal/h with a probability of detection of 95% or greater. At the same time, the method must not produce false alarms (declaring a leak when the tank is tight) more than 5% of the time.

To assure that tank testing methods meet either the 0.1 or 0.2 gal/h performance standards, the EPA requires that each method be evaluated using prescribed protocols. The MagLink LX with 924B Probe with 2” float was evaluated according to the US EPA protocol “Standard Test Procedures for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems”, May 2019 following the 0.2 gal/h standard. For the ease of reading this report, this protocol will be referred to as the ATGS protocol.

Section 2.0 Overview of Evaluation Method

The ATGS protocol provides for several alternative approaches to the evaluation of ATGS's. The standard approach utilizing testing at a specialized test facility was used for this evaluation. For this option, the evaluation is conducted under controlled conditions. Since the system operates as an ATGS, the water sensing function of the ATGS was evaluated.

The ATGS protocol test procedures introduce four main factors that may influence the test results: Size of leak; amount of product in the tank; temperature differentials; and tank deformation. This is accomplished by testing at different product levels under various conditions where product of different temperatures is added to a partially filled test tank.

Testing was conducted using the manufacturer's normal test routine. The MagLink LX was installed per the manufacturer's installation specifications by an OPW employee. The MagLink LX console was programmed to conduct tests by an OPW Employee. The leak rate reported by the MagLink LX was compared to the actual volume of product removed from the tank. A statistical analysis of the data was used to determine the performance characteristics of the test method.

In addition to the measurement of product levels, the equipment must also be capable of detecting an incursion of water into the tank. A series of tests are required to determine the minimum detection level and sensitivity of the MagLink LX with 924B Probe with 2" OPW floats to water level changes. This testing was conducted by mounting the 924B Probe with 2" OPW floats in a test stand. Known volumes of water were added to a cylinder containing the probe assembly. The measured level changes were compared with independently measured level changes and the differences were statistically analyzed to determine the precision of the tester.

Section 3.0 Description of the MagLink LX console

The system used in the evaluation was the MagLink LX ATG with a 924B magnetostrictive probe. A more complete description of the MagLink LX ATG features have been provided on the appropriate description forms in Attachment A.

The MagLink LX ATG consists of a console that houses probe interfaces and a microprocessor to process level and temperature data from a magnetostrictive probe. These include product level, product temperature, ullage, and water level as well as other programmable functions such as automatic start times, and alarm levels. The same information can be printed on a small printer if one is present.

The 924B Probe with 2” OPW fuel float and 2” OPW water float operates on magnetostrictive principles to measure product and water levels in the tank. The temperature of the product is determined from five thermistors located in the magnetostrictive probe. Product levels and temperatures are combined and processed in an algorithm by the microprocessor in the console. A large number of sensors using various operating principles can be attached to the controller.

Section 4.0 Description of the Testing Location

The MagLink LX ATG with 924B probe with 2” floats was evaluated at the Fuels Management Research Center (FMRC) located in Grain Valley, Missouri. The FMRC includes one 20,055 gallon and two 13,767 gallon Xerxes FRP underground storage tanks. Numerous access ports are available for installation of test equipment.

Product temperature differentials are achieved by circulating product through external heat exchangers, which are heated by a glycol solution or cooled using a Freon chiller, before product is returned to one of the three tanks. Product deliveries are simulated by transferring product from one tank to another using positive displacement pumps at delivery rates up to 110 gal/min.

Leaks are generated using a variable speed peristaltic pump. Fuel is pulled from the tank, collected in a container for the duration of the leak and weighed at the conclusion of each test. The leak rate is determined from the volume of fuel and the duration of the leak.

This evaluation was conducted on the test tank with a volume of 13,767 gallons. The MagLink LX ATG with 924B Probe with 2” OPW fuel float and 2” OPW water float is approved for use on tanks up to a nominal capacity of 20,650 gallons.

Section 5.0 Leak Detection Test Results

The MagLink LX ATG was programmed to conduct leak detection testing according to the manufacturer's normal procedures. There were a total of 24 leak detection tests that were conducted between 50% and 95% product volume for this evaluation. Included in the 24 evaluation tests were 12 tests performed at 90-95% volume and 12 tests at 50% product volume. There were also 4 low level tests that were performed at 14% in order to evaluate the low level performance. A summary of the test results for the MagLink LX with the 924B Probe with 2" floats are shown in table 1.

Table 1 – MagLink LX with 924B Probe with 2" floats

Test No.	Product Temperature Differential (deg F)	Nominal Leak Rate (gal/h)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)	Meas.-Ind. Leak Rate (gal/h)
1	-0.1	0.2	0.2	0.159	-0.041
2	-0.1	0.3	0.304	0.264	-0.04
3	-0.1	0.1	0.12	0.083	-0.037
4	-0.1	0	0	-0.008	-0.008
5	10	0.1	0.118	0.099	-0.019
6	10	0.3	0.295	0.235	-0.06
7	10	0.2	0.199	0.127	-0.072
8	10	0	0	-0.04	-0.04
9	-10	0.1	0.108	0.094	-0.014
10	-10	0	0	-0.011	-0.011
11	-10	0.2	0.203	0.225	0.022
12	-10	0.3	0.229	0.208	-0.021
13	-1.1	0.2	0.212	0.208	-0.004
14	-1.1	0.3	0.295	0.286	-0.009
15	-1.1	0.1	0.103	0.053	-0.05
16	-1.1	0	0	0.011	0.011
17	10.9	0.3	0.262	0.238	-0.024
18	10.9	0	0	-0.048	-0.048
19	10.9	0.2	0.183	0.1	-0.083
20	10.9	0.1	0.106	0.06	-0.046
21	-10.8	0.1	0.111	0.123	0.012
22	-10.8	0.3	0.286	0.289	0.003
23	-10.8	0.2	0.189	0.162	-0.027
24	-10.8	0	0	0.07	0.07

Calculation of P_D and P_{FA} for Precision Leak Detection

Table 2 summarize the performance results for the MagLink LX with 924B Probe with 2" floats that were obtained for a threshold of 0.1 gal/h. All of the results were calculated for the MagLink LX ATG using the procedures specified in the ATGS protocol. Nominal Leak rates of 0, 0.1, 0.2, and 0.3 gal/h were induced for the evaluation.

Table 2. Results for MagLink LX with 924B Probe with 2" floats

	Basic Statistics
Description	**924B Probe with 2" floats**
Number of Tests	24
Leak Rate	0.2 gal/h
Threshold	0.1 gal/h
Variance	0.001092 gal^2/h^2
MSE	0.001591 gal^2/h^2
Standard deviation	0.033045 gal/h
Bias	-0.02233 gal/h
t(bias)	-3.31096
Significant Bias?	Yes
PFA (%) using 0.1 threshold.	0.300 %
PD (%)	99.700%
Minimum Threshold	0.05663 gal/h
MDL using minimum threshold	0.1133 gal/h
Minimum Detectable Leak Rate for 95% using 0.1 gal/h as threshold	0.1566 gal/h
Test Parameters	
Maximum Tank Size	20,650 gallons
Average Stabilization Time (1st Test of pair)	8 hours
Average Data Collection Time	2 hours
Maximum Temperature Differential	13.07 degrees F
Effects of Tank Level	NS (t=0.157; P=87.7%%)
Effects of Temperature	Sig (F= 8.647; P= 0.2%)
Water Detection Mode	
Minimum Detectable Water Level (in)	1.016
Minimum Water Level Change (in)	0.0098

The results shown in Table 2 for the MagLink LX with 924B Probe with 2” float meets the requirements of the federal regulations for Monthly Monitoring with 0.2 gal/h leaks with a P_D of 95% or greater and P_{FA} of 5% or less for tight tanks.

Size of Tank

Testing for Precision Leak Detection was conducted on a tank with a nominal capacity of 13,767 gallons. The tank was 120 inches in diameter and 322 inches long. Tanks of up to 1.5 times this volume or a nominal capacity of 20,650 gallons may be tested by the MagLink LX ATG with 924B Probe with 2” floats.

Maximum Allowable Temperature Difference for Precision Leak Detection

There were 6 simulated fuel deliveries for the 24 tests used to calculate the evaluation results. The temperature of the product that was transferred to the tank during the ATGS testing ranged from -10.8 deg F to 10.9 deg F. The standard deviation of these temperatures was 8.71 deg F. Using the EPA formula of 1.5 times the standard deviation of the temperature differences present during the evaluation, the maximum allowable temperature difference between product delivered and product in the tank is ±13.07 deg F.

There was an indication that of these temperature differentials may cause problems for the MagLink LX ATG with 924B Probe with 2” floats. A one-way analysis of variance was used to compare the three sets of temperature data (nominally 0, -10.1, and +10.1 deg F). The F-statistic (with 2 and 22 degrees of freedom) was 8.647 with a P-value of 0.002, or 0.2% which was statistically significant at the 5% level. The mean difference for Group 1 was 0.00425 gal/h; the mean difference for group 2 was -0.02225 gal/h, and mean difference for group 3 was -0.049 gal/h. A comparison of these three mean differences indicated that the difference between group 1 and group 3 was statistically significant. Thus, there was a trend with the mean differences decreasing as the temperature difference increased from -10 degrees F to +10 degrees F. The standard deviations of the 3 groups ranged from 0.0221 to 0.0313 gal/h. The 3 pairs of standard deviations were each tested and none of them was statistically significant. (The comparison of group 1 to group 2 gave a P-value of 19.3%; and the comparison of group 1 to group 3 gave a P-value of 18.9%, and the comparison of group 2 to group 3 gave a P-value of 49.3%. None of the comparisons of the variability approached statistical significance. The results indicate that a longer stabilization time might be advisable, since the temperature affected the results for the MagLink LX console.

Average Waiting Time After Filling

The waiting time after receiving product into the test tank was 8 hours.

Average Data Collection Time Per Test

The tests time for the MagLink LX and 924B Probe with 2” floats was 2 hours for every test. The average data collection time for this evaluation on MagLink LX 924B Probe with 2” floats was 2 hours.

Product Levels

For this evaluation, the testing was conducted with nominal product levels of 50% and 90-95% of the tank capacity. The mean difference was -0.0234 gal/h at the 50% level and was -0.0213 gal/h at the 90% level. A t-test was used to test whether there was a significant difference at the 5% level in the bias for the MagLink LX console for the two product levels used in the evaluation. For the MagLink LX with 924B Probe with 2” floats, ($t = 0.157$, $t_{critical} = 1.706$; P=0.8765 or 87.65% 2-sided), showing that there was not a statistically significant difference in the average leak rate at the 50% product level compared to the average leak rate at the product 90% level. The variances of the results at each level were compared with an F-test, giving F = 3.76, with 11 degrees of freedom for numerator and denominator, corresponding to a P-value of 0.0378, 2-sided, or 3.78%, which was statistically significant at the 5% level. Thus, the conclusion is that there was some difference in the variability of the results for the high (90%) level (standard deviation of 0.0424 gal/h) compared to the low (50%) level (standard deviation of 0.0219 gal/h).

Minimum Product Level

To check that the system functioned adequately at lower product levels, 4 tests were run with the product level at 14% of capacity. While these tests are not included in the overall estimation of performance, their results were compared with the other test levels to ensure that no differences in performance were found.

Table 3: Low Level tests

Low Level Tests(not included in evaluation statistics)

25	14	na	0.3	0.276	0.192	-0.084
26	14	na	0	0	-0.03	-0.03
27	14	na	0.2	0.183	0.21	0.027
28	14	na	0.1	0.091	0.096	0.005

The results at the low level were compared to the combined results at the 50% and 90% levels. The difference in means was not significant ($t = 0.36$, P = 0.723 or 72.3% 2-sided). The ratio of the variances was 1.175 (an F-statistic with 3 and 23 degrees of freedom) with a P value of P = 0.961 (2-sided) or 96.1%, not statistically significantly different at the 5% significance level. Thus, there was no statistically significant difference in the performance at the 14% product level compared to the higher levels [of 50% and 90%].

Minimum Threshold

The minimum threshold for the MagLink LX ATG with 924B Probe with 2" floats that will result in a false alarm rate of 5% is also included in Table 2 as 0.05663 gal/h. The corresponding MDL for this threshold would be 0.1133 gal/h. These calculations assume that the data have been corrected for bias, since the bias was significant[1]. A threshold less than the minimum threshold will result in a false alarm rate of greater than 5%. The maximum threshold that can be used and still give a PD of 95% for detecting a leak rate of 0.2 gal/h was also calculated as 0.1433 gal/h.

Minimum Detectable Leak Rate

The minimum leak rate for the MagLink LX with 924B Probe with 2" floats that can be detected with a probability of 95% is also summarized in Table 2 as 0.1133 gal/h. This uses the minimum threshold of 0.05663 gal/h. The minimum detectable leak rate for the MagLink LX with 924B Probe with 2" floats using a threshold of 0.1 gal/h was also calculated and is shown in Table 2 as 0.15663 gal/h.

[1]To correct the data for bias, the bias is subtracted from each data value.

Section 6.0 Water Sensor Test Results

The water tests for the MagLink LX with 924B Probe with a 2” OPW water float was conducted under laboratory conditions by adding known volumes of water to a reservoir containing the probe assembly. Sufficient diesel fuel to cover the water float was added before the tests were conducted. Independently measured level changes were compared with the measured level changes reported by the MagLink LX console. The point at which the water was first detected was determined, followed by incremental additions of water to determine the resolution of the water sensor. The results of the water sensor tests have been summarized in Table 3.

Minimum Detectable Water Level

At the 95% confidence level, the tolerance limit (MDL) was determined using the procedures described in the ATGS protocol. The upper tolerance limit estimates the minimum level of water that the sensor can detect at least 95 % of the time. The mean values at which water can be detected are summarized in Table 2. The minimum detectable water level for the MagLink LX with 924B Probe with a 2” OPW water float is 1.016 inches.

Minimum Water Level Change

The minimum water level (MLC) change that the water sensor can detect (after the MDL is reached) was also provided. This information is also summarized in Table 3. The minimum detectable water level change on the MagLink LX with 924B Probe with 2” floats is 0.0098 inches.

Section 7.0 Conclusions

The following conclusions are based on the results of the testing described in this report.

1. The MagLink LX console with 924B Probe with 2” floats float exceeds the EPA 0.2 gal/h performance requirements for Monthly Monitoring of underground storage tanks.

2. The MagLink LX console with 924B Probe with 2” floats using a threshold of 0.1 gal/h had a PFA of 0.300 % and had a PD of 99.7% for detecting a leak rate of 0.2 gal/h. This exceeds the performance requirements listed in the ATGS protocol.

3. There were statistically significant differences in performance at the 90%, and 50% product levels. While the mean differences were similar, tests at the 90% product level were significantly more variable. This means that the minimum 5% threshold at a 90% product level would be 0.076 gal/h, while at a 50% level the minimum 5% threshold at the 90% product level would be 0.0393 gal/h. When tests were run at the 14% level, the performance was not statistically different from the combined results for the higher levels. Based on the lower level analysis, the MagLink LX console with 924B Probe with 2” OPW fuel float and 2” OPW water float will perform adequately at levels down to 14% of capacity.

4. There were statistically significant differences in performance when tests were run at three temperature differences, nominally product added 10 degrees F cooler, about the same, or 10 degrees F warmer than the product in the tank. The variability was larger for the 10 deg F cooler group than for the other two. The average differences between the measured and induced leak rates differed significantly among the 3 temperature groups, increasing as the added product temperature increased. The +/- 10 degree performance analysis indicates that the MagLink LX console with 924B Probe with 2” floats, as observed in this evaluation, may need more than an 8 hour stabilization period.

5. The MagLink LX console with 924B Probe with a 2” OPW fuel float is validated for use on tanks up to a nominal capacity of 20,650 gallons.

6. The MagLink LX console with 924B Probe with a 2” OPW fuel float is validated for use on tanks with a product level at or above 14%.

Attachment A

Official Forms for the MagLink LX Automatic Tank Gauging System with 924B Probe with 2” floats for Precision Leak Detection on Underground Storage Tanks up to 20,650 gallons

Results of U.S. EPA Standard Evaluation
Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) described below complies with the performance requirements of the federal underground storage tank regulation. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems." The full evaluation report also includes a form describing the method and a form summarizing the test data. Tank owners using this leak detection system should keep this form on file to provide compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

ATGS Description

Name MagLink LX Automatic Tank Gauge

Version number MagLink LX with 924B Probe with a 2" OPW Fuel Float and 2" OPW Water Float

Vendor Dover Fueling Solutions (USA)

6900 Santa Fe Drive
(street address)

Hodgkins	IL	60525	U.S.A.	(708) 485-4200
(city)	(state)	(zip)	(country)	(phone)

Vendor Dover Fueling Solutions (Italy)

Via Privata Giulio Natta n. 6
(street address)

20823 Lentate sul Seveso	*(MB)*	28013	Italy	+39 036 215 8146 5
(city)	(state)	(zip)	(country)	(phone)

Evaluation Results (see Tables below for summary of Evaluation Results)

This ATGS, which declares tank to be leaking when the measured leak rate exceeds the threshold of 0.1 gallon per hour, has a probability of false alarms [PFA] of 0.300%.

The corresponding probability of detection [PD] of a 0.2 gallon per hour leak is 99.70%

For a 5% PFA, the minimum threshold is 0.0566 gal/h, and the MDL with 95% PD is 0.1133 gal/h. The MDL with 95% PD using a threshold of 0.1 gal/h is 0.1435 gal/h.

The minimum water level (threshold) in the tank that the ATGS can detect is 1.016 inches.

The minimum change in water level that can be detected by the ATGS is 0.0098 inches. (provided that the water level is above the threshold).

Therefore, this ATGS (X) does ( ) does not meet the **federal** performance standards established by the U.S. Environmental Protection Agency (0.20 gallon per hour at P_D of 95% and P_{FA} of 5%), and this ATGS (X) does ( ) does not meet the **federal** performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch. *Tables 1 summarizes all of the performance data that was evaluated in this project.*

Table 1. Summary of Results 924B Probe with 2” floats

	Basic Statistics
Description	**924B Probe with 2” floats**
Number of Tests	24
Leak Rate	0.2 gal/h
Threshold	0.1gal/h
Variance	0.001092 gal^2/h^2
MSE	0.001591 gal^2/h^2
Standard deviation	0.033045 gal/h
Bias	-0.02233 gal/h
t(bias)	-3.31096
Significant Bias?	Yes
PFA (%) using 0.1 threshold.	0.300 %
PD (%)	99.700%
Minimum Threshold	0.05663 gal/h
MDL using minimum threshold	0.1133 gal/h
Minimum Detectable Leak Rate for 95% using 0.1 gal/h as threshold	0.1566 gal/h
Test Parameters	
Maximum Tank Size	20,650 gallons
Average Stabilization Time (1st Test of pair)	8 Hours
Average Data Collection Time	2 hours
Maximum Temperature Differential	13.07 degrees F
Effects of Tank Level	NS (t=0.157; P=87.7%%)
Effects of Temperature	Sig (F= 8.647; P= 0.2%)
Water Detection Mode	
Minimum Detectable Water Level (in)	1.016
Minimum Water Level Change (in)	0.0098

Test Conditions During Evaluation (identical for all floats)

The evaluation testing was conducted in a 13,767 gallon ( ) steel (X) fiberglass tank that was 120 inches in diameter and 322 inches in length.

The temperature difference between product added to fill the tank and product already in the tank ranged from -10.8 deg F to +10.9 deg F, with a standard deviation of 8.71 deg F. The tests were conducted with the tank product levels 14%, 50 % and 90 % full.

The product used in the evaluation was diesel fuel.

Limitations on the Results (identical for all floats)

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for installing and operating the ATGS are followed.
- The tank contains a product identified on the method description form.
- The tank is no larger than 20,650 gallons.
- The fuel level in the tank must be at or above 14%. The waiting time after adding any substantial amount of product to the tank is 8 hours.
- The temperature of the added product does not differ more than 13.07 degrees Fahrenheit from that already in the tank.
- The total data collection time for the test is at least 2 hours.
  - Other limitations specified by the vendor of determined during testing: None Specified

➢ **Safety disclaimer: This test procedure only addresses the issue of the ATG system's ability to detect leaks. It does not test the equipment for safety hazards.**

Certification of Results

I certify that the ATGS was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to one of the following:

(X) standard EPA test procedure for ATGS
( ) alternative EPA test procedure for ATGS

Craig D. Wilcox, President
(printed name)

Craig Wilcox
(signature)

September 21, 2021
(date)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, Missouri 64029
(city, state. zip)

(816) 443-2494
(phone number)

Reporting Form for Leak Rate Data
Automatic Tank Gauging System

Method Name and Version: Maglink LX with 924B Probe with 2" OPW Floats 0.2 for up to 20K tanks

Evaluation Period: from___4/29/2021____ to ____7/19/2021____ (Dates)

Test No.	Date at Completion of Last Fill (m/d/y)	Time at Completion of Last Fill (military)	Data Test Began (m/d/y)	Time Test Began (military)	Time Test Ended (military)	Test Duration (minutes)	Level After Transfer Completed (% full)	Product Temperature Differential (deg F)	Nominal Leak Rate (gal/h)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)	Meas.-Ind. Leak Rate (gal/h)
1	4/29/2021	1430	4/29/2021	2230	0030	120	90	-0.1	0.2	0.2	0.159	-0.041
2	4/29/2021	1430	4/30/2021	0042	0242	120	90	-0.1	0.3	0.304	0.264	-0.04
3	4/29/2021	1430	4/30/2021	2351	0151	120	50	-0.1	0.1	0.12	0.083	-0.037
4	4/29/2021	1430	5/1/2021	0200	0400	120	50	-0.1	0	0	-0.008	-0.008
5	5/1/2021	1635	5/2/2021	0035	0235	120	90	10	0.1	0.118	0.099	-0.019
6	5/1/2021	1635	5/2/2021	0305	0505	120	90	10	0.3	0.295	0.235	-0.06
7	5/1/2021	1635	5/2/2021	2315	0115	120	50	10	0.2	0.199	0.127	-0.072
8	5/1/2021	1635	5/3/2021	0120	0320	120	50	10	0	0	-0.04	-0.04
9	5/3/2021	1537	5/3/2021	2337	0137	120	90	-10	0.1	0.108	0.094	-0.014
10	5/3/2021	1537	5/4/2021	0150	0350	120	90	-10	0	0	-0.011	-0.011
11	5/3/2021	1537	5/5/2021	0126	0326	120	50	-10	0.2	0.203	0.225	0.022
12	5/3/2021	1537	5/5/2021	0335	0535	120	50	-10	0.3	0.229	0.208	-0.021
13	5/5/2021	1410	5/5/2021	2210	0010	120	90	-1.1	0.2	0.212	0.208	-0.004
14	5/5/2021	1410	5/6/2021	0100	0300	120	90	-1.1	0.3	0.295	0.286	-0.009
15	5/5/2021	1410	5/6/2021	2130	2330	120	50	-1.1	0.1	0.103	0.053	-0.05
16	5/5/2021	1410	5/7/2021	0015	0215	120	50	-1.1	0	0	0.011	0.011
17	5/7/2021	1605	5/8/2021	0005	0205	120	90	10.9	0.3	0.262	0.238	-0.024
18	5/7/2021	1605	5/8/2021	0210	0410	120	90	10.9	0	0	-0.048	-0.048
19	5/7/2021	1605	5/9/2021	2245	0045	120	50	10.9	0.2	0.183	0.1	-0.083
20	5/7/2021	1605	5/10/2021	0055	0255	120	50	10.9	0.1	0.106	0.06	-0.046
21	5/18/2021	1700	5/19/2021	0100	0300	120	90	-10.8	0.1	0.111	0.123	0.012
22	5/18/2021	1700	5/19/2021	0522	0722	120	90	-10.8	0.3	0.286	0.289	0.003
23	5/18/2021	1700	5/19/2021	2246	0046	120	50	-10.8	0.2	0.189	0.162	-0.027
24	5/18/2021	1700	5/19/2021	0130	0330	120	50	-10.8	0	0	0.07	0.07

Low Level Tests(not included in evaluation statistics)

25	7/9/2021	1100	7/15/2021	1457	1657	120	14	na	0.3	0.276	0.192	-0.084
26	7/9/2021	1100	7/15/2021	1900	2100	120	14	na	0	0	-0.03	-0.03
27	7/9/2021	1100	7/19/2021	1400	1600	120	14	na	0.2	0.183	0.21	0.027
28	7/9/2021	1100	7/19/2021	2200	0000	120	14	na	0.1	0.091	0.096	0.005

Description
Automatic Tank Gauging System

This section describes briefly the important aspects of the automatic tank gauging system (ATGS). It is not intended to provide a thorough description of the principles behind the system or how the equipment works.

ATGS Name and Version

MagLink LX console with 924B Probe with 2" floats

Product
> Product type

For what products can this ATGS be used? (check all applicable)

(X) gasoline
(X) diesel
(X) aviation fuel
(X) fuel oil #4
( ) fuel oil #6
(X) solvents
(X) waste oil
(X) other (list) bio-diesel and ethanol blends compatible with probe floats

> Product level

What product level is required to conduct a test?

( ) greater than 90% full

( ) greater than 50% full

(X) other (specify) greater than 14% full

Does the ATGS measure inflow of water as well as loss of product (gallon per hour)?

( ) yes

(X) no

Does the ATGS detect the presence of water in the bottom of the tank?

(X) yes

( ) no

Level Measurement

What technique is used to measure changes in product volume?

( ) directly measure the volume of product change

( ) changes in head pressure

( ) changes in buoyancy of a probe

( ) mechanical level measure (e.g., ruler, dipstick)

( ) changes in capacitance

( ) ultrasonic

(X) change in level of float (specify principle, e.g., capacitance, magnetostrictive, load cell, etc.) magnetostrictive

( ) other (describe briefly) _____

Temperature Measurement

If product temperature is measured during a test, how many temperature sensors are used?

( ) single sensor, without circulation

( ) single sensor, with circulation

( ) 2-4 sensors

(X) 5 or more sensors

( ) temperature-averaging probe

If product temperature is measured during a test, what type of temperature sensor is used?

( ) resistance temperature detector (RTD)

( ) bimetallic strip

( ) quartz crystal

(X) thermistor

( ) other (describe briefly) _____

If product temperature is not measured during a test, why is it not?

( ) the factor measured for change in level/volume is independent of temperature (e.g., mass)

( ) the factor measured for change in level/volume self-compensates for changes in temperature

( ) other (explain briefly) _____

Data Acquisition

How are the test data acquired and recorded?

( ) manually

( ) by strip chart

(X) by computer

Procedure information

> Waiting times

What is the minimum waiting period between adding a large volume of product (i.e., a delivery) and the beginning of a test (e.g., filling from 50% to 90-95% capacity)?

( ) no waiting period

( ) less than 3 hours

( ) 3-6 hours

(X) 7-12 hours

( ) more than 12 hours

> Test duration

What is the minimum time for collecting data?

( ) less than 1 hour

( ) 1 hour

(X) 2 hours

( ) 3 hours

( ) 4 hours

( ) 5-10 hours

( ) more than 10 hours

( ) variable (explain)

> Total time

What is the total time needed to test with this ATGS after a delivery?
(waiting time plus testing time)

Nano and 924B Probe with 2” floats __10__ hours _0_ minutes *(maximum test time)*

What is the sampling frequency for the level and temperature measurements?

( ) more than once per second

(X) at least once per minute

( ) every 1-15 minutes

( ) every 16-30 minutes

( ) every 31-60 minutes

( ) less than once per hour

( ) variable (explain) _____

> Identifying and correcting for interfering factors

How does the ATGS determine the presence and level of the ground water above the bottom of the tank?

( ) observation well near tank

( ) information from USGS, etc.

( ) information from personnel on-site

( ) presence of water in the tank

( ) other (describe briefly) _____

(X) level of ground water above bottom of the tank not determined

How does the ATGS correct for the interference due to the presence of ground water above the bottom of the tank?

( ) system tests for water incursion

( ) different product levels tested and leak rates compared

( ) other (describe briefly) _____

(X) no action

How does the ATGS determine when tank deformation has stopped following delivery of product?

(X) wait a specified period of time before beginning test

( ) watch the data trends and begin test when decrease in product level has stopped

( ) other (describe briefly) _____

( ) no procedure

Are the temperature and level sensors calibrated before each test?

( ) yes

(X) no

If not, how frequently are the sensors calibrated?

( ) weekly

( ) monthly

( ) yearly or less frequently

(X) never

> Interpreting test results

How are level changes converted to volume changes (i.e., how is height-to-volume conversion factor determined)?

(X) actual level changes observed when known volume is added or removed (e.g., liquid metal bar) *(This is one way the Nano console can be used to generate a custom tank chart)*

(X) theoretical ratio calculated from tank geometry

(X) interpolation from tank manufacturer's chart

(X) other (describe briefly) All three options are available

( ) not applicable; volume measured directly

How is the coefficient of thermal expansion (Ce) of the product determined?

( ) actual sample taken for each test and Ce determined from specific gravity

( ) value supplied by vendor of product

(X) average value for type of product

( ) other (describe briefly) _____

How is the leak rate (gallon per hour) calculated?

( ) average of subsets of all data collected

(X) difference between first and last data collected

( ) from data from last _____ hours of test period

( ) from data determined to be valid by statistical analysis

( ) other (describe) _____

What threshold value for product volume change (gallon per hour) is used to declare that a tank is leaking?

( ) 0.05 gallon per hour

(X) 0.10 gallon per hour

( ) 0.20 gallon per hour

() other (list) _____

Under what conditions are test results considered inconclusive?

( ) too much variability in the data (standard deviation beyond a given value)

( ) unexplained product volume increase such as stiction

( ) other (describe briefly) _____

Exceptions

Are there any conditions under which a test should not be conducted?

( ) water in the excavation zone

( ) large difference between ground temperature and delivered product temperature

( ) extremely high or low ambient temperature

( ) invalid for some products (specify) _____

( ) other (describe briefly) _____

What are acceptable deviations from the standard testing protocol?

(X) none

( ) lengthen the duration of test

( ) other (describe briefly) _____

What elements of the test procedure are determined by personnel on-site?

( ) product level when test is conducted

( ) when to conduct test

( ) waiting period between filling tank and beginning test

( ) length of test

( ) determination that tank deformation has subsided

( ) determination of "outlier" data that may be discarded

( ) other (describe briefly) _____

(X) none

Evaluation of the MagLink LX by DFS Automatic Tank Gauging System with DMP Probe with 2-inch Floats for Monthly Monitoring for 0.2 gal/h on Underground Storage Tanks up to 20,650 gallons

Final Report Version 2

PREPARED FOR:

Dover Fueling Solutions

October 8, 2021

Ken Wilcox Associates, Inc.
1125 Valley Ridge Drive, Grain Valley, MO 64029, USA
Voice (816) 443-2494, Fax (816) 443-2495
E-mail cwilcox@kwaleak.com, Web http://www.kwaleak.com

Evaluation of the MagLink LX by DFS Automatic Tank Gauging System with DMP Probe with 2-inch Floats for Monthly Monitoring for 0.2 gal/h on Underground Storage Tanks up to 20,650 gallons

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PREPARED FOR:

Dover Fueling Solutions
6900 Santa Fe Drive
Hodgkins, IL 60525

October 8, 2021

Preface

This report describes testing conducted on the MagLink LX Automatic Tank Gauging System with a DMP magnetostrictive probe that utilized an OPW 2” fuel float and DMP 2” water float. This evaluation meets the requirements of the U.S. Environmental Protection Agency for Automatic Tank Gauging Systems for Monthly Monitoring for 0.2 gal/h leaks. This system can be installed on underground storage tanks up to 20,650 gallons in volume. The forms contained in this report are based on data collected using the US EPA protocol “Standard Test Procedures for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems”, May 2019.

The statistics included in this report were calculated by Dr. Jairus Flora and the report was prepared by Craig D. Wilcox, Ken Wilcox Associates, Inc. Technical Questions regarding this evaluation should be directed to Craig Wilcox at 816-443-2494

KEN WILCOX ASSOCIATES, INC

Craig Wilcox, President, KWA, Inc.
October 8, 2021

Jairus D. Flora, Jr., Ph.D.
October 8, 2021

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Attachment A.

Official Forms for the MagLink LX Automatic Tank Gauging Systems with DMP probe with 2” OPW fuel float and 2” DMP water float on Underground Storage Tanks up to 20,650 gallons

Section 1.0 Introduction

The Environmental Protection Agency requires that all tank testing equipment be capable of meeting certain performance standards. Automatic Tank Gauging Systems (ATGS) for monthly testing, are required to be capable of detecting leaks of 0.2 gal/h with a probability of detection of 95% or greater. At the same time, the method must not produce false alarms (declaring a leak when the tank is tight) more than 5% of the time. An ATGS can also be evaluated to the 0.1 gal/h standard for monthly monitoring which requires the ATGS to be capable of detecting leaks of 0.1 gal/h with a probability of detection of 95% or greater. At the same time, the method must not produce false alarms (declaring a leak when the tank is tight) more than 5% of the time.

To assure that tank testing methods meet either the 0.1 or 0.2 gal/h performance standards, the EPA requires that each method be evaluated using prescribed protocols. The MagLink LX with DMP Probe with 2” float was evaluated according to the US EPA protocol “Standard Test Procedures for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems”, May 2019 following the 0.2 gal/h standard. For the ease of reading this report, this protocol will be referred to as the ATGS protocol.

Section 2.0 Overview of Evaluation Method

The ATGS protocol provides for several alternative approaches to the evaluation of ATGS's. The standard approach utilizing testing at a specialized test facility was used for this evaluation. For this option, the evaluation is conducted under controlled conditions. Since the system operates as an ATGS, the water sensing function of the ATGS was evaluated.

The ATGS protocol test procedures introduce four main factors that may influence the test results: Size of leak; amount of product in the tank; temperature differentials; and tank deformation. This is accomplished by testing at different product levels under various conditions where product of different temperatures is added to a partially filled test tank.

Testing was conducted using the manufacturer's normal test routine. The MagLink LX was installed per the manufacturer's installation specifications by an OPW employee. The MagLink LX console was programmed to conduct tests by an OPW Employee. The leak rate reported by the MagLink LX was compared to the actual volume of product removed from the tank. A statistical analysis of the data was used to determine the performance characteristics of the test method.

In addition to the measurement of product levels, the equipment must also be capable of detecting an incursion of water into the tank. A series of tests are required to determine the minimum detection water level and sensitivity of the MagLink LX with DMP Probe with a 2" DMP water float. This testing was conducted by mounting the DMP Probe with a 2" DMP water float in a test stand. Known volumes of water were added to a cylinder containing the probe assembly. The measured level changes were compared with independently measured level changes and the differences were statistically analyzed to determine the precision of the tester.

Section 3.0 Description of the MagLink LX console

The system used in the evaluation was the MagLink LX ATG with a DMP magnetostrictive probe. A more complete description of the MagLink LX ATG features have been provided on the appropriate description forms in Attachment A.

The MagLink LX ATG consists of a console that houses probe interfaces and a microprocessor to process level and temperature data from a magnetostrictive probe. These include product level, product temperature, ullage, and water level as well as other programmable functions such as automatic start times, and alarm levels. The same information can be printed on a small printer if one is present.

The DMP Probe with 2” OPW fuel float and 2” DMP water float operates on magnetostrictive principles to measure product and water levels in the tank. The temperature of the product is determined from five thermistors located in the magnetostrictive probe. Product levels and temperatures are combined and processed in an algorithm by the microprocessor in the console. A large number of sensors using various operating principles can be attached to the controller.

Section 4.0 Description of the Testing Location

The MagLink LX ATG with DMP probe with 2” floats was evaluated at the Fuels Management Research Center (FMRC) located in Grain Valley, Missouri. The FMRC includes one 20,055 gallon and two 13,767 gallon Xerxes FRP underground storage tanks. Numerous access ports are available for installation of test equipment.

Product temperature differentials are achieved by circulating product through external heat exchangers, which are heated by a glycol solution or cooled using a Freon chiller, before product is returned to one of the three tanks. Product deliveries are simulated by transferring product from one tank to another using positive displacement pumps at delivery rates up to 110 gal/min.

Leaks are generated using a variable speed peristaltic pump. Fuel is pulled from the tank, collected in a container for the duration of the leak and weighed at the conclusion of each test. The leak rate is determined from the volume of fuel and the duration of the leak.

This evaluation was conducted on the test tank with a volume of 13,767 gallons. The MagLink LX ATG with DMP Probe with 2” OPW fuel float and 2” DMP water float is approved for use on tanks up to a nominal capacity of 20,650 gallons.

Section 5.0 Leak Detection Test Results

The MagLink LX ATG was programmed to conduct leak detection testing according to the manufacturer's normal procedures. There were a total of 24 leak detection tests that were conducted between 50% and 95% product volume for this evaluation. Included in the 24 evaluation tests were 12 tests performed at 90-95% volume and 12 tests at 50% product volume. There were also 4 low level tests that were performed at 14% in order to evaluate the low level performance. A summary of the test results for the MagLink LX with the DMP Probe with 2" floats are shown in table 1.

Table 1 – MagLink LX with DMP Probe with 2" floats

Test No.	Product Temperature Differential (deg F)	Nominal Leak Rate (gal/h)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)	Meas.-Ind. Leak Rate (gal/h)
1	-0.1	0.2	0.2	0.208	0.008
2	-0.1	0.3	0.304	0.283	-0.021
3	-0.1	0.1	0.12	0.053	-0.067
4	-0.1	0	0	0.011	0.011
5	10	0.1	0.118	0.141	0.023
6	10	0.3	0.295	0.309	0.014
7	10	0.2	0.199	0.13	-0.069
8	10	0	0	-0.066	-0.066
9	-10	0.1	0.108	0.113	0.005
10	-10	0	0	-0.03	-0.03
11	-10	0.2	0.203	0.129	-0.074
12	-10	0.3	0.229	0.243	0.014
13	-1.1	0.2	0.212	0.207	-0.005
14	-1.1	0.3	0.295	0.272	-0.023
15	-1.1	0.1	0.103	0.15	0.047
16	-1.1	0	0	-0.01	-0.01
17	10.9	0.3	0.262	0.237	-0.025
18	10.9	0	0	-0.023	-0.023
19	10.9	0.2	0.183	0.14	-0.043
20	10.9	0.1	0.106	-0.039	-0.145
21	-10.8	0.1	0.111	0.137	0.026
22	-10.8	0.3	0.286	0.297	0.011
23	-10.8	0.2	0.189	0.149	-0.04
24	-10.8	0	0	0.096	0.096

Calculation of P_D and P_{FA} for Precision Leak Detection

Table 2 summarize the performance results for the MagLink LX with DMP Probe with 2" floats that were obtained for a threshold of 0.1 gal/h. All of the results were calculated for the MagLink LX ATG using the procedures specified in the ATGS protocol. Nominal Leak rates of 0, 0.1, 0.2, and 0.3 gal/h were induced for the evaluation.

Table 2. Results for MagLink LX with DMP Probe with 2" floats

	Basic Statistics
Description	**DMP Probe with 2" floats**
Number of Tests	24
Leak Rate	0.2 gal/h
Threshold	0.1 gal/h
Variance	0.002341 gal^2/h^2
MSE	0.0026 gal^2/h^2
Standard deviation	0.048387 gal/h
Bias	-0.01608 gal/h
t(bias)	-1.62837
Significant Bias?	NO (P=11.2%)
PFA (%) using 0.1 threshold.	2.51 %
PD (%)	97.49%
Minimum Threshold	0.0829 gal/h
MDL using minimum threshold	0.1659 gal/h
Minimum Detectable Leak Rate for 95% using 0.1 gal/h as threshold	0.1829 gal/h
Test Parameters	
Maximum Tank Size	20,650 gallons
Average Stabilization Time (1st Test of pair)	8 hours
Average Data Collection Time	2 hours
Maximum Temperature Differential	13.07 degrees F
Effects of Tank Level	NS (t=1.311; P=20.34%%)
Effects of Temperature	NS (F= 1.885; P= 17.7%)
Water Detection Mode	
Minimum Detectable Water Level (in)	0.681
Minimum Water Level Change (in)	0.0098

The results shown in Table 2 for the MagLink LX with DMP Probe with 2” float meets the requirements of the federal regulations for Monthly Monitoring with 0.2 gal/h leaks with a P_D of 95% or greater and P_{FA} of 5% or less for tight tanks.

Size of Tank

Testing for Precision Leak Detection was conducted on a tank with a nominal capacity of 13,767 gallons. The tank was 120 inches in diameter and 322 inches long. Tanks of up to 1.5 times this volume or a nominal capacity of 20,650 gallons may be tested by the MagLink LX ATG with DMP Probe with 2” floats.

Maximum Allowable Temperature Difference for Precision Leak Detection

There were 6 simulated fuel deliveries for the 24 tests used to calculate the evaluation results. The temperature of the product that was transferred to the tank during the ATGS testing ranged from -10.8 deg F to 10.9 deg F. The standard deviation of these temperatures was 8.71 deg F. Using the EPA formula of 1.5 times the standard deviation of the temperature differences present during the evaluation, the maximum allowable temperature difference between product delivered and product in the tank is ±13.07 deg F.

There was no indication that any of these temperature differentials caused any problems for the MagLink LX ATG with DMP Probe with 2” floats as long as the appropriate stabilization times were allowed before testing. A one-way analysis of variance was used to compare the three sets of temperature data (nominally 0, -10.1, and +10.1 deg F). The F-statistic (with 2 and 22 degrees of freedom) was 1.885 with a P-value of 0.177, or 17.7% which was not statistically significant at the 5% level. The standard deviations of the 3 groups ranged from 0.033 to 0.053. The 3 pairs of standard deviations were each tested and none of them was statistically significant. (The comparison of group 1 to group 3 gave a P-value of 12.4%; the comparison of group 2 to group 3 gave a P-value of 14.4%, and the comparison of group 1 to group 2 gave a P-value of 69.8%. None of these comparisons approached statistical significance. The results indicate that the temperature compensation for the MagLink LX console is sufficient.

Average Waiting Time After Filling

The waiting time after receiving product into the test tank was 8 hours.

Average Data Collection Time Per Test

The tests time for the MagLink LX and DMP Probe with 2” floats was 2 hours for every test. The average data collection time for this evaluation on MagLink LX DMP Probe with 2” floats was 2 hours.

Product Levels

For this evaluation, the testing was conducted with nominal product levels of 50% and 90-95% of the tank capacity. A t-test was used to test whether there was a significant difference at the 5% level in the bias for the MagLink LX console for the two product levels used in the evaluation. For the MagLink LX with DMP Probe with 2" floats, (t = 1.311, $t_{critical}$ = 1.706; P=0.2034 or 20.34% 2-sided), showing that there was not a statistically significant difference in the average leak rate at the 50% product level compared to the average leak rate at the product 90% level. The variances of the results at each level were compared with an F-test, giving F = 10.034, with 11 degrees of freedom for numerator and denominator, corresponding to a P-value of 0.00062, 2-sided, or 0.062%, which was statistically significant. Thus, the conclusion is that while there was no difference in the average difference in measured minus induced leak rates, but there was a significant difference in the variability of the results for the high (90%) level compared to the low (50%) level, with the 50% level giving more variable test results.

Minimum Product Level

To check that the system functioned adequately at lower product levels, 4 tests were run with the product level at 14% of capacity. While these tests are not included in the overall estimation of performance, their results were compared with the other test levels to ensure that no differences in performance were found.

Table 3: Low Level tests

Low Level Tests(not included in evaluation statistics)

25	14	na	0.3	0.276	0.223	-0.053
26	14	na	0	0	-0.013	-0.013
27	14	na	0.2	0.183	0.138	-0.045
28	14	na	0.1	0.091	0.105	0.014

The results at the low level were compared to the combined results at the 50% and 90% levels. The difference in means was not significant (t = 0.325, P = 0.7487 2-sided). The ratio of the variances was 0.405 (an F-statistic with 3 and 23 degrees of freedom) with a P value of P = 0.249 (2-sided) or 24.9%, not statistically significantly different at the 5% significance level. Thus, there was no statistically significant difference in the performance at the 14% level compared to the higher levels.

Minimum Threshold

The minimum threshold for the MagLink LX ATG with DMP Probe with 2” floats that will result in a false alarm rate of 5% is also included in Table 2 as 0.0829 gal/h. The corresponding MDL for this threshold would be 0.1659 gal/h. For these calculations, the bias was ignored since it was not significant. A threshold less than the minimum threshold will result in a false alarm rate of greater than 5%. The maximum threshold that can be used and still give a PD of 95% for detecting a leak rate of 0.2 gal/h was also calculated as 0.1179 gal/h.

Minimum Detectable Leak Rate

The minimum leak rate for the MagLink LX with DMP Probe with 2” floats that can be detected with a probability of 95% is also summarized in Table 2 as 0.1659 gal/h. This uses the minimum threshold of 0.0829 gal/h. The minimum detectable leak rate for the MagLink LX with DMP Probe with 2” floats using a threshold of 0.1 gal/h was also calculated and is shown in Table 2 as 0.1829 gal/h.

Section 6.0 Water Sensor Test Results

The water tests for the MagLink LX with DMP Probe with a 2” DMP water float was conducted under laboratory conditions by adding known volumes of water to a reservoir containing the probe assembly. Sufficient diesel fuel to cover the water float was added before the tests were conducted. Independently measured level changes were compared with the measured level changes reported by the MagLink LX console. The point at which the water was first detected was determined, followed by incremental additions of water to determine the resolution of the water sensor. The results of the water sensor tests have been summarized in Table 3.

Minimum Detectable Water Level

At the 95% confidence level, the tolerance limit (MDL) was determined using the procedures described in the ATGS protocol. The upper tolerance limit estimates the minimum level of water that the sensor can detect at least 95 % of the time. The mean values at which water can be detected are summarized in Table 2. The minimum detectable water level for the MagLink LX with DMP Probe with a 2” DMP water float is 0.681 inches.

Minimum Water Level Change

The minimum water level (MLC) change that the water sensor can detect (after the MDL is reached) was also provided. This information is also summarized in Table 3. The minimum detectable water level change on the MagLink LX with DMP Probe with 2” floats is 0.0098 inches.

Section 7.0 Conclusions

The following conclusions are based on the results of the testing described in this report.

1. The MagLink LX console with DMP Probe with 2” floats float exceeds the EPA 0.2 gal/h performance requirements for Monthly Monitoring of underground storage tanks.

2. The MagLink LX console with DMP Probe with 2” floats using a threshold of 0.1 gal/h had a PFA of 2.51 % and had a PD of 97.49% for detecting a leak rate of 0.2 gal/h. This exceeds the performance requirements listed in the ATGS protocol.

3. There were no statistically significant differences in performance at the 90%, and 50% product levels1. When tests were run at the 14% level, the performance was not statistically different from the combined results for the higher levels1. Based on the lower-level analysis, the MagLink LX console with DMP Probe with 2” OPW fuel float and 2” DMP water float will perform adequately at levels down to 14% of capacity.

4. There were no statistically significant differences in performance when tests were run at three temperature differences, nominally product added 10 degrees F cooler, about the same, or 10 degrees F warmer than the product in the tank. The +/- 10 degree performance analysis indicates that the MagLink LX console with DMP Probe with 2” floats, as observed in this evaluation, adequately compensates for any temperature changes due to hot and cold fuel transfers after an 8 hour stabilization period.

5. The MagLink LX console with DMP Probe with a 2” OPW fuel float is validated for use on tanks up to a nominal capacity of 20,650 gallons.

6. The MagLink LX console with DMP Probe with a 2” OPW fuel float is validated for use on tanks with a product level at or above 14 inches.

1While there were no significant differences in the means, the results at the 50% product level were significantly more variable than at the 90%% or 14% product levels.

Attachment A

Official Forms for the MagLink LX Automatic Tank Gauging System with DMP Probe with 2” floats for Precision Leak Detection on Underground Storage Tanks up to 20,650 gallons

Results of U.S. EPA Standard Evaluation
Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) described below complies with the performance requirements of the federal underground storage tank regulation. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems." The full evaluation report also includes a form describing the method and a form summarizing the test data. Tank owners using this leak detection system should keep this form on file to provide compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

ATGS Description

Name MagLink LX Automatic Tank Gauge

Version number MagLink LX with DMP Probe with a 2" OPW Fuel Float and 2" DMP Water Float

Vendor Dover Fueling Solutions (USA)

6900 Santa Fe Drive
(street address)

Hodgkins	IL	60525	U.S.A.	(708) 485-4200
(city)	(state)	(zip)	(country)	(phone)

Vendor Dover Fueling Solutions (Italy)

Via Privata Giulio Natta n. 6
(street address)

20823 Lentate sul Seveso	*(MB)*	28013	Italy	+39 036 215 8146 5
(city)	(state)	(zip)	(country)	(phone)

Evaluation Results (see Tables below for summary of Evaluation Results)

This ATGS, which declares tank to be leaking when the measured leak rate exceeds the threshold of 0.1 gallon per hour, has a probability of false alarms [PFA] of 2.51%.

The corresponding probability of detection [PD] of a 0.2 gallon per hour leak is 97.49%

For a 5% PFA, the minimum threshold is 0.0829 gal/h, and the MDL with 95% PD is 0.1659 gal/h. The MDL with 95% PD using a threshold of 0.1 gal/h is 0.1829 gal/h.

The minimum water level (threshold) in the tank that the ATGS can detect is 0.681 inches.

The minimum change in water level that can be detected by the ATGS is 0.0098 inches. (provided that the water level is above the threshold).

Therefore, this ATGS (X) does ( ) does not meet the **federal** performance standards established by the U.S. Environmental Protection Agency (0.20 gallon per hour at P_D of 95% and P_{FA} of 5%), and this ATGS (X) does ( ) does not meet the **federal** performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch. *Tables 1 summarizes all of the performance data that was evaluated in this project.*

Table 1. Summary of Results DMP Probe with 2" floats

	Basic Statistics
Description	**DMP Probe with 2" floats**
Number of Tests	24
Leak Rate	0.2 gal/h
Threshold	0.1gal/h
Variance	0.002341 gal^2/h^2
MSE	0.0026 gal^2/h^2
Standard deviation	0.048387 gal/h
Bias	-0.01608 gal/h
t(bias)	-1.62837
Significant Bias?	NO (P=11.2%)
PFA (%) using 0.1 threshold.	2.51 %
PD (%)	97.49%
Minimum Threshold	0.0829 gal/h
MDL using minimum threshold	0.1659 gal/h
Minimum Detectable Leak Rate for 95% using 0.1 gal/h as threshold	0.1829 gal/h
Test Parameters	
Maximum Tank Size	20,650 gallons
Average Stabilization Time (1st Test of pair)	8 Hours
Average Data Collection Time	2 hours
Maximum Temperature Differential	13.07 degrees F
Effects of Tank Level	NS (t=1.311; P=20.34%%)
Effects of Temperature	NS (F= 1.885; P= 17.7%)
Water Detection Mode	
Minimum Detectable Water Level (in)	0.681
Minimum Water Level Change (in)	0.0098

Test Conditions During Evaluation (identical for all floats)

The evaluation testing was conducted in a 13,767 gallon ( ) steel (X) fiberglass tank that was 120 inches in diameter and 322 inches in length.

The temperature difference between product added to fill the tank and product already in the tank ranged from -10.8 deg F to +10.9 deg F, with a standard deviation of 8.71 deg F. The tests were conducted with the tank product levels 14%, 50 % and 90 % full.

The product used in the evaluation was diesel fuel.

Limitations on the Results (identical for all floats)

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for installing and operating the ATGS are followed.
- The tank contains a product identified on the method description form.
- The tank is no larger than 20,650 gallons.
- The fuel level in the tank must be at or above 14%. The waiting time after adding any substantial amount of product to the tank is 8 hours.
- The temperature of the added product does not differ more than 13.07 degrees Fahrenheit from that already in the tank.
- The total data collection time for the test is at least 2 hours.
  - Other limitations specified by the vendor of determined during testing: None Specified

➢ **Safety disclaimer: This test procedure only addresses the issue of the ATG system's ability to detect leaks. It does not test the equipment for safety hazards.**

Certification of Results

I certify that the ATGS was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to one of the following:

(X) standard EPA test procedure for ATGS
( ) alternative EPA test procedure for ATGS

Craig D. Wilcox, President
(printed name)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Craig Wilcox
(signature)

Grain Valley, Missouri 64029
(city, state. zip)

October 8, 2021
(date)

(816) 443-2494
(phone number)

Reporting Form for Leak Rate Data
Automatic Tank Gauging System

Method Name and Version: Maglink LX with DMP Probe with 2" OPW Fuel Float and 2" DMP Water Float 0.2 for up to 20K tanks

Evaluation Period: from___4/29/2021____ to ____7/19/2021____ (Dates)

Test No.	Date at Completion of Last Fill (m/d/y)	Time at Completion of Last Fill (military)	Data Test Began (m/d/y)	Time Test Began (military)	Time Test Ended (military)	Test Duration (minutes)	Level After Transfer Completed (% full)	Product Temperature Differential (deg F)	Nominal Leak Rate (gal/h)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)	Meas.-Ind. Leak Rate (gal/h)
1	4/29/2021	1430	4/29/2021	2230	0030	120	90	-0.1	0.2	0.2	0.208	0.008
2	4/29/2021	1430	4/30/2021	0042	0242	120	90	-0.1	0.3	0.304	0.283	-0.021
3	4/29/2021	1430	4/30/2021	2351	0151	120	50	-0.1	0.1	0.12	0.053	-0.067
4	4/29/2021	1430	5/1/2021	0200	0400	120	50	-0.1	0	0	0.011	0.011
5	5/1/2021	1635	5/2/2021	0035	0235	120	90	10	0.1	0.118	0.141	0.023
6	5/1/2021	1635	5/2/2021	0305	0505	120	90	10	0.3	0.295	0.309	0.014
7	5/1/2021	1635	5/2/2021	2315	0115	120	50	10	0.2	0.199	0.13	-0.069
8	5/1/2021	1635	5/3/2021	0120	0320	120	50	10	0	0	-0.066	-0.066
9	5/3/2021	1537	5/3/2021	2337	0137	120	90	-10	0.1	0.108	0.113	0.005
10	5/3/2021	1537	5/4/2021	0150	0350	120	90	-10	0	0	-0.03	-0.03
11	5/3/2021	1537	5/4/2021	2250	0050	120	50	-10	0.2	0.203	0.129	-0.074
12	5/3/2021	1537	5/5/2021	0335	0535	120	50	-10	0.3	0.229	0.243	0.014
13	5/5/2021	1410	5/5/2021	2210	0010	120	90	-1.1	0.2	0.212	0.207	-0.005
14	5/5/2021	1410	5/6/2021	0100	0300	120	90	-1.1	0.3	0.295	0.272	-0.023
15	5/5/2021	1410	5/6/2021	2130	2330	120	50	-1.1	0.1	0.103	0.15	0.047
16	5/5/2021	1410	5/7/2021	0015	0215	120	50	-1.1	0	0	-0.01	-0.01
17	5/7/2021	1605	5/8/2021	0005	0205	120	90	10.9	0.3	0.262	0.237	-0.025
18	5/7/2021	1605	5/8/2021	0210	0410	120	90	10.9	0	0	-0.023	-0.023
19	5/7/2021	1605	5/9/2021	2245	0045	120	50	10.9	0.2	0.183	0.14	-0.043
20	5/7/2021	1605	5/10/2021	0055	0255	120	50	10.9	0.1	0.106	-0.039	-0.145
21	5/18/2021	1700	5/19/2021	0100	0300	120	90	-10.8	0.1	0.111	0.137	0.026
22	5/18/2021	1700	5/19/2021	0522	0722	120	90	-10.8	0.3	0.286	0.297	0.011
23	5/18/2021	1700	5/19/2021	2246	0046	120	50	-10.8	0.2	0.189	0.149	-0.04
24	5/18/2021	1700	5/19/2021	0130	0330	120	50	-10.8	0	0	0.096	0.096

Low Level Tests(not included in evaluation statistics)

25	7/9/2021	1100	7/15/2021	1457	1657	120	14	na	0.3	0.276	0.223	-0.053
26	7/9/2021	1100	7/15/2021	1900	2100	120	14	na	0	0	-0.013	-0.013
27	7/9/2021	1100	7/19/2021	1400	1600	120	14	na	0.2	0.183	0.138	-0.045
28	7/9/2021	1100	7/19/2021	2200	0000	120	14	na	0.1	0.091	0.105	0.014

Description
Automatic Tank Gauging System

This section describes briefly the important aspects of the automatic tank gauging system (ATGS). It is not intended to provide a thorough description of the principles behind the system or how the equipment works.

ATGS Name and Version

MagLink LX console with DMP Probe with 2" floats

Product
> Product type

For what products can this ATGS be used? (check all applicable)

(X) gasoline
(X) diesel
(X) aviation fuel
(X) fuel oil #4
( ) fuel oil #6
(X) solvents
(X) waste oil
(X) other (list) bio-diesel and ethanol blends compatible with probe floats

> Product level

What product level is required to conduct a test?

( ) greater than 90% full

( ) greater than 50% full

(X) other (specify) greater than 14% full

Does the ATGS measure inflow of water as well as loss of product (gallon per hour)?

( ) yes

(X) no

Does the ATGS detect the presence of water in the bottom of the tank?

(X) yes

( ) no

Level Measurement

What technique is used to measure changes in product volume?

( ) directly measure the volume of product change

( ) changes in head pressure

( ) changes in buoyancy of a probe

( ) mechanical level measure (e.g., ruler, dipstick)

( ) changes in capacitance

( ) ultrasonic

(X) change in level of float (specify principle, e.g., capacitance, magnetostrictive, load cell, etc.) magnetostrictive

( ) other (describe briefly) _____

Temperature Measurement

If product temperature is measured during a test, how many temperature sensors are used?

( ) single sensor, without circulation

( ) single sensor, with circulation

( ) 2-4 sensors

(X) 5 or more sensors

( ) temperature-averaging probe

If product temperature is measured during a test, what type of temperature sensor is used?

( ) resistance temperature detector (RTD)

( ) bimetallic strip

( ) quartz crystal

(X) thermistor

( ) other (describe briefly) _____

If product temperature is not measured during a test, why is it not?

( ) the factor measured for change in level/volume is independent of temperature (e.g., mass)

( ) the factor measured for change in level/volume self-compensates for changes in temperature

( ) other (explain briefly) _____

Data Acquisition

How are the test data acquired and recorded?

( ) manually

( ) by strip chart

(X) by computer

Procedure information

> Waiting times

What is the minimum waiting period between adding a large volume of product (i.e., a delivery) and the beginning of a test (e.g., filling from 50% to 90-95% capacity)?

( ) no waiting period

( ) less than 3 hours

( ) 3-6 hours

(X) 7-12 hours

( ) more than 12 hours

> Test duration

What is the minimum time for collecting data?

( ) less than 1 hour

( ) 1 hour

(X) 2 hours

( ) 3 hours

( ) 4 hours

( ) 5-10 hours

( ) more than 10 hours

( ) variable (explain)

> Total time

What is the total time needed to test with this ATGS after a delivery?
(waiting time plus testing time)

Nano and DMP Probe with 2” floats __10__ hours _0_ minutes *(maximum test time)*

What is the sampling frequency for the level and temperature measurements?

( ) more than once per second

(X) at least once per minute

( ) every 1-15 minutes

( ) every 16-30 minutes

( ) every 31-60 minutes

( ) less than once per hour

( ) variable (explain) _____

> Identifying and correcting for interfering factors

How does the ATGS determine the presence and level of the ground water above the bottom of the tank?

( ) observation well near tank

( ) information from USGS, etc.

( ) information from personnel on-site

( ) presence of water in the tank

( ) other (describe briefly) _____

(X) level of ground water above bottom of the tank not determined

How does the ATGS correct for the interference due to the presence of ground water above the bottom of the tank?

( ) system tests for water incursion

( ) different product levels tested and leak rates compared

( ) other (describe briefly) _____

(X) no action

How does the ATGS determine when tank deformation has stopped following delivery of product?

(X) wait a specified period of time before beginning test

( ) watch the data trends and begin test when decrease in product level has stopped

( ) other (describe briefly) _____

( ) no procedure

Are the temperature and level sensors calibrated before each test?

( ) yes

(X) no

If not, how frequently are the sensors calibrated?

( ) weekly

( ) monthly

( ) yearly or less frequently

(X) never

> Interpreting test results

How are level changes converted to volume changes (i.e., how is height-to-volume conversion factor determined)?

(X) actual level changes observed when known volume is added or removed (e.g., liquid metal bar) *(This is one way the Nano console can be used to generate a custom tank chart)*

(X) theoretical ratio calculated from tank geometry

(X) interpolation from tank manufacturer's chart

(X) other (describe briefly) All three options are available

( ) not applicable; volume measured directly

How is the coefficient of thermal expansion (Ce) of the product determined?

( ) actual sample taken for each test and Ce determined from specific gravity

( ) value supplied by vendor of product

(X) average value for type of product

( ) other (describe briefly) _____

How is the leak rate (gallon per hour) calculated?

( ) average of subsets of all data collected

(X) difference between first and last data collected

( ) from data from last _____ hours of test period

( ) from data determined to be valid by statistical analysis

( ) other (describe) _____

What threshold value for product volume change (gallon per hour) is used to declare that a tank is leaking?

( ) 0.05 gallon per hour

(X) 0.10 gallon per hour

( ) 0.20 gallon per hour

() other (list) _____

Under what conditions are test results considered inconclusive?

( ) too much variability in the data (standard deviation beyond a given value)

( ) unexplained product volume increase such as stiction

( ) other (describe briefly) _____

Exceptions

Are there any conditions under which a test should not be conducted?

( ) water in the excavation zone

( ) large difference between ground temperature and delivered product temperature

( ) extremely high or low ambient temperature

( ) invalid for some products (specify) _____

( ) other (describe briefly) _____

What are acceptable deviations from the standard testing protocol?

(X) none

( ) lengthen the duration of test

( ) other (describe briefly) _____

What elements of the test procedure are determined by personnel on-site?

( ) product level when test is conducted

( ) when to conduct test

( ) waiting period between filling tank and beginning test

( ) length of test

( ) determination that tank deformation has subsided

( ) determination of "outlier" data that may be discarded

( ) other (describe briefly) _____

(X) none

ProGauge

ProGauge MagLink LX Plus Installation Manual

Part Number: - M2050-PLUS

Revision: - 0

MagLink LX Plus

NOTE: Before you use this manual, make sure you have the most recent revision. Look at the revision of this document to make sure it agrees with the most current revision found at https://www.opwglobal.com/opw-fms/tech-support/manuals-how-to-videos/technical-manuals.
Download the latest revision if necessary.

FUELING SOLUTIONS

ProGauge is a part of Dover Fueling Solutions.

Contact

ProGauge

START ITALIANA S.r.l.
Via Natta 6

20823 Lentate Sul Seveso (MB)

Italy

Tel. +39 0362 1581465
Fax +39 0362 1581464

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Section 1 Preface

Start Italiana S.r.l. has made every effort possible to see that this document is complete, accurate and updated. With every revision of the console, the related information is added to the document. Start Italiana S.r.l. reserves the right to make unannounced improvements and/or changes in the product and/or associated programs. Start Italiana S.r.l. is not liable for damages of any kind, including those resulting in the document, including typographical errors.

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Section 2 General Warnings

Carefully read the instructions in this manual before you do the installation procedures.

Only approved persons are permitted to install this equipment and configure the console.

The manufacturer is not responsible for operations that are not included in this manual.

The manufacturer is not liable in regards to competent bodies for changes to the equipment and software that are not approved.

In case of failure or defect, refer directly to an authorized service provider or manufacturer.

The manufacturer is not liable for injury and/or damage to persons and/or property and/or pets caused by the failure to obey safety instructions.

All approved personnel must know all safety requirements in this manual, the configuration manual and the user manual.

Refer directly to an approved service provider or manufacturer for questions about the operation of the equipment.

IMPORTANT: You must read and obey all safety instructions in this manual before you use this equipment.

WARNING: Incorrect use of this equipment that does not agree with the instructions in this manual can cause a risk to safety.

WARNING: A minimum insulation thickness of 0.25 mm is necessary for all internal wiring of different intrinsically safe circuits.

A grounding conductor must be connected between the I.S. ground terminals of the Intrinsic safety barrier in the console and the power distribution panel. This connection must have a cross-sectional area of at least 4 mm2 for the added earth connection.

WARNING: Substitution of components can decrease intrinsic safety.

ADVESTISEMENT: La substitution des composants peut compromettre la sécurité intrinsèque

READ CAREFULLY: The control drawing shown in ILL. 14 shall be provided with all devices.

IMPORTANT: If a replacement power supply cable is necessary, use an applicable, approved ELBZ/7 type power cord. Do not use another type of power cable.

Section 3 Introduction

This manual was prepared in accordance with IEC 82079-1 standards. “Preparation of instructions for use - Structuring, content and presentation - Part 1: General principles and detailed requirements and according to the ATEX Directive 2014/34/EU concerning equipment and protective systems intended for use in potentially explosive atmospheres."

This manual gives all necessary information about the installation of the MagLink LX 4 console.

IMPORTANT: This manual must be used together with the related product manuals:

- M2051 MagLink LX 4/LX Plus Configuration Manual
- M2052 MagLink LX 4/LX Plus User Manual

You must install the console as shown in this manual, configure the console as instructed in the M2051 MagLink LX 4/LX Plus Configuration Manual, and use the console in the field as shown in the M2052 MagLink LX 4/LX Plus User Manual.

WARNING: This device must not be discarded with household waste. This device is labeled in accordance with European Directive 2012/19/UE concerning used electrical and electronic appliances (waste electrical and electronic equipment – WEEE).

This guideline gives the methods for the return and recycling of used electronic devices as applicable throughout the EU. To return your used device, use the return and collection systems available to you.

The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 50°C or incinerate.

The table that follows lists reference data of the manufacturer:

Data	Description
Name	START ITALIANA S.r.l.
Address	Via Natta 6 20823 Lentate Sul Seveso, (MB) Italy
Telephone	+39 0362 1581465
Fax	+39 0362 1581464
Website	www.startitaliana.com
e-Mail	support@startitaliana.it

INFORMATION: The units of measurement contained in this manual refer to a specified selection by the user. Refer to the M2051 MagLink LX 4/LX Plus Configuration Manual for more information on how to set units of measure.

Section 4 General Indications

The MagLink LX Plus console is shipped in a cardboard box (L 450 x H 300 x D 200 [mm]) and includes the components as follows:

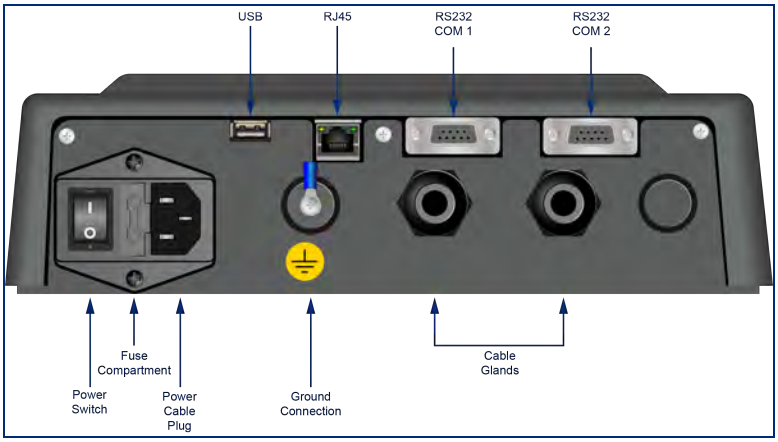
- MagLink LX Plus console
- Quality control certification checklist
- User manual, installation manual and web configuration manual

Weight of the console with its carton: 2 kg.

The table below shows the primary technical characteristics of the console:

Element	Characteristic
Display	Display TFT 7 inch Dimensions 155 x 88 [mm]
Console	Dimensions · Width 267 mm · Height with cable: 215 mm · Depth 80 mm

The illustration below shows the ports and connections on the bottom of the console:



Element	Description
USB	For USB printer connection. It can also be used for firmware updates and back-up of the console (Refer to the M2052 MagLink LX 4/LX Plus User Manual)
RJ45	For console configuration, and local network connections (Refer to the M2051 MagLink LX 4/LX Plus Configuration Manual)
RS232 Com 1	Serial port for connection to management systems (FCC/POS/DCD)
RS232 Com 2	Serial port for connection to management systems (FCC/POS/DCD)
Ground connection	Ground connection of the internal Intrinsically Safe barrier. Use a dedicated 4.0 mm^2 copper cable to connect to the main ground lug in the electrical panel of the station. This will prevent high voltages sent to the Intrinsically Safe wiring side if there is an electrical fault in the power side.

Section 5 Labeling and Type Designations

The table below shows the labels attached to the LX Plus console:

Label	Description
	Product label attached to the side of the console.
Associated Device, Provides intrinsically safe circuit extensions for use in Hazardous Locations when connected per Control Drawing No. 210909. WARNING – Substitution of components may impair intrinsic safety ADVERTISSEMENT- La substitution des composants peut compromettre la sécurité intrinsèque	I.S. Warning label attached next to the Product label.
Replace battery with Panasonic part Number ML621 Only Use another battery may present a risk of fire or explosion. See owner manual for safety instruction	Label attached to the aluminium plate near the RTC battery that shows replacement information.
Intrinsically safe circuits wiring	Label attached under the cable gland related to safety circuit (only if the color of the cable gland is different than blue).
	Label attached to the ISB-1W, internally.

Section 6 CAN/CSA C22.3 NO. 61010-1-12

Clause Ref.	STATEMENTS/INFORMATION REQUIRED IN MANUAL	YES	NO
5.4.1 h	Instructions for lifting and carrying		X
5.4.2 e	Ingress Protection (IP) rating and any mounting arrangements required	X	
5.4.2 f	Details on an impact rating with an IK code (if less than 5J)		X
5.4.3 a	Assembly, location and mounting requirements	X	
5.4.3 b	Instructions for protective earthing	X	
5.4.3 c	Connections to the supply	X	
5.4.3 d	For permanently connected equipment; supply wiring requirements and requirements for any external switch or circuit-breaker and external overcurrent protection devices and a recommendation that the switch or circuit-breaker be near the equipment		X
5.4.3 e	Ventilation requirements		X
5.4.3 f	Requirements and safety characteristics for special external services		X
5.4.4 b	Instructions not to position the equipment so that it is difficult to operate the disconnecting device		X
5.4.4 c	Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials	X	
5.4.4d	Specifications of limits for intermittent operation		X
5.4.4 f	Instructions for replacement of consumable materials	X	
5.4.4 g	Instructions for cleaning and decontamination		X
5.4.4 h	A statement listing potentially poisonous or injurious substances that can be liberated from the equipment, and possible quantities		X
5.4.4 i	Detailed instructions about risk reduction procedures relating to flammable liquids		X
5.4.4 j	Details of methods of reducing the risks of burns from surfaces		X
5.4.4	There shall be a statement in the instruction which states that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired	X	
5.4.5	Instruction against replacing detachable mains supply cords by inadequately rated cords	X	
5.4.5	The specific replaceable battery type shall be stated	X	
5.4.5	Any parts which are required to be examined or supplied only by the manufacturer or his agent are specified		X
5.4.5	The rating and characteristics of replaceable fuses shall be stated	X	
5.4.5	Product-specific risks that may affect the service personnel, protective measures for these risks and verification of the safe state of the equipment after repair.		X
5.4.6	Aspects resulting from integration into systems or effects resulting from special ambient or application conditions shall be described in the documentation		X

Section 7 Installation

7.1 Installation Warnings

DANGER: Do not install the console in a hazardous area!

Flammable fumes can cause an explosion when mixed with air.

Dangerous areas can occur where there are gases or fumes.

The MagLink LX Plusconsole is ***NOT*** explosion-proof.

WARNING: Only use fuses of 250 V - 1 A for input power.

WARNING: connect the Intrinsically Safe Ground connection of the console to the earth system of the site. A possible explosion or fire can occur if damage is caused to the intrinsic safety of the device and high voltages are sent to the Hazardous Area.

7.2 Installation Location

Select a location for the console installation where weather cannot cause negative effects or damage to the electrical circuits (high and low temperatures, high humidity, direct sunlight etc.).

NOTICE: Install the console in a place that is protected from moisture, direct sun, and water splashes. The console should be installed indoors in a climate-controlled room.

CAUTION: The console must be installed in a safe area.

7.3 Electrical Connection

To make a connection to 110-220 VAC:

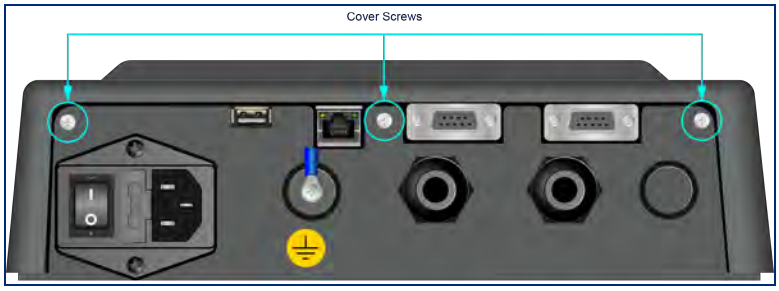
- De-energize all power switches at the main electrical panel.
- Make sure to use the applicable connections to connect the console to the electrical panel.
- A Power Supply Cord is not supplied: Use an applicable, approved ELBZ/7 type power cord.
- Make sure the power plug is connected to the ground and protected against short circuits and power surges.
- Make sure to connect the I.S. ground to the site's earth system. Use a dedicated 4.0 mm^2 copper cable (see the illustration below).

- The power cord must be easy to identify and must have easy access so it can be used to remove power.

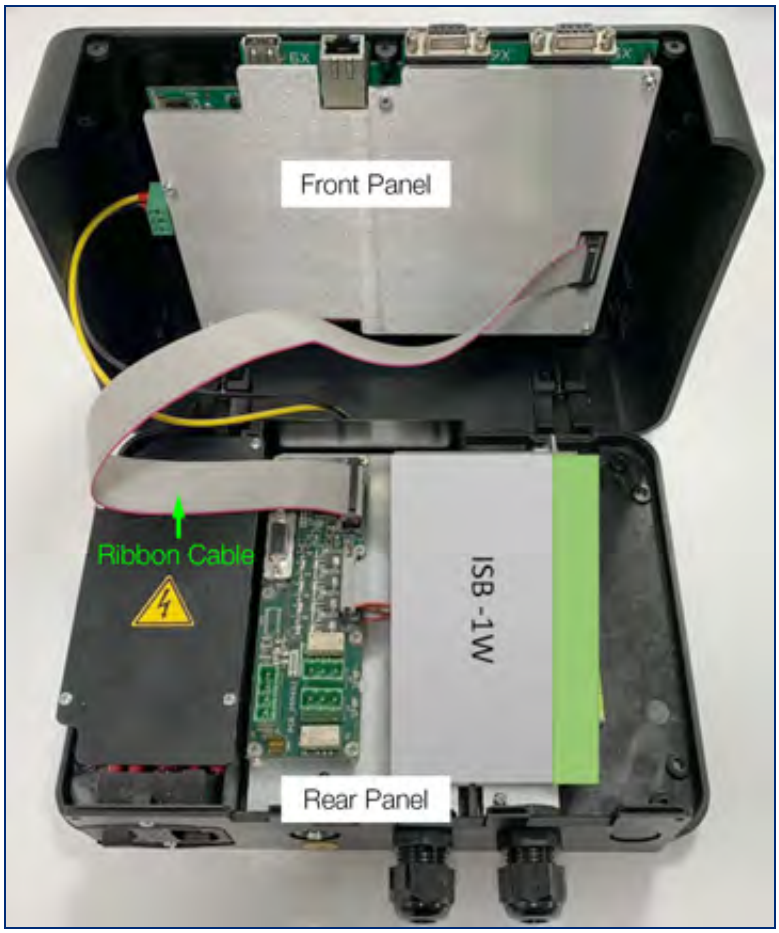
WARNING: There is high voltage within the console.

IMPORTANT: The electrical connection procedure must be done by approved personnel only!

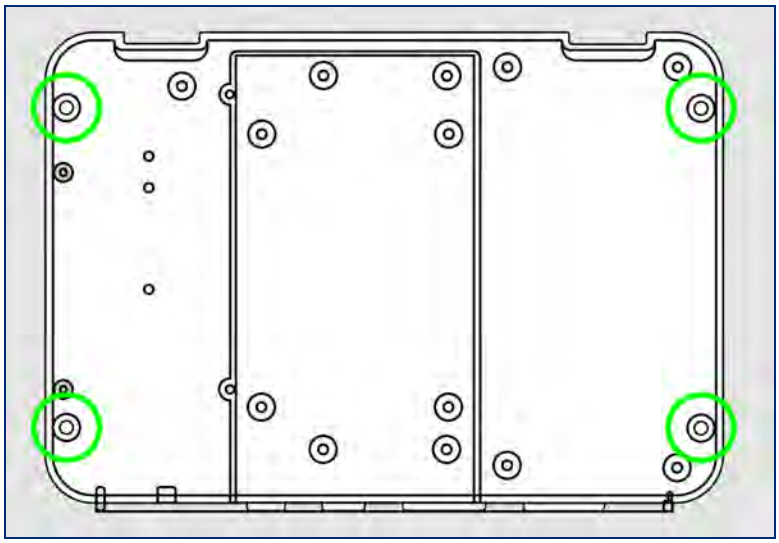
7.4 Installation Procedure



1. Remove the three (3) cover screws as shown in the illustration above.



2. Lift the cover carefully and disconnect the ribbon cable from the rear panel of the console as shown in the illustration above. Put the cover and screws in a temporary safe location where they can be found later and where the components cannot be damaged.



3. Attach the rear panel to a wall.

a. Select a location to attach the console to an indoor wall where it can be easily seen. Make sure to keep sufficient access to the connection ports on the bottom of the console.

b. Hold the unit against the wall where it will be attached. There are four (4) mounting screw holes in the unit (see the illustration above for the locations of the holes).

c. Use a pen to identify the screw hole locations on the wall.

d. Drill the holes at the screw hole location marks.

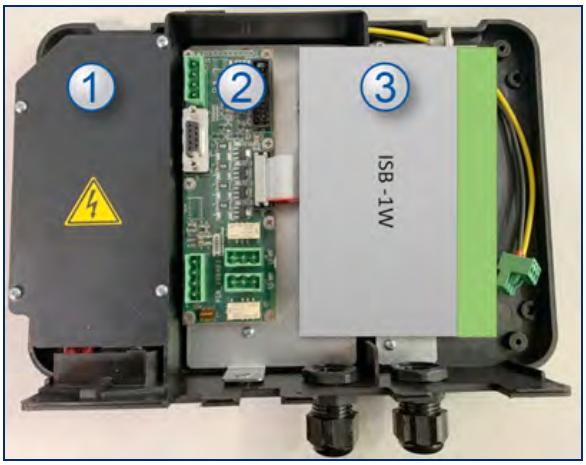
e. Tap the holes for an applicable screw size or put screw anchors in the hole.

NOTE: It is recommended to use size 6 Fischer wall anchors.

f. Attach the unit to the wall with the applicable screws.

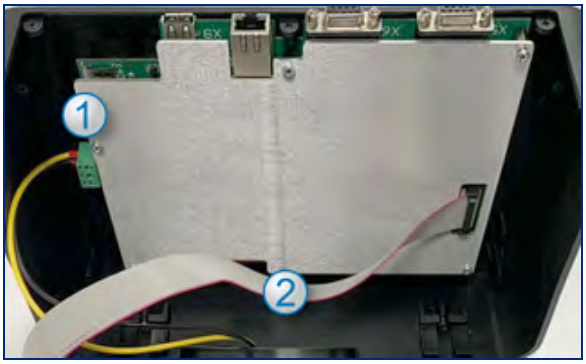
Section 8 Console Components

8.1 Rear Panel



1. Power supply (PSU) protection panel.
2. Auxiliary board with 2 output relays NO (0.5A @ 30VAC / 2A @ 30VDC) and RS485 / RS232 communication ports.
3. ISB-1W 4-channel 12V Intrinsically Safe barrier

8.2 Front Panel



The front panel contains the main processing board with the touch screen display and the communication ports.

1. Ribbon cable that connects the back panel with the front panel.
2. Power-IN
   - Yellow (+12V): Terminal 1
   - Black (-0V): Terminal 2
   - Not used: Terminal 3

8.3 Micro SD Card

The illustration above shows the location of the Micro SD Card. The SD Card contains the operating system, firmware, configuration and a history of the console.

IMPORTANT: Do not remove the micro SD card while the console is in operation. The console cannot function without the SD card in place.

The Real-Time-Clock of the processing unit is supported by a battery that is located on the main electronic board of the unit.

8.4 Battery Safety and Replacement

Replace Battery With Panasonic Part No. ML621 Only. Use Of Another Battery May Present A risk Of Fire Or Explosion. See Owner's Manual For Safety Instructions.

DANGER: The coin cell battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire. Replace coin cell battery with Replace Battery With Panasonic Part No. ML621 ONLY. Use of another battery may present a risk of fire or explosion.

To avoid possible explosion or fire, do not replace the lithium battery with a type that is not compatible.

Battery can explode if mistreated. Do not recharge, disassemble or dispose of in fire.

The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 100°C or incinerate.

Dispose of used battery promptly. Keep away from children. Do not disassemble and do not dispose of in fire.

The console can remain energized via the backup battery, even though the line power has been removed.

The inside of the console contains high-voltage circuitry; ONLY certified technicians should be permitted access to the console.

An external disconnect device must be installed for any permanently connected equipment!

An electrical outlet must be installed near any equipment requiring access through a plug connection!

The console has one (1) lithium battery. When the battery can no longer hold sufficient electrical power it must be replaced.

IMPORTANT: Replace the battery with a recommended replacement ONLY. Use of a different battery can cause a risk of fire or explosion.

A used battery must be removed from the console. Used batteries must be moved to a battery-recycling center for approved disposal.

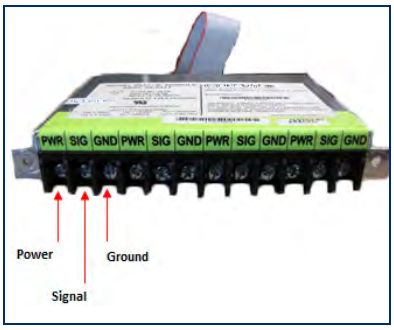
8.5 Compatible Devices

The devices shown below can be connected to the ISB-1W I.S barrier that iscontained in the console:

- 924B probes
- DMP 1-wire probes
- Smart sensors

8.6 Device Connections to the ISB-1W Internal I.S. Barrier

The ISB-1W 12V I.S (Intrinsically Safe) barrier has four channels where probes and sensor can connect.



There are no serviceable components within the barrier. If a channel becomse defective, it cannot be used. The remaining channels can continue to be used.

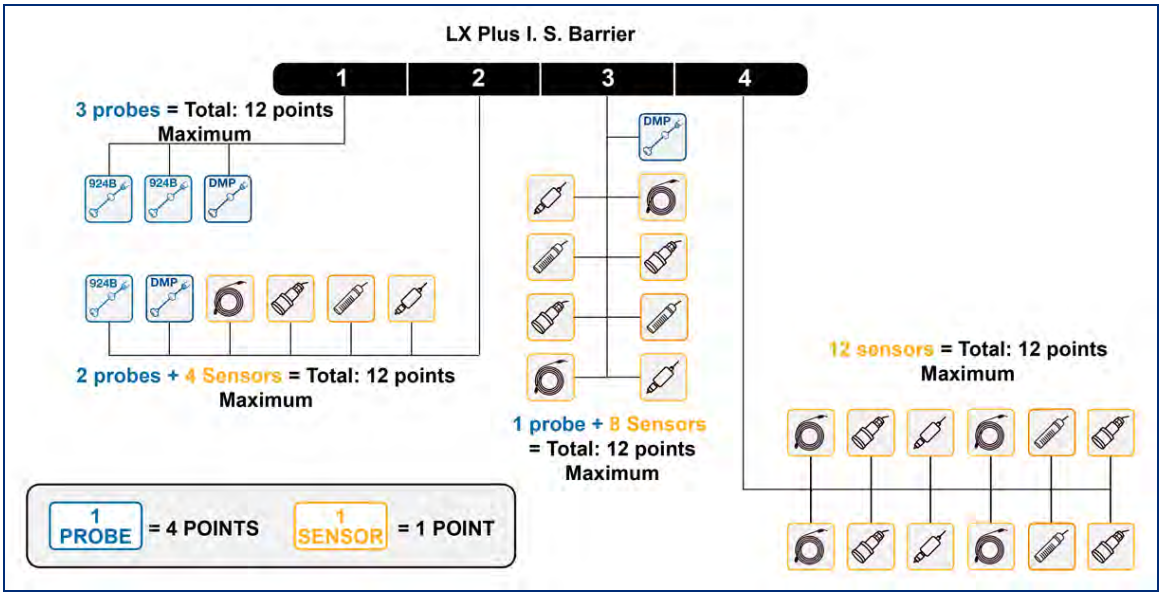
The ISB-1W I.S barrier is powered by the 12V DC supply of the console. It supplies 12V DC to the devices in the field.

The devices can be multi-dropped to each I.S channel (multiple probes and sensors can be connected to the same I.S channel on the same field cable).

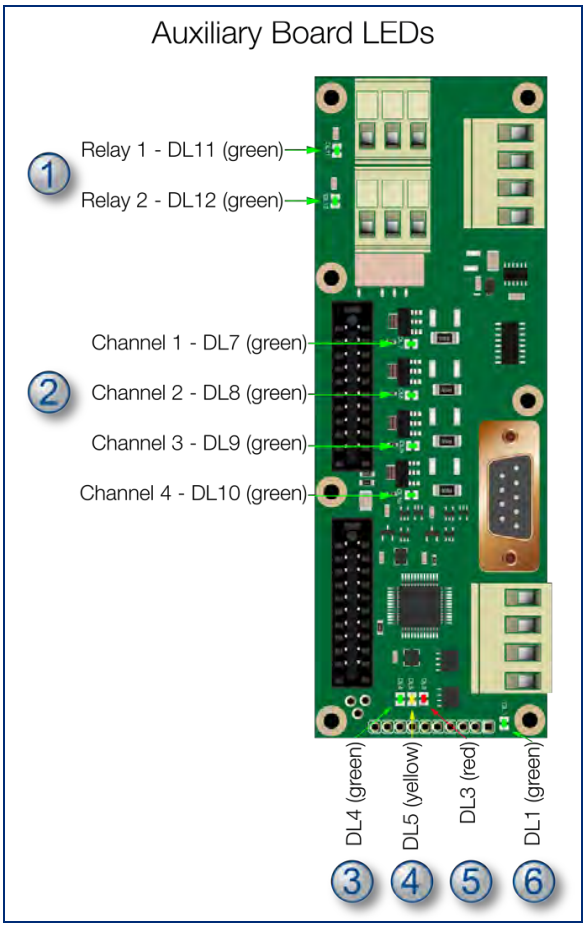
There is a maximum limit of three (3) probes or 12 sensors that can be connected to a barrier channel.

The maximum number of devices that can connect to the ISB-1W barrier is 12 probes or or 24 smart sensors.

A range of different device connections can be made. Refer to the illustration below for possible combinations.



8.7 Auxiliary Board LEDs



1. DL 11 (relay 1) / DL12 (relay 2), will come on (green) when the relay is energized.
2. DL 7 (Channel 1) green

   DL 8 (Channel 2) green

   DL 9 (Channel 3) green

   DL 10 (Channel 4) green

   When device detection occurs, these four (4) LED lights will come on in sequence. This shows that power is applied to each of the channels on the barrier. When devices are sensed on a channel its LED will remain on. When a device is not sensed on a channel, its LED will go off. Device detection occurs when power is applied to the console, the software is updated or device detection is started.
3. DL 4 (green): This LED will flash when the firmware on the auxiliary board operates. When the software is updated the light will first stay on and then it will flash.
4. DL 5 (yellow): This LED will flash when communication between the auxiliary board and the console mainboard is occurs. When there is no communication for more than 30 secs, the LED will stay on. During a software update the LED will go off.
5. DL 3 (red): This LED operates only during a software update. While information is saved the LED will flash. If a problem occurs when information is saved, the LED will stay on.
6. DL 1 (green) (power): This LED will come on when power is applied to the the auxiliary board.

Section 9 Probe Installation Preparation

This section shows the procedures necessary for installation of tank-probes that will be connected to your Nano console.

Topics in this section include:

"Probe Placement" on the next page

"Product Offset Calculation" on page 25

"Riser, Manhole and Junction Box Installation" on page 26

"Conduit Seal Fittings for Cables" on page 29

"Probe Installation in Underground Storage Tanks" on page 32

9.1 Probe Placement

CAUTION: Model 924B and DMP probes must be installed as shown in this section. If the installation cannot be done with the minimum or maximum dimensions specified, do not continue with the installation.

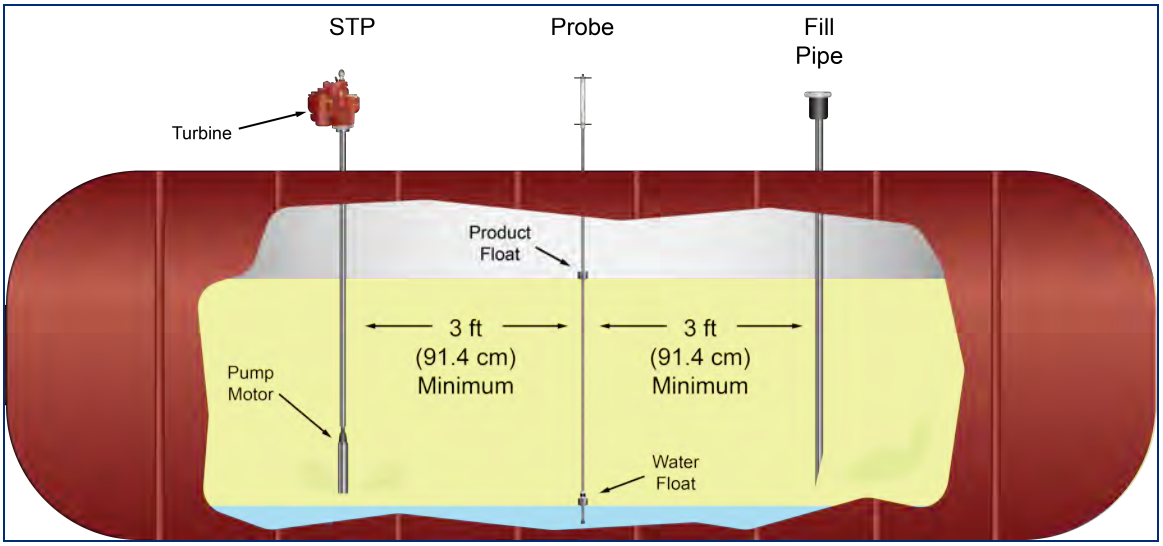
Model 924B and DMP probes are safe for Class 1, Div 1, Group D hazardous locations. This includes tanks containing regular, super, diesel and unleaded gasoline; antifreeze; kerosene; mineral spirits; oxinol, methanol and methanol blends; motor, torque and transmission oil; and alcohol. If you are not sure if a product is included in this class, speak to your product specialist or distributor.

The best location to install a probe is in the center of the tank (see the illustration below).

The probe must be installed (approximately) a minimum of three (3) feet (91 cm) from the tank fill-pipe. If the distance is less than this interval, the force of the product that goes into the tank can cause the water float to travel up the shaft of the probe. This can cause the controller to give an incorrect high-water alarm.

Adjust the drop-tube of the fill pipe so that the product flow is pointed away from the probe.

A Submersible Turbine Pump (STP) must be installed (approximately) a minimum of three (3) feet (91 cm) from the probe. If the distance is less than this interval, the force of the product that the pump pulls from the tank can cause incorrect indications of the water and product floats.



Probe Placement

9.2 Product Offset Calculation

It is possible to calculate product offset for a probe that is not installed in the center of a "pitched" tank. Pitch occurs when a tank is installed tilted along its horizontal axis. Some tanks are installed with one end lower than the other to let water and sediment collect at the low end, so that clear product can be pulled from the high end. Tank "settling" can also occur and can cause a tank a tank to become tilted. Use a dipstick to measure the level of product at two points of the tank. It is recommended that these measurements be taken at opposite ends of the tank (see the figure below).

The product depth at the lower end of the tank is value “A.” The product depth at the higher end is value “B.” The distance between the two measuring points is “C.”

The formula for pitch is:

(A-B)/C

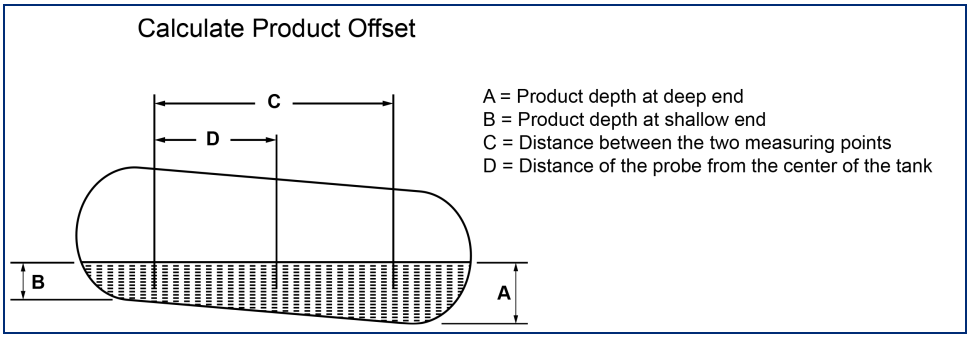
For example:

(46"-40")/120" = 6"/120" = 0.05”

To calculate the product offset, measure value “D,” the distance of the probe from the center of the tank. The formula for product offset is **“D” x pitch**. For the example above: 36” x 0.05 = 1.8”.

If the probe is located closer to the higher end of the tank, the product offset is positive. For the example above: 1.8”.

If the probe is located closer to the lower end of the tank, the product offset is negative; for the example above: -1.8”.



Product Offset

9.3 Riser, Manhole and Junction Box Installation

Install the components shown below after the probe installation location in the tank has been selected.

WARNING: To prevent explosion or fire, it is recommended to use non-sparking tools in an environment that could contain flammable hydrocarbon vapors. DO NOT USE CORDED ELECTRIC OR BATTERY OPERATED POWER TOOLS. Only use pneumatic or manual tools.

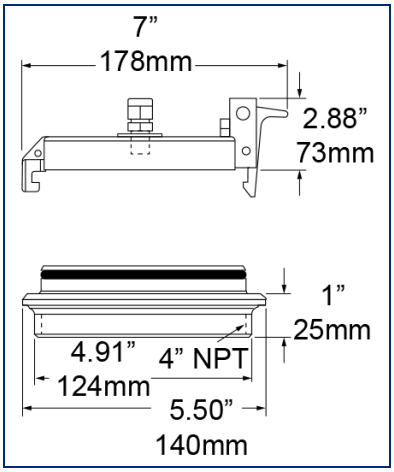
9.3.1 Riser Assembly

A four (4) inch diameter riser pipe must be installed on the tank opening where the probe will be installed. The riser pipe must be of sufficient length to hold the probe head, connector and an applicable length of cable.

An adapter collar and riser cap must be installed on the riser pipe to keep contamination out of the fuel tank. The riser must be tapped to accept the correct thread for the adapter collar and riser cap assembly.

NOTICE: Tap the applicable threads on the top of the riser before it is installed so that contamination does not enter the tank.

DFS recommends to use the OPW 62M Monitor Probe Cap & Adapter Kit (OPW- FMS P/N 30-0219 for 924B Probe installations [Accepts .069" - .178" diameter wire] and PN/ 30-0229 for DMP Probe installations [Accepts .170" - .470" diameter wire]). The illustration below shows the cap and adapter dimensions and thread specifications for reference.



You can keep the cap off of the assembly until after the probe has been put in the tank and riser.

9.3.2 Manhole and Junction Box

NOTE: The section that follows is applicable to the OPW-FMS 924B junction box installation. For information on DMP probe installation with an IP68 junction box see "Dover Magnetostrictive Probe (DMP)" on page 36.

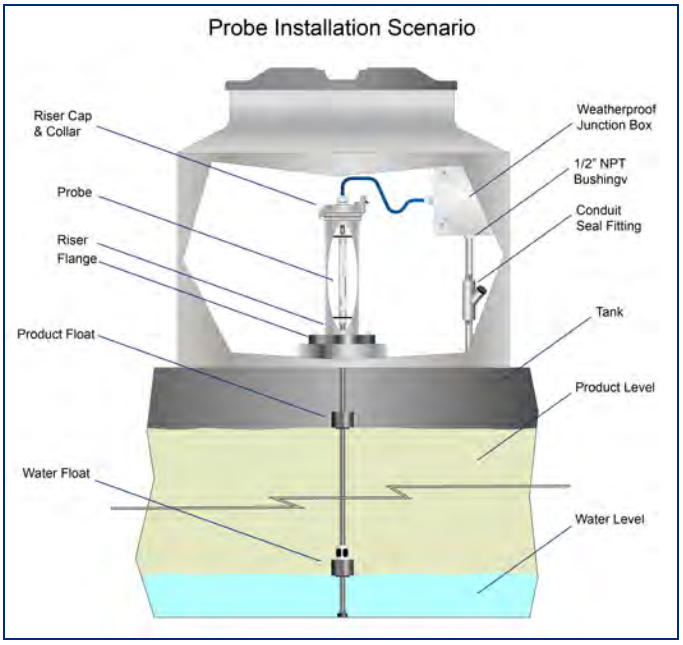
Install a manhole of at least 45.7 cm (18 inches) diameter around an unused fitting in the top of the tank. This manhole must be of sufficient dimensions to contain the riser for the probe and a weatherproof junction box.

NOTE: The 924B probe cable (OPW P/N 10-1185) is 6 feet (1.83 M) in length. Make sure there is sufficient length of cable from the probe to where a weatherproof junction box is to be installed.

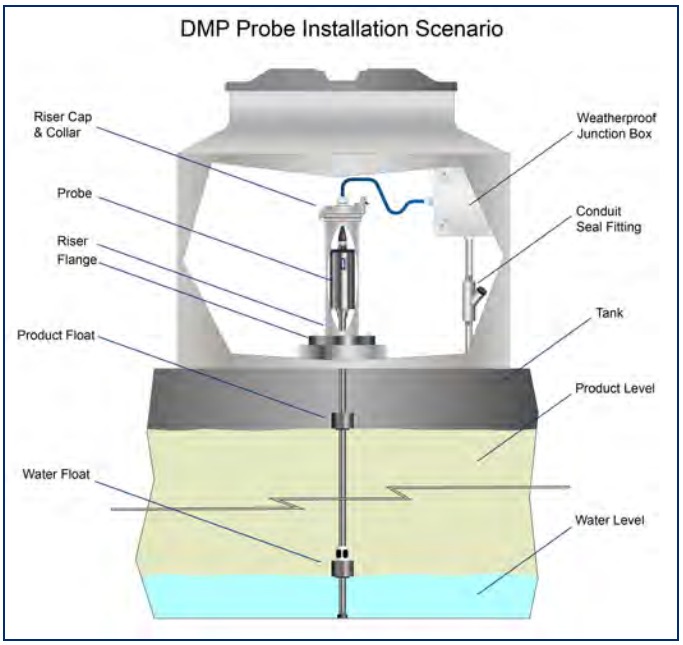
The weatherproof junction box must be of sufficient dimensions to contain a 0.5 inch (12.7 mm) conduit, a minimum 12 inches (30.5 cm) coiled field wiring, all applicable probe and sensor cables and an epoxy resin seal-pack.

Install a 1/2-inch NPT bushing in the weatherproof junction box for the conduit.

WARNING: Seal-offs are required any time I.S. wiring enters conduit. Install one conduit seal fitting in the manhole where the conduit leaves the junction box and one in the building before the conduit goes into the console. See the Conduit Seal Fittings for Cables section that follows for more information.



924B Probe Installation

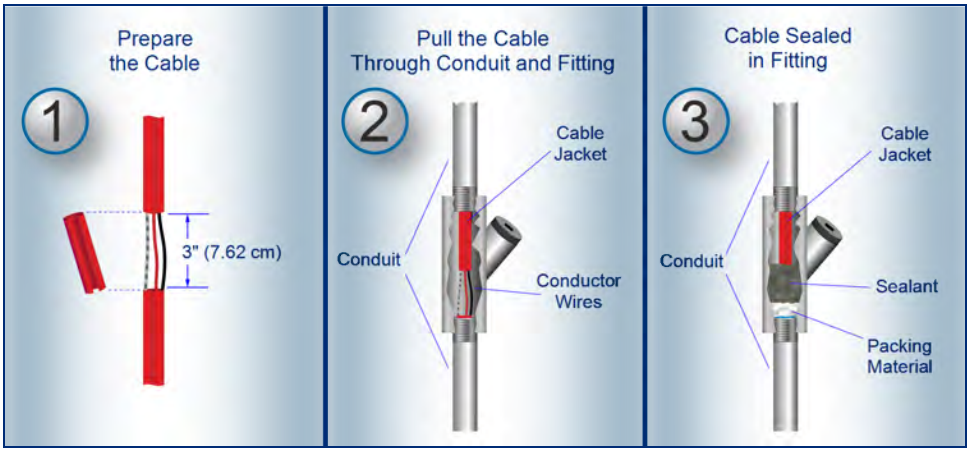


DMP Probe Installation

9.4 Conduit Seal Fittings for Cables

IMPORTANT: To comply with Article 501 of the National Elecrical Code, Seal-offs must be installed where I.S. wiring enters conduit. Install one conduit seal fitting in the manhole where the conduit leaves the junction box and one in the building before the conduit goes into the console.

WARNING: The Tank-Probe cables must be sealed ***before*** they go into the I.S. barrier (explosive fumes can travel through the cable *jacket*). This will keep explosive fumes away from the I.S. barrier.

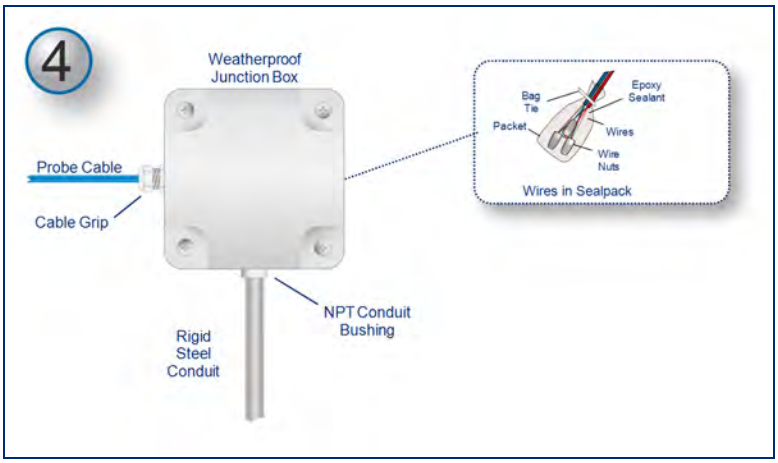


1. Prepare the Cable: Remove a sufficient length of the cable *jacket* so that the *conductor* wires can extend into the conduit seal fitting (approximately 3 inches [7.62 cm]).

IMPORTANT: Make sure you do not cause damage to the conductor wire insulation!

2. Pull the prepared Cable through the assembled conduit and fitting so that the *conductor* wires extend into the conduit seal fitting.
3. See the manufacturer's instructions that came with your Conduit Seal Fittings for the correct procedure to fill the seal cavity with an applicable sealing compound.

IMPORTANT: Make sure that the open ends of the prepared cable inside the fitting are completely sealed. This will prevent the flow of explosive fumes through the Cable *jacket*.

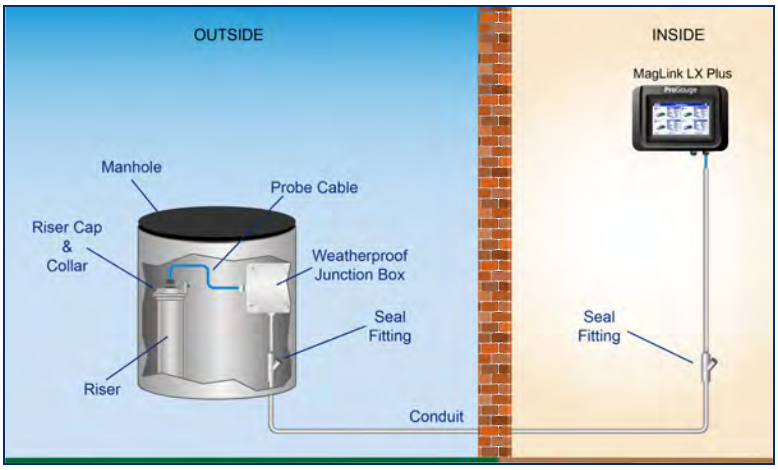


4. Tank-Probe or Smart Sensor wires that use a prepared Belden or Alpha cable must go through NPT bushings into a weatherproof junction box. Bushings must be used in all junction boxes.
5. The cable must go through rigid steel conduit from the junction box directly to the I.S. barrier.
6. Put a label on each cable and conductor wire to identify its connection.

CAUTION: The console must have a dedicated power circuit and must be on the same phase as all other OPW equipment.

Only OPW probe cables and sensor wiring can be in the same conduit that goes to the I.S. barriers.

NOTICE: Incorrect cables, wiring, or conduit can cause electronic noise interference with probe/sensor measurements. This can cause measurement indications at the console that can show as a hardware error. The warranty is voided if incorrect cables, wiring and/or conduit are installed. The ground wire must be correctly installed for the noise-filtering circuitry to operate correctly. Thus, the conduit must not be used for operation of the ground.


OUTSIDE
INSIDE
MagLink LX Plus
Manhole
Probe Cable
Riser Cap
&
Collar
Weatherproof
Junction Box
Seal
Fitting
Riser
Conduit
Seal
Fitting

9.5 Probe Installation in Underground Storage Tanks

1. Install a manhole of a minimum of 18 inches (45.7 cm) diameter around an unused fitting in the top of the tank. This manhole must be of a sufficient size to contain a weatherproof junction box together with the probe and riser assembly.

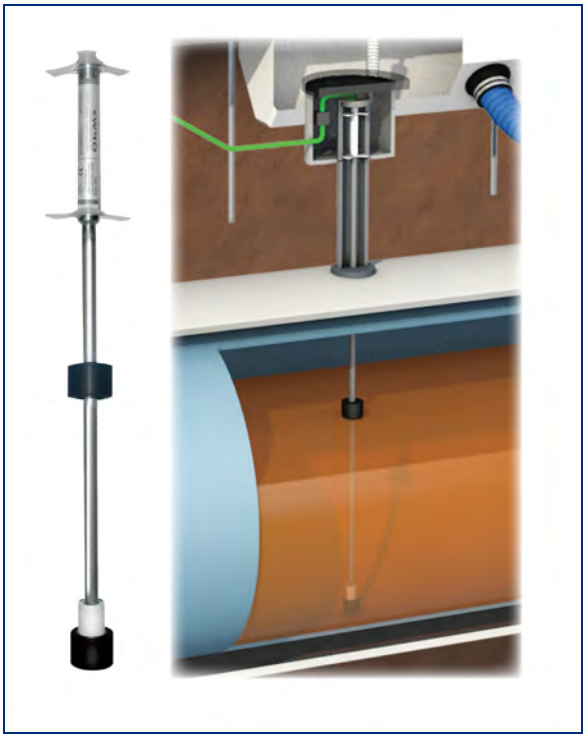
NOTE: If the fitting is not in the center of the tank, additional measurements are required for probe compensation.
If the fitting is not in the center of the tank more measurements will be necessary to maintain the minimum distances between the probe and the fill and sump tubes.

2. The probe cable (OPW P/N 10-1185) is 6 feet (1.83 M) in length. Make sure there is sufficient length of cable from the probe to where a weatherproof junction box is to be installed.
3. Leave a minimum 12 inches (30.5 cm) of extra, coiled wiring (probe wire and field wire) inside the weatherproof junction box. The box must be large enough to contain a 0.5 inch (12.7 mm) conduit, coiled field wiring and epoxy seal-pack, as shown in the field wiring diagram.

CAUTION: Seal-offs are required any time I.S. wiring enters conduit. Install one conduit seal fitting in the manhole where the conduit leaves the junction box and one in the building before the conduit goes into the console.

4. Install a 1/2-inch NPT bushing in the weatherproof junction box.

Section 10 924B Probe Installation



10.1 Probe Floats

There are three types of floats used with the probes: Product, Water for Diesel, and Water for Gasoline.

IMPORTANT: The two types of water floats are NOT interchangeable. Because diesel has more density than gasoline, the diesel floats are heavier than the gasoline floats. If an incorrect water float is installed in a diesel tank, it will not go through the product to the water below. As a result, the fuel tank will have unusually high water measurements. This can also cause irregular product measurements because the water float can cause interference with the product float.

Probe Type/Float Style	Float Kits
924B 2” (5.1 cm) Floats:	Gas: 30-1509-02 Diesel: 30-1509-01

NOTICE: The product float for LPG is not approved for installations where it can be pressurized at or more than 300PSI. Pressures higher than 300PSI will damage the device and it will not be easy to get accurate measurements.

10.2 Model 924B Probe Specifications

CAUTION: Special Conditions for Safe Use:

Static electricity can cause fires. To prevent static electricity in the probe, do not rub or clean the probe with a cloth. Make sure to release static electricity from the probe in an area away from the hazardous area before it is installed.

These devices have not been approved for use across a boundary wall.

The housing cover at the top of the probe is made of aluminum. To avoid ignition hazards do not let the head hit or rub against another object.

924B Magnetostrictive Probe Specifications	
Power Requirements:	Nominal 12+ VDC from I.S. Barrier
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
Maximum Total-Run Wiring Length*:	305 m (1,000 feet) Belden 88760 or Alpha 55371 152 m (500 feet) Belden88761 (or equivalent)
Level Measurement, Product: Level Measurement, Water: Temperature Resolution/Accuracy:	± 0.0127 mm (± 0.0005 inches) ± 0.254 mm (± 0.012 inches) ± 0.1°C / ± 0.5°C
Classifications:	Class I, Division 1, Group D
Certifications:	IECEx UL 11.0012X DEMKO 11 ATEX 1012670X
I.S. Barrier Used:	12V ONLY; OPW P/N: 20-4344 (Green Label)
Multi-drop Restriction**:	924B is the only probe that can be multi-dropped at a maximum of four (4) probes per channel
Connections:	Blue = Power, Brown = Signal, Black and Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all probes on one channel. This length includes the wire from the I.S. barrier to each probe in the string.

NOTE: **ONLY 924B Probes made after September 1, 2007, (version 7.xx firmware) can be installed in a multi-drop installation.

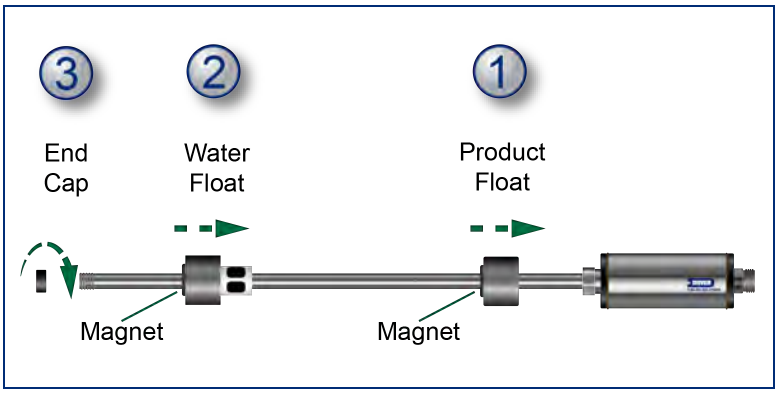
Section 11 Dover Magnetostrictive Probe (DMP)

The Dover Magnetostrictive Probe (DMP) is installed almost the same as a 924B Probe.

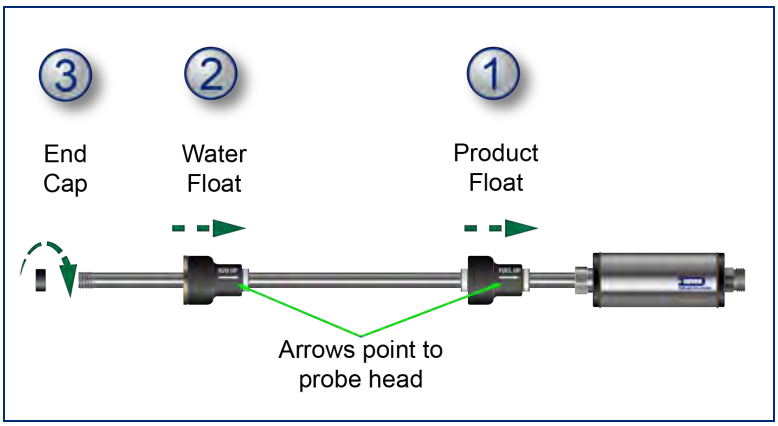
11.1 DMP Probe Installation

IMPORTANT: To prevent damage to the probe, be careful when you remove the probe from its packaging and when you install it in a tank. Do not let probe components hit the sides of manholes or tank openings. Make sure the stainless steel probe shaft does not get bent. This can cause incorrect indications in fluid levels.

IMPORTANT: If the fitting is not in the center of the tank, a Product Offset Calculation will be necessary. See Product Offset Calculation for information.



DMP Probe with OPW-FMS Floats

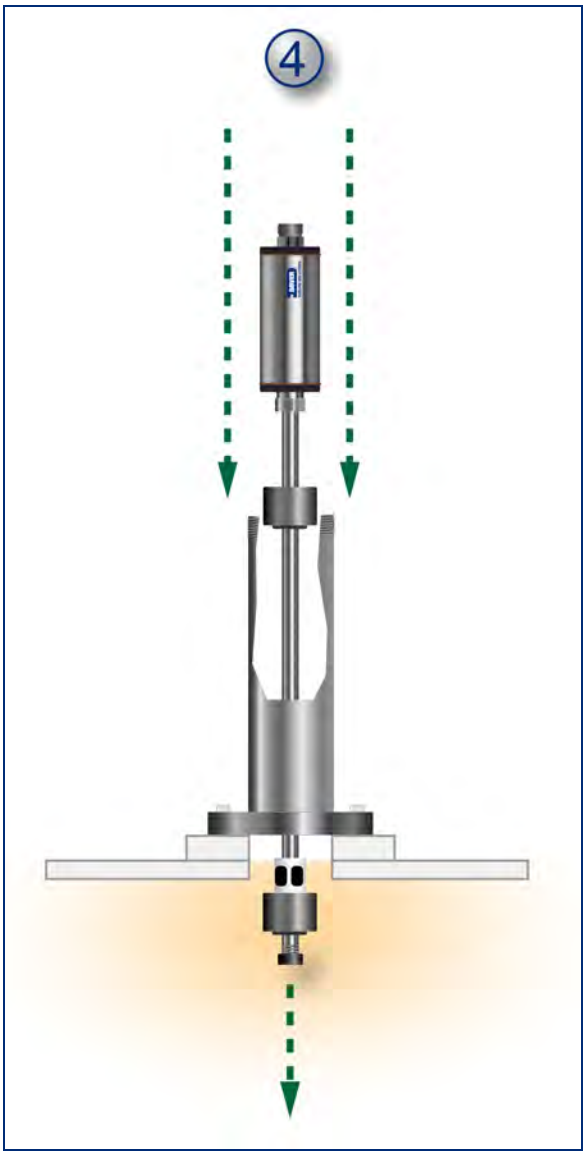


DMP Probe with ProGauge Floats

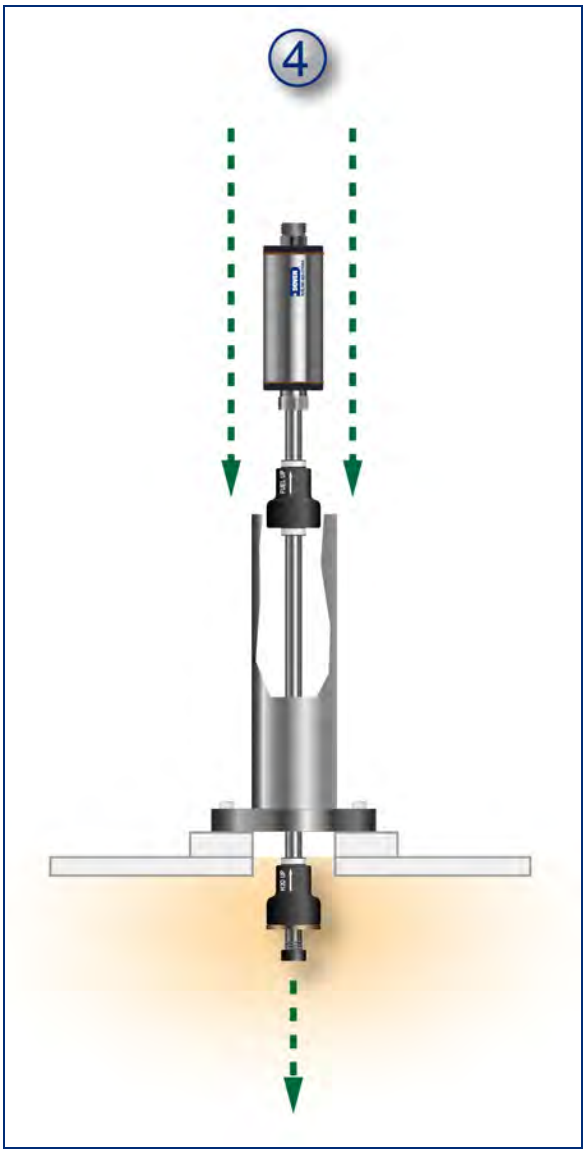
The DMP probe is shipped fully assembled. You can skip to step 4 to install an assembled probe. If it becomes necessary to disassemble the probe components, use steps 1-3 below to assemble the floats and end cap to the probe before you continue.

1. Put the Product Float on the probe shaft. Make sure the magnet side points toward the bottom of the probe shaft for FMS Floats. Make sure the arrow points toward the probe head for ProGauge floats.

2. Put the Water Float on the probe shaft (if applicable). Make sure the magnet side points toward the bottom of the probe shaft for FMS Floats. Make sure the arrow points toward the probe head for ProGauge floats.
3. Attach the End Cap to the end of the probe shaft. Turn it clockwise to tighten.



DMP Probe with FMS Floats



DMP Probe with ProGauge Floats

4. Carefully put the assembled probe down through the riser into the tank until the probe end cap touches the bottom of the tank.

NOTICE: Carefully lower the probe down into the tank. To prevent damage to the probe, do not let the probe fall and hit the bottom of the tank wall.

5. Connect the 7/8" probe cable connector to the probe.

NOTE: The DMP cable is 1.5 M (3.28 ft.) by default but can be ordered with a different specified length.

11.2 Spacer Assembly (6-3/4 RA SS) and Adjustment

IMPORTANT: The minimum inner diameter for a riser is 52 mm (2.05 in.). This gives an allowance for the head gaskets so the probe can move freely inside the riser

The DMP Probe can be installed in a minimum 52 mm (2.05 in.) inner diameter riser without modification. If the probe is to be installed in a riser with an inner diameter up to 4-inches (101.6 mm), a spacer must be installed. This will keep the probe in the center of the riser and in a vertical position through the bottom of the tank.

The Probe Spacer kit contains:

- One (1) stainless steel, flexible spacer.
- Two (2) M3x8 screws
- Two (2) M3 nuts

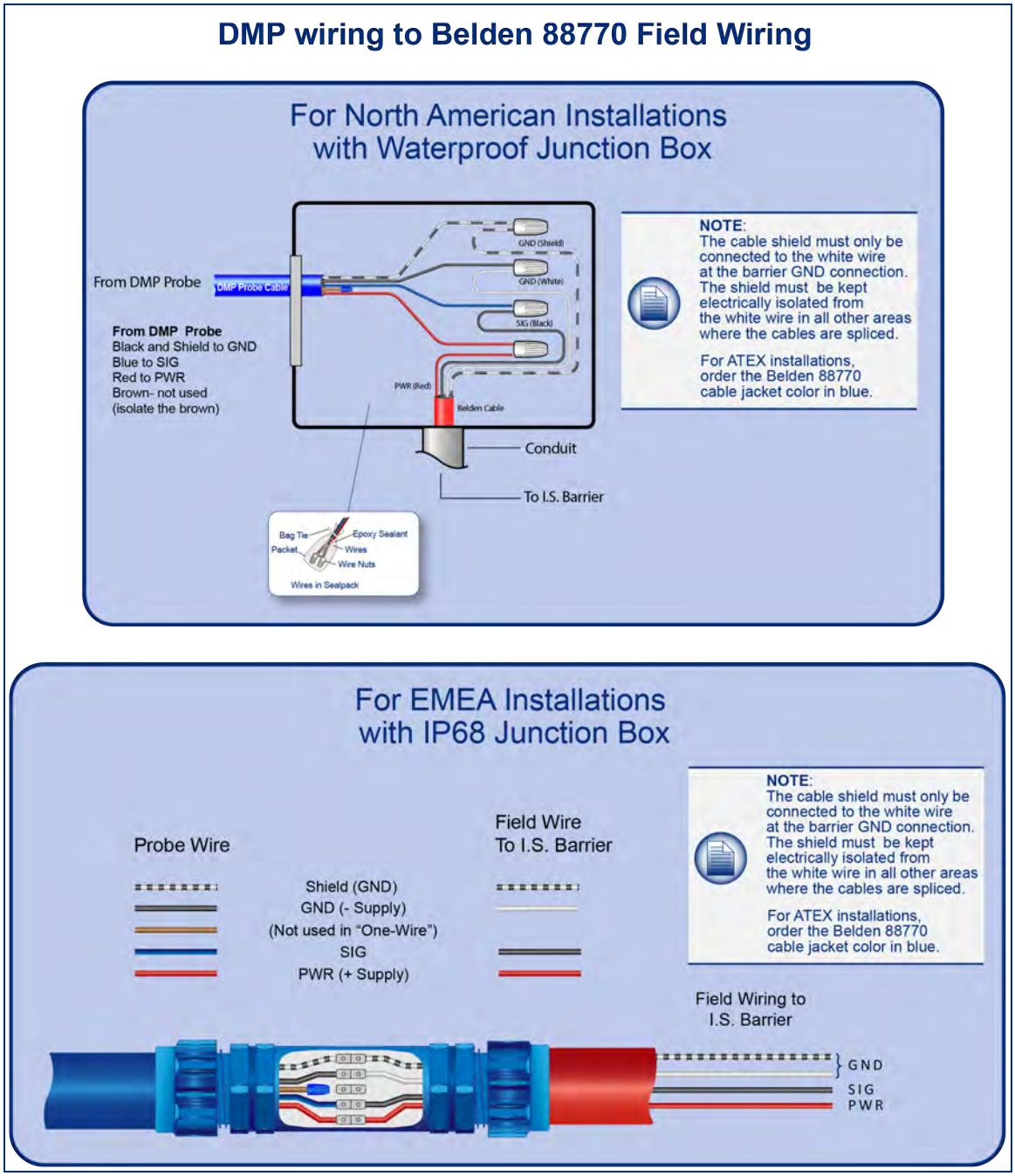
NOTICE: Be careful to not cause damage to the probe label when you install or when you make adjustments to the spacer. The label contains important safety and product information.

To assemble and adjust the probe spacer:

1. Bend the probe spacer around the probe head.
2. Align the holes of the 90° bends of the top and bottom strips.
3. Put the two (2) screws through the two (2) pairs of holes and fasten with the two (2) nuts. Do not tighten the screws completely at this time.
4. To adjust the width of the spacer, move the top and bottom strips nearer to or away from each other. This will cause the outer diameter of the vertical strips to move in or out until you find the correct fit inside the riser. When the correct fit has been found, tighten the screws completely.

11.3 DMP Probe Cable Wiring to LX Plus I.S. Barrier

11.3.1 DMP wiring to Belden 88770

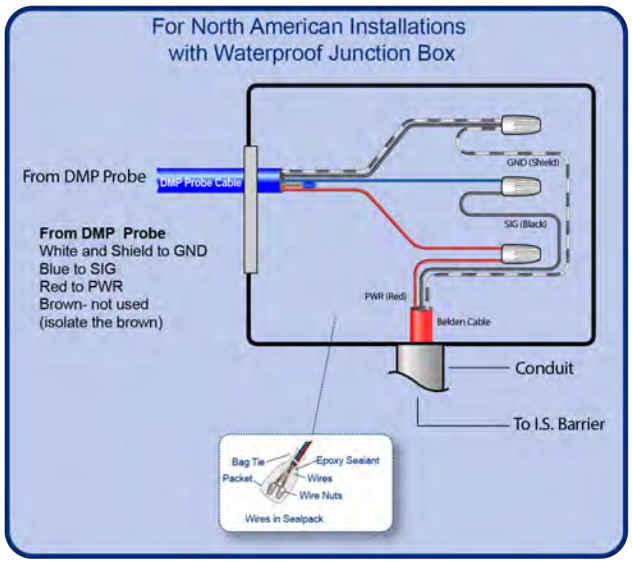


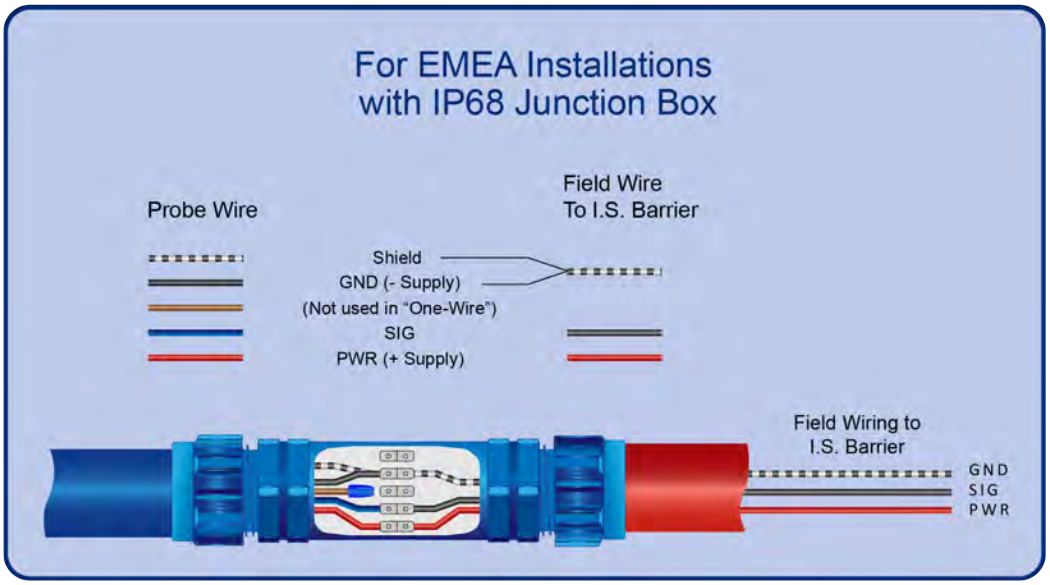
For new DMP installations it is recommended to use Belden 88770 for field wiring. The top illustration above shows the wiring of the DMP Probe "One-Wire" to typical field wiring in a waterproof juncion box for installations in North America. The bottom illustration shows the wiring of the DMP "One Wire" in an IP68 rated junction box for EMEA installations.

11.3.2 DMP wiring to Belden 88760

NOTE: This is for wiring installations that have Belden 88760 installed. New installations should use Belden 88770 (se the section above).

DMP wiring to Belden 88760 (or equivalent) Field Wiring





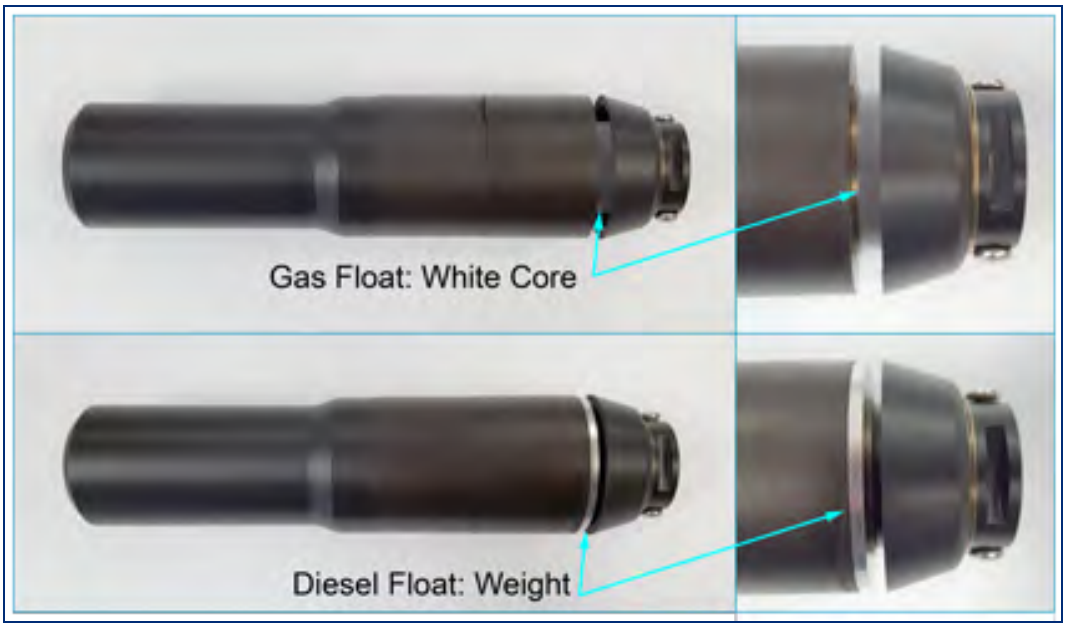
The illustrations above show how to install existing Belden 88760 field wiring with new DMP Probes. The top illustration above shows the wiring of the DMP Probe "One-Wire" to typical field wiring in a waterproof juncion box for installations in North America. The bottom illustration shows the wiring of the DMP "One Wire" in an IP68 rated junction box for EMEA installations.

Section 12 Density Measurement Float (DMF)

OPW Part Number 20-4431 (Gas - White Core) & 20-4432 (Diesel - Black Core)

The Density Measurement Float (DMF) can be installed on a pre-existing probe. The DMF continuously measures the average density of the fuel in the tank. This can measure the smallest change in product density in the API density range. Fuel-density reports can be shown real-time on the console or exported to an external device. The readings can be a nominal or temperature-corrected density.

There are two (2) types of the DMF. One that measures density for gasoline (20-4431) and another for diesel (20-4432). They can be identified by the white core of the gasoline float or the metal weight of the diesel float. See the image below.



Density Measurement Float Specifications	
Materials:	Nitrophyl, Delrin, and Stainless-Steel spring
Dimensions:	Length: 20.3 cm (8 inches) Diameter: 5.1 cm (2 inches)
Precision:	±0.04%
Suggested Location:	15.2 cm (6 inches) from the bottom of the probe **NOTE**: Use two (2) set screws at the top of the float to hold it in position

Product Density and Chemical Compatibility			
Product Group	**Compatibility**	**API**	**Specific Gravity**
Gasoline	Gasoline Aviation Gasoline Regular Unleaded Regular Leaded Premium Unleaded Gasoline/Methanol blend, less than 5% methanol Gasohol, less than 40% ethanol	45 < API < 78	0.68 < d < 0.80
Diesel	Diesel Jet Fuel Kerosene Motor Oil Toluene Gear Oil Transmission Oil	26 < API < 45	0.80 < d < 0.90

WARNING: THIS IS A STATIC SENSITIVE DEVICE! To prevent the risk of explosion from static discharge, do not clean or rub this device with a dry cloth.

NOTICE: To prevent damage to the I.S. barrier, you must turn off the power to the module that the probe is connected to before you begin the procedure below.

1. Turn off the power to the module that the probe is connected to before you remove the probe from the tank.
2. Remove the probe from the tank and remove the clip and the nylon probe foot from the bottom of the probe.
3. Remove the water float. Put the density float on the probe shaft (make sure the top of the float points toward the probe head) and tighten the screws of the float (the screws are at the top of the float). Keep a space of 10.2 cm to 15.2 cm (4 to 6 inches) at the bottom of the probe shaft so the water float can detect at least 7.6 cm (3 inches) of water.
4. Put the water float, nylon probe foot and end clip back on the probe shaft.
5. Put the probe back in the tank.
6. Turn on the power to the module.

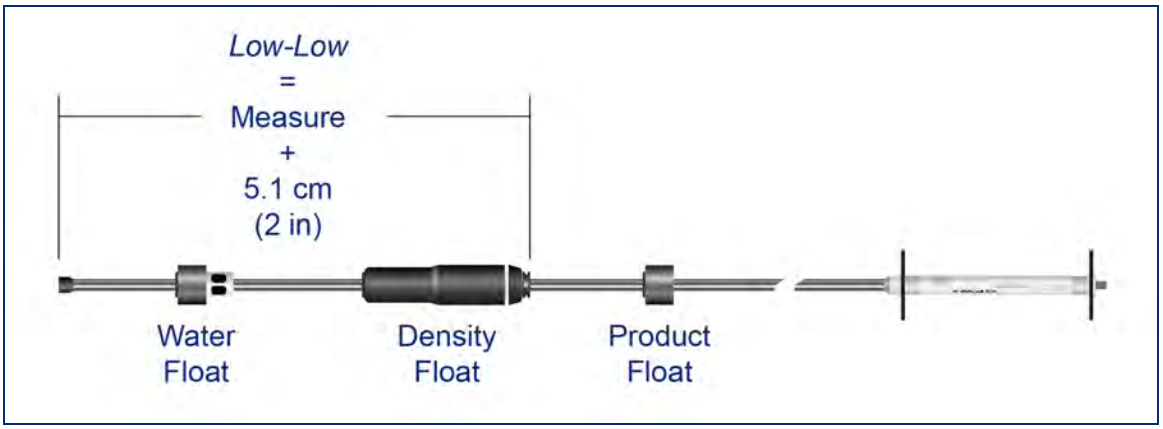
For DMF configuration and calibration refer to the M2051 LX 4/LX Plus Configuration Manual.

You will need the A and B Factors that are etched into the body of the float. See the image below.

NOTICE: The Density Measurement Float is not to be used in a pressurized tank.

12.1 Tank Thresholds

- Make sure that the Density float is installed between the Water Float and the Product Float. When you set the product threshold levels (*Low* and *Low-Low*) in the console's **Tank Thresholds** screen, make sure the values are higher than where the Density Float is installed. Refer to your console's configuration guide.
- Measure the distance between the end of the probe shaft and the top end of the Density Float. Add 5.1 cm (2 inches) to this distance to include the dead zone at the end of the probe. The result is the value of the minimum *Low-Low* product threshold.



Calculate Low-Low Threshold

Section 13 Sensor Support

The LX Plus console supports OPW-FMS Smart Sensors that use IntelliSense™ Technology. The OPW smart sensors can monitor all contained areas of the fuel-storage system: tank interstice, piping sumps, STP containment sumps, dispenser sumps and pans, monitoring wells and site locations. Sensors connected to the I.S. barrier are automatically detected and identified by the console.

13.1 IntelliSense™ Technology

This technology lets the console's internal I.S. barrier automatically find the sensor's connection, type and status. IntelliSense will minimize user entry errors and identify hardware issues with minimal troubleshooting.

13.2 Mixed Multi-Drop Installation

The LX Plus **Mixed Multi-Drop technology** can run probes and sensors on one cable back to the tank gauge.

IMPORTANT: Seal packs and weatherproof junction boxes are REQUIRED with ALL I.S. field connections for North American installations.

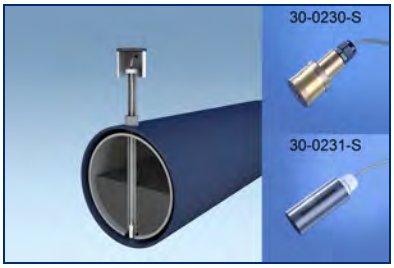
13.3 Smart Sensors

Part Number	Description
30-0232-DH-10	Discriminating Dispenser Sump Sensor
30-0232-DH-20	Discriminating STP Sump Sensor
30-0236-LW	Discriminating Interstitial Sensor (Optical)
30-0234-HW-06/15/20	Hydrocarbon Liquid Sensor with water indicator (6, 15 and 24 ft. lengths)
30-0234-HW-01	Interstitial Hydrocarbon Liquid with water indicator
30-0231-S	Interstitial Sensor-Float Switch – (Small Plastic)
30-0231-L	Sump Sensor-Float Switch – (Large Plastic)
30-0230-S	Liquid Only Float Sensor (Brass) - steel tank interstitial containment area
30-0232-D-10	Dual Float Non-Discriminating Dispenser Sump Sensor
30-0232-D-20	Dual Float Non-Discriminating STP Sump Sensor
30-0232-D-10B	Dual Float Brine Sensor for Containment Sump
30-0232-D-20B	Dual Float Brine Sensor for Fiberglass Tanks
30-0235-V	Hydrocarbon Vapor Sensor

13.4 Interstitial Level Sensor

Smart Sensor Equipped with Intellisense™ Technology

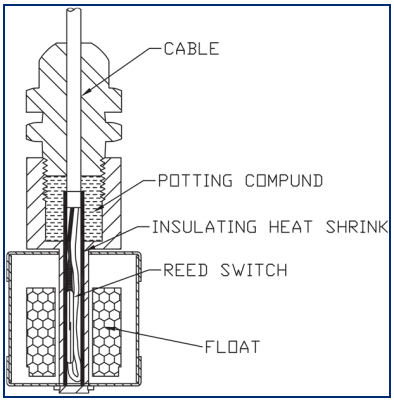
30-0230-S Liquid Only Float Sensor (Brass) & 30-0231-S Interstitial Sensor-Float Switch



Description

The primary function of these sensors is to sense liquid in the interstitial area of a double-walled steel tank (these sensors are not for use in a double-walled fiberglass tank). A float inside the sensor moves up when the liquid level increases. The float switch will operate and cause an alarm condition in the controller. The 30-0230-S is made of brass and the 30-0321-S is made of a chemical resistant, non-metallic material.

These sensors can also be used in sumps, fuel dispenser pans and other locations where there is liquid that could indicate that a leak has occurred. These sensors can also be used together with a vapor sensor (30-0235-V) to monitor wet wells to make sure that there is a normal liquid level. If there is a break in the cable it will cause an alarm condition in the system.



Specifications	
Primary Use:	30-0230-S: STP Sumps and Fuel Dispenser Pans 30-0231-S: Interstitial Area
Alternate Use:	30-0230-S: Steel Tank Interstitial 30-0231-S: Sumps and Fuel Dispenser Pans
Detects:	Liquid
Operating Temperature:	–20°C to +50°C (–4°F to +122°F)
Dimensions - 30-0231-S	Diameter: 1.3 inches (3.4cm), Length: 3.9 inches (10 cm)
Cable Requirements:	Belden #88760 or Alpha #55371 4.5m (15 feet) of gas & oil resistant cable to the inline ISIM + 1.3m (4 feet) ISIM tail.
Maximum Wiring Length*:	1,000’ (305 m) field wiring
Alarm Threshold Configuration:	Fully Automatic
Diagnostic Reading on sensor setup:	**0 - 0.5** (normal), **485 - 495** (in alarm)
Multi-Drop Restriction	Maximum points per channel = 12 points, 924B and DMP Probes = 4 points, ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

IMPORTANT: This Smart Sensor must ONLY be connected to an OPW Fuel Management Systems 12V VSmart Module. This will make sure that operation conditions are safe. Smart Sensors CANNOT be used with SS1, 2 or 3, iTouch or EECO consoles.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

NOTE: If this sensor is used to monitor a normally dry well, use a meter to set the float position so the sensor is in a closed position when there is NO liquid level (the float will be in the lower position). To monitor a normally wet well, use a meter to set the float so that the sensor is in a closed condition WITH a liquid level (the float will be in the upper position).

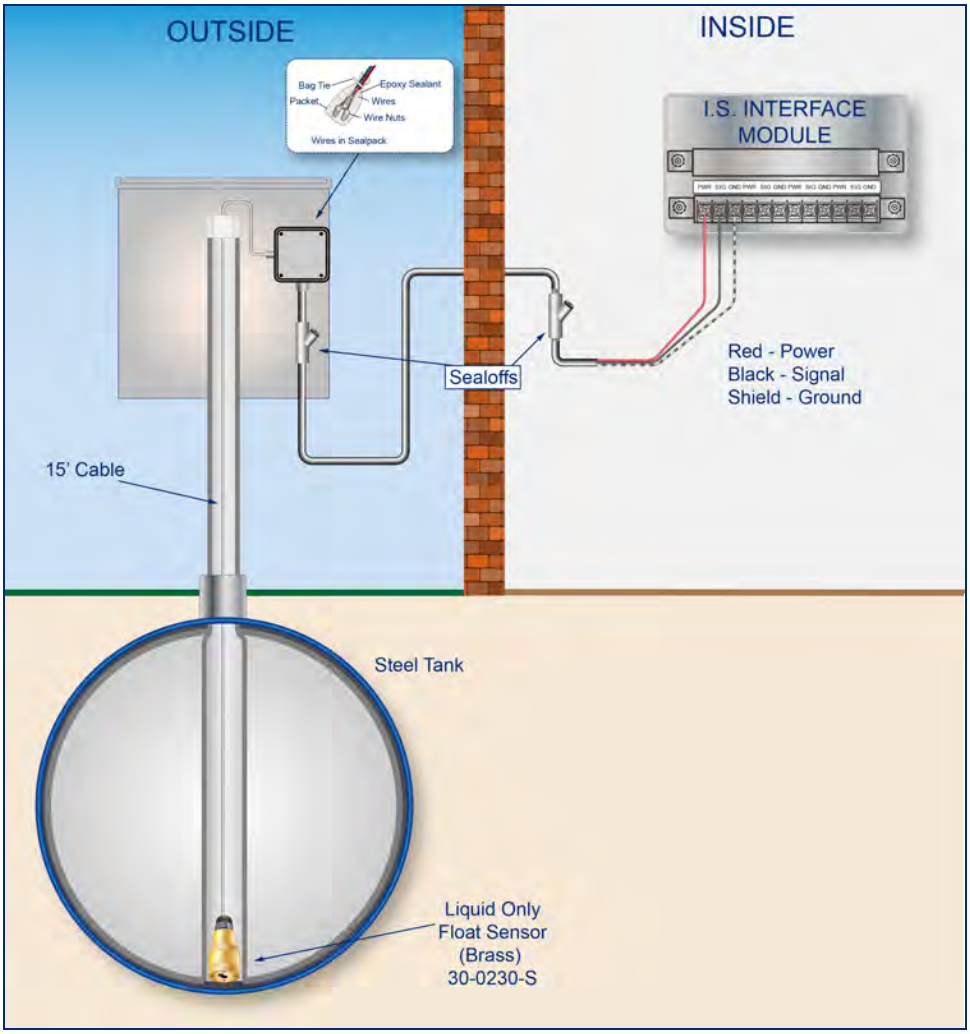
- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Make sure the sump pit or pan is dry.
- Install the sensor approximately 1/2” (1.3 cm) above the bottom of the sump/pan. Attach the sensor wire to a pipe or bracket with a tie wrap.
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

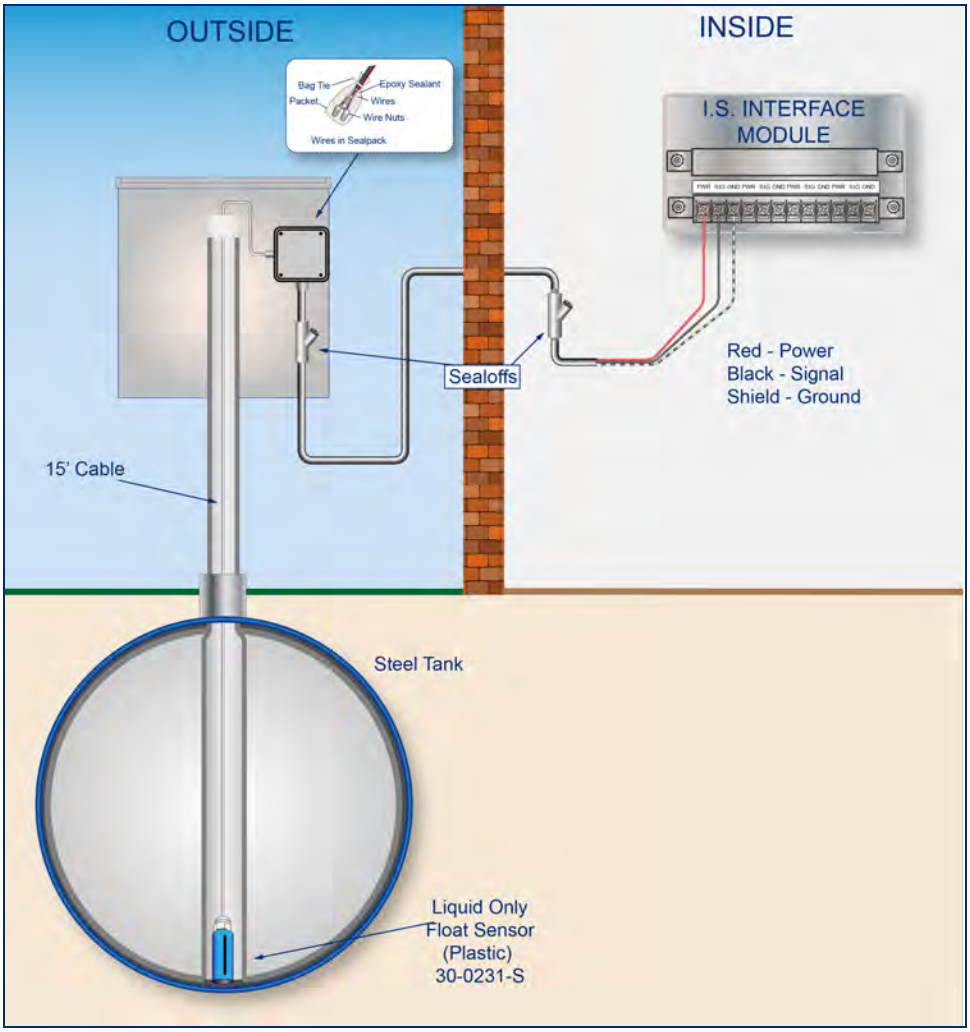
Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black (hydrocarbon sensor)	Signal
Shield (or 3rd conductor)	Ground

Typical Installation Drawings

30-0230-S



30-0231-S



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Float Sensor Test

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

Sensor installed in a normally dry well

- Put the float in the HIGH position. This will cause an alarm condition in the controller.
- Put the float back in the LOW position. Make sure that the controller is not in an alarm condition.

Sensor installed in a normally wet well

- Put the float in the LOW position. This will cause an alarm condition in the controller.
- Put the float back in the HIGH position. Make sure that the controller is not in an alarm condition.

If the controller does not go into an alarm condition, look to see if the thresholds are correctly programmed in the system. Look to see if the float is in the correct position (refer to the applicable instruction above). A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

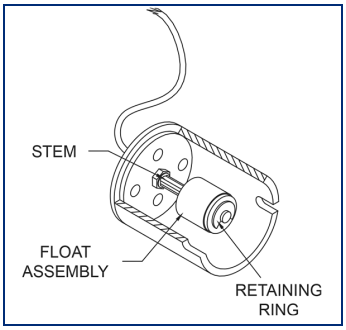
13.5 Single Level Sump Sensor-Float Switch

Smart Sensor Equipped with Intellisense™ Technology

30-0231-L

Description

The primary function of the single-level sensor is to sense liquid in sumps, fuel dispenser pans and other locations where there is liquid that could indicate that a leak has occurred. A float inside the sensor moves up when the liquid level increases. The float switch will operate and cause an alarm condition in the controller. If there is a break in the cable it will cause an alarm condition in the system.



Specifications	
Primary Use(s):	Sumps and Fuel Dispenser Pans
Detects:	Liquid
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
Dimensions:	Diameter: 7.4 cm (2.90 inches), 9.5 cm (3.70 inches)
Cable Requirements:	Belden #88760 or Alpha #55371 3.6m (12 feet) of gas & oil resistant cable to the inline ISIM + 1.3m (4 feet) ISIM tail.
Maximum Wiring Length*:	305 m (1,000 ft.) field wiring
Alarm Threshold Configuration:	Fully Automatic
Diagnostic Reading on sensor setup:	**0 to 0.5** (normal), **485 to 495** (in alarm)
Multi-Drop Restriction	Maximum points per channel = 12 points, 924B and DMP Probes = 4 points, ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

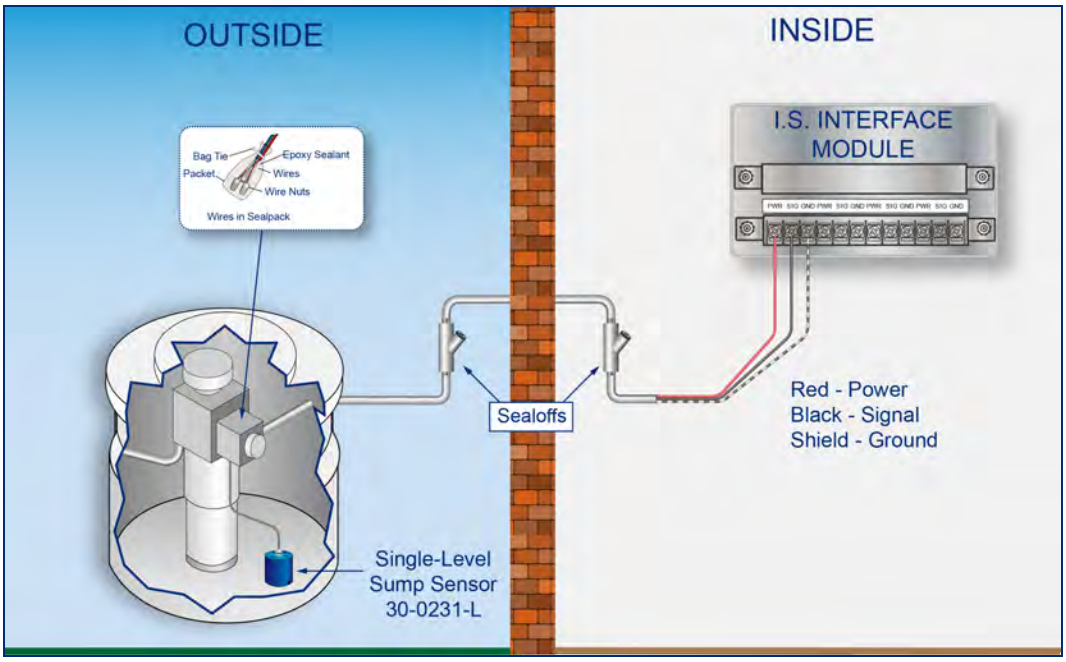
NOTE: If this sensor is used to monitor a normally dry well, use a meter to set the float position so the sensor is in a closed position when there is NO liquid level (the float will be in the lower position). To monitor a normally wet well, use a meter to set the float so that the sensor is in a closed condition WITH a liquid level (the float will be in the upper position).

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Make sure the sump pit or pan is dry.
- Install the sensor on the bottom of the sump/pan. Attach the sensor wire to a pipe or bracket with a tie wrap.
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black (hydrocarbon sensor)	Signal
Shield (or 3rd conductor)	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Float Sensor Test

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

- Turn the sensor so the bottom opening points up and wait for a minimum of two (2) minutes.
- Make sure that the controller is not in an alarm condition.
- Put the sensor back in its normal position. Make sure that the alarm condition stops.

If the controller does not go into an alarm condition, look to see if the thresholds are correctly programmed in the system. Look to see if the float is in the correct position (refer to the applicable instruction above). A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

13.6 Dual Float Non-Discriminating Sensors

Smart Sensor Equipped with Intellisense™ Technology

30-0232-D-10 Dispenser Sump Sensor & 30-0232-D-20 STP Sump Sensor

Description

IMPORTANT: This float body is the same as the 30-0232-D-10B / D-20B and 30-0232-DH-10 / DH-20 (DH-XX has a carbon-polymer strip in the bottom). Look at the label to make sure you have the correct sensor for the applicable function.

The primary function of the Dual Float Non-Discriminating Sensor is to sense liquid hydrocarbons and water in sumps, fuel dispenser pans and other locations where there is liquid that could indicate that a leak has occurred. This sensor looks almost the same as the 30-0232-DH-XX but is non-discriminating. This means that the sensor does *not* use a carbon/polymer material to sense liquid hydrocarbons. Use the D-10 on fuel dispenser pans and transition sumps. Use the D-20 in tank sump pits. Two (2) float switches are used in the body of the sensor to sense low and high liquid levels. If there is a break in the cable it will cause an alarm condition in the system.

Specifications	
Primary Use(s):	D-10: Fuel Dispenser Pan/Sump D-20: STP Sumps
Alternate Uses:	D-10: STP Sumps D-20: Fuel Dispenser Pan/Sump
Detects:	Low Liquid, High Liquid, Fuel (non-discriminating)
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
D-10 Dimensions: D-20 Dimensions:	Diameter: 5.8 cm (2.3 in.), Length: 28.2 cm (11.1 in.) Diameter: 5.8 cm (2.3 in.), Length: 53.6 cm (21.1 in.)
Float Requirements:	Low: 3.8 cm (1.5 in.), High: 27.9 cm (11 in.)
Cable:	Belden #88760 or Alpha #55371 3.6m (12 feet) of gas & oil resistant cable to the inline ISIM + 1.3m (4 feet) ISIM tail.
Maximum Wiring Length*:	305 m (1,000 ft.) field wiring
Alarm Threshold Configuration:	Fully Automatic
Diagnostic Reading on sensor setup:	**12 to 13** (normal), **3 to 4** (lower float in alarm - raised), **1 to 2** (upper and lower float in alarm - raised)
Multi-Drop Restriction	Maximum points per channel = 12 points, 924B and DMP Probes = 4 points, ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

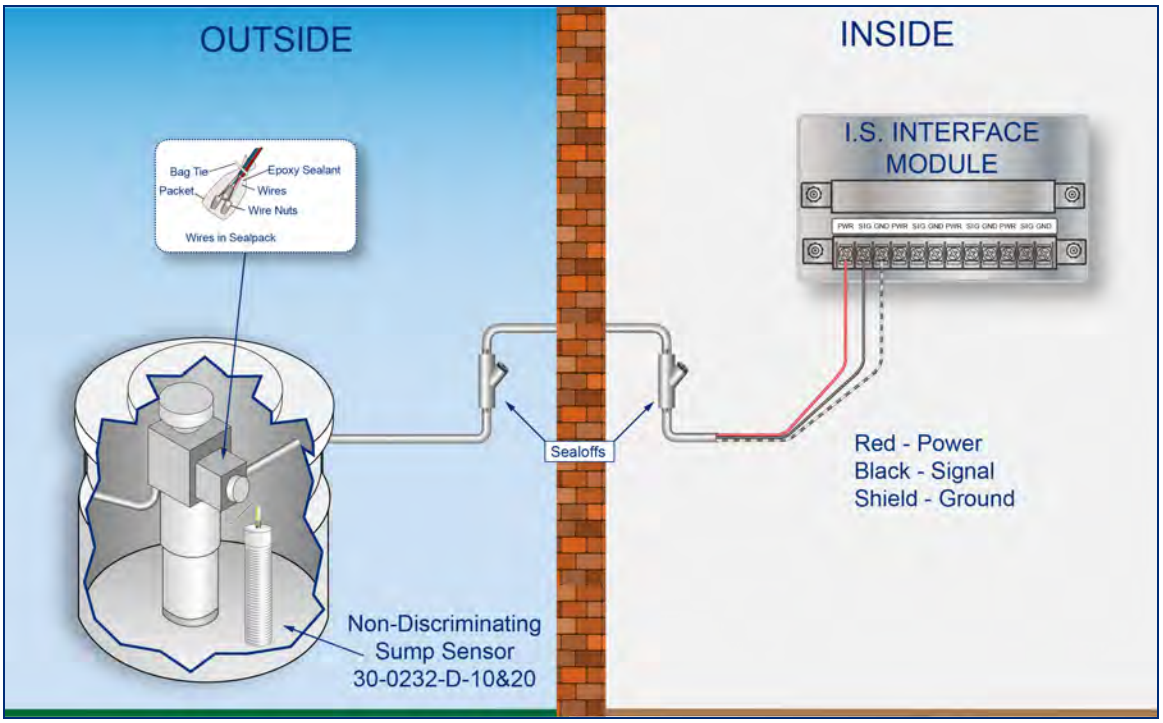
Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Make sure the sump pit or pan is dry.
- Install the sensor so that it touches the bottom of the sump pit or pan.
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black (hydrocarbon sensor)	Signal
Shield (or 3rd conductor)	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Float Sensor Test

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

Sensor installed in a normally dry well

- Put the float in the HIGH position. This will cause an alarm condition in the controller.
- Put the float back in the LOW position. Make sure that the controller is not in an alarm condition.

Sensor installed in a normally wet well

- Put the float in the LOW position. This will cause an alarm condition in the controller.

- Put the float back in the HIGH position. Make sure that the controller is not in an alarm condition.

If the controller does not go into an alarm condition, look to see if the thresholds are correctly programmed in the system. Look to see if the float is in the correct position (refer to the applicable instruction above). A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

13.7 Discriminating Dispenser Sump/STP Sump Sensor

Smart Sensor Equipped with Intellisense™ Technology

30-0232-DH-10 & 30-0232-DH-20

Description

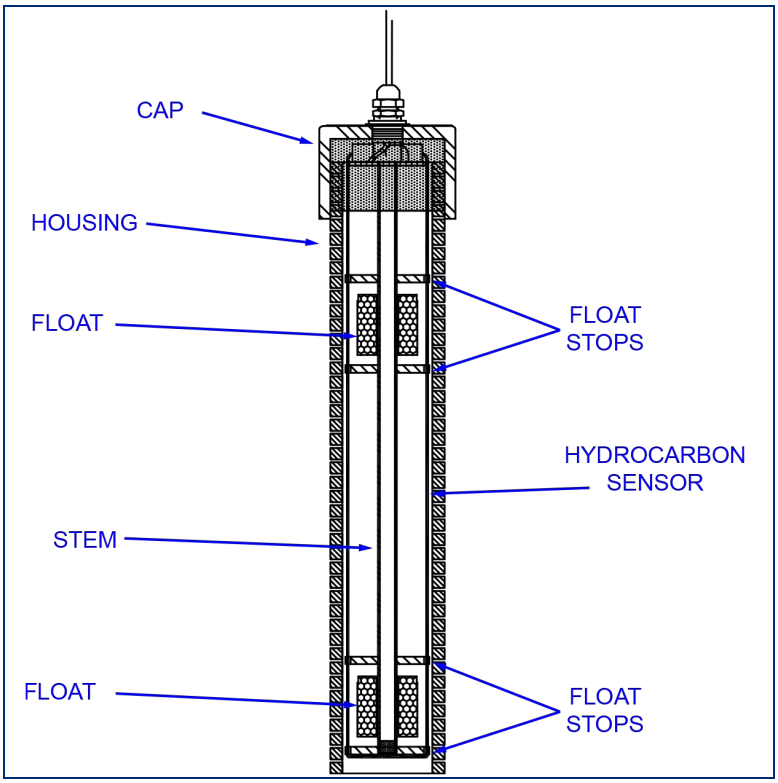
IMPORTANT: This float body is the same as the 30-0232-D10 / D20 and 30-0232-D-10B / D-20B. Look at the label to make sure you have the correct sensor for the applicable function.

The primary function of the Discriminating Dispenser Sump/STP Sump Sensor is to sense liquid hydrocarbons and water in sumps, fuel dispenser pans and other locations where there is liquid that could indicate that a leak has occurred. Use the DH-10 on fuel dispenser pans and transition sumps. Use the DH-20 in tank sumps.

The sensor has a strip made of a carbon/polymer material that changes its electrical resistance when it is touched by liquid hydrocarbons.

Sensor with Carbon/polymer Strip

Two (2) float switches are used in the body of the sensor to sense low and high liquid levels. If there is a break in the cable it will cause an alarm condition in the system.



Cutaway View of Sensor that Shows Internal Floats

Specifications	
Primary Use(s):	DH-10: Fuel Dispenser Pan/Sump DH-20: STP Sumps
Alternate Uses:	DH-10: STP Sumps DH-20: Fuel Dispenser Pan/Sump
Detects:	Low Liquid, High Liquid, Fuel
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
DH-10 Dimensions: DH-20 Dimensions:	Diameter: 5.8 cm (2.3 in.), Length: 28.2 cm (11.1 in.) Diameter: 5.8 cm (2.3 in.), Length: 53.6 cm (21.1 in.)
Float Requirements:	Low: 3.8 cm (1.5 in.), High: 27.9 cm (11 in.)
Nominal resistance (uncontaminated)	Less than 5,000 ohms
Nominal resistance (contaminated)	More than 30,000 ohms
Cable:	Belden #88760 or Alpha #55371 3.6 m (12 feet) of gas & oil resistant cable to the inline ISIM + 1.3 m (4 feet) ISIM tail
Maximum Wiring Length*:	305 m (1,000 ft.) field wiring
Alarm Threshold Configuration:	Fully Automatic
Diagnostic Reading on sensor setup:	
Clean Carbon/polymer (no Hydrocarbon)	**12 to 13** (normal), **3 to 4** (lower float in alarm - raised), **1 to 2** (upper and lower float in alarm - raised)
Belcor Active (Hydrocarbon present)	**3.5 to 3.7** (normal), **1.8 to 2.0** (lower float in alarm - raised), **1.2 to 1.4** (upper and lower float in alarm - raised)
Multi-Drop Restriction	Maximum points per channel = 12 points 924B and DMP Probes = 4 points ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

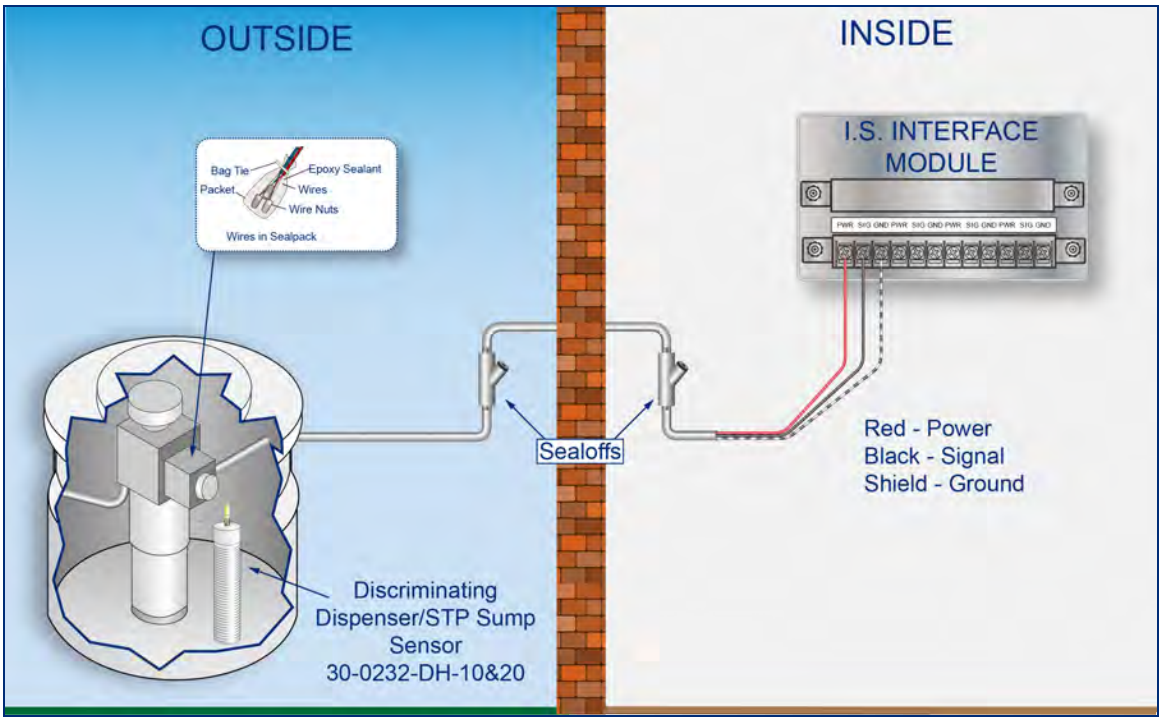
Use wire-nuts and epoxy-resin seal-packs for North American field connections (refer to M00-390008 Waterproof Electrical Connections for information).

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Make sure the sump pit or pan is dry.
- Install the sensor so that it touches the bottom of the sump pit or pan.
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- For North American installations, seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black (hydrocarbon sensor)	Signal
Shield (or 3rd conductor)	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Float Sensor Test

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

Sensor installed in a normally dry well

- Put the float in the HIGH position. This will cause an alarm condition in the controller.
- Put the float back in the LOW position. Make sure that the controller is not in an alarm condition.

Sensor installed in a normally wet well

- Put the float in the LOW position. This will cause an alarm condition in the controller.

- Put the float back in the HIGH position. Make sure that the controller is not in an alarm condition.

If the controller does not sense the alarm conditions simulated by these tests, look to see if the thresholds and alarms are correctly programmed in the system. Look to see if the float is in the correct position (refer to the applicable instruction above). A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

Hydrocarbon Sensor - Functional Test and Remove Contamination

IMPORTANT: It is recommended to only do the procedures below when it becomes necessary and only as a last alternative. These procedures can cause a decrease in the original electrical resistance of the polymer. If possible, speak with a certified OPW-FMS technician before you do these procedures.

NOTICE: **Do not use fuel (gasoline, diesel etc.) to test or clean the sensor!** Once the carbon/polymer material has touched liquid hydrocarbon, it is possible that the sensor will not return to its initial electrical resistance. This can have an unwanted effect on its operation. Replace the sensor if necessary. If you do not obey this instruction it can void your warranty.

Functional Test - Hydrocarbon Liquid Sensor of the Device

- Put the polymer fully into *Mineral Spirits* and wait approximately 10 minutes.
- Remove the sensor and let it hang to air dry for another 10 minutes.
- The test is satisfactory if an alarm condition or other event related to the hydrocarbon part of the sensor occurs. If the test results are unsatisfactory, replace the sensor.

Functional Test - Water Sensor of the Device

- Put the end of the sensor fully into *TAP water* for at least two (2) minutes.
- The test is satisfactory if an alarm condition or other event related to the water sensor of the device occurs.

Clean the Hydrocarbon Sensor of the Device

- Make sure the sensor is disconnected.
- Put the contaminated portion of the sensor fully into *Denatured Alcohol* for one (1) hour.
- Flush the sensor with water to remove all remaining contamination.
- Let the sensor dry in the air for one (1) hour.
- Reconnect the sensor.

NOTE: If the sensor does not return to near its original resistance after you do a functional test or contamination has been removed, it is recommended to replace the sensor.

13.8 Dual Float Brine Sensors

Smart Sensor Equipped with Intellisense™ Technology

30-0232-D-10B (for Containment Sump) and 30-0232-D-20B (for Fiberglass Tanks)

Description

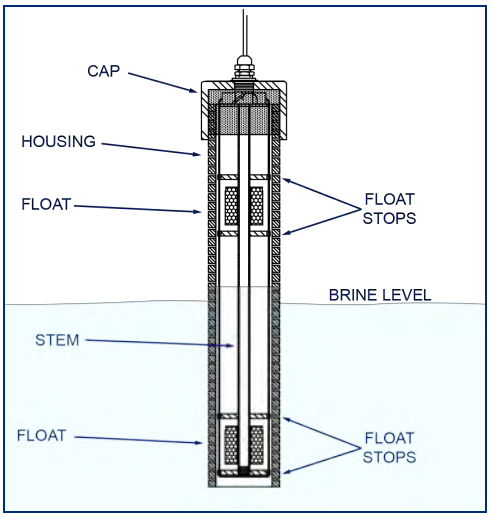
IMPORTANT: This float body is the same as the 30-0232-D-10 / D-20 and 30-0232-DH-10 / DH-20 (DH-XX has a carbon-polymer strip in the bottom). Look at the label to make sure you have the correct sensor for the applicable function.

The primary function of the Dual Float Brine Sensor is to sense liquid in the brine-filled reservoir of the interstitial area of a doubled-walled tank. Two (2) float switches are used in the body of the sensor to sense fluid level changes. The device will cause an alarm condition in the system if the fluid level increases or decreases more than the normal constant level in the middle between the upper and lower floats. If there is a break in the cable it will cause an alarm condition in the system.

Since this sensor is not made to sense hydrocarbons it does not use a carbon/polymer strip.

No Carbon/Polymer Strip

The bottom float of the brine sensor will stay in the up position in a normal condition. When the sensor is in an alarm condition, the upper float will be in a position to cause the alarm condition or the fluid level has decreased below the bottom float.



Cutaway View of Sensor Showing Internal Floats

Specifications	
Primary Use:	Measure the level of brine solution
Detects:	Low Liquid, High Liquid
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
D-10B Dimensions: D-20B Dimensions:	Diameter: 5.8 cm (2.3 in.), Length: 28.2 cm (11.1 in.) Diameter: 5.8 cm (2.3 in.), Length: 53.6 cm (21.1 in.)
Float Requirements:	Low: 3.8 cm (1.5 in.), High: 27.9 cm (11 in.)
Cable:	Belden #88760 or Alpha #55371 3.6 m (12 feet) of gas & oil resistant cable to the inline ISIM + 1.3 m (4 feet) ISIM tail
Maximum Wiring Length*:	305 m (1,000 ft.) field wiring
Alarm Threshold Configuration:	Fully Automatic
Diagnostic Reading on sensor setup:	**3 to 4** (normal), **12 to 13** (bottom float in alarm - bottom and top floats in the down position), **1 to 2** (upper float in alarm - top and bottom floats in the up position)
Multi-Drop Restriction	Maximum points per channel = 12 points 924B and DMP Probes = 4 points ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

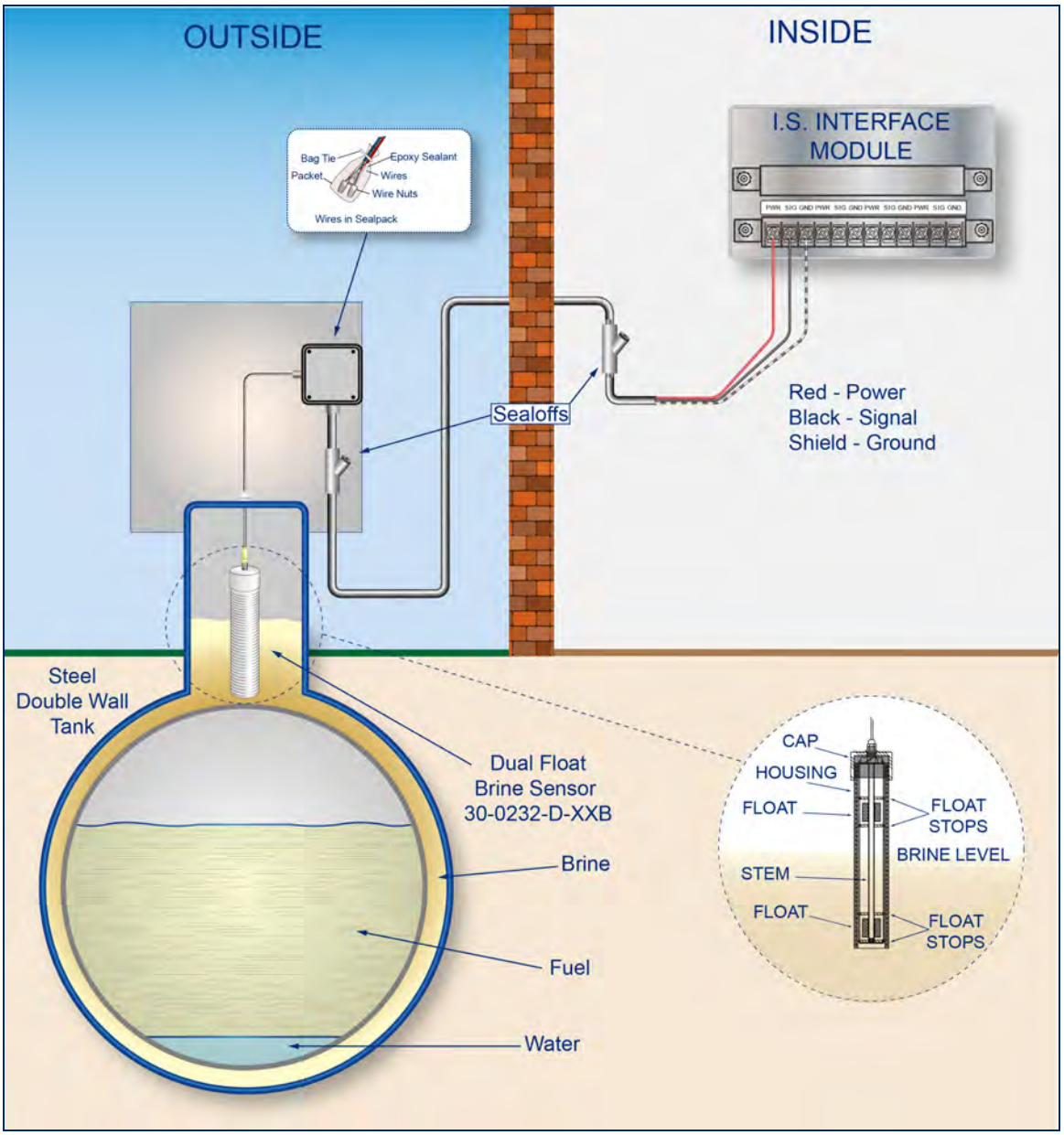
Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black (hydrocarbon sensor)	Signal
Shield (or 3rd conductor)	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Float Sensor Test

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

Sensor installed in an interstitial monitoring reservoir

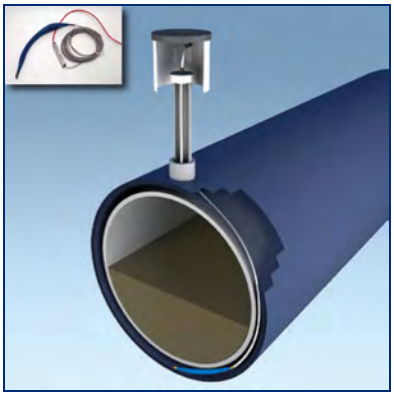
- Put the bottom float in the low position and the top float in the low position. This will cause a low-level alarm condition in the controller.
- Put the bottom float in the high position and the top float in the high position. This will cause a high-level alarm condition in the controller.
- Put the bottom float in the high position and the top float in the low position. Make sure that the controller is not in an alarm condition.

If the controller does not go into an alarm condition, look to see if the thresholds are correctly programmed in the system. Look to see if the float is in the correct position (refer to the applicable instruction above). A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

13.9 Interstitial Hydrocarbon Liquid Sensor with Water Indicator

Smart Sensor Equipped with Intellisense™ Technology

30-0234-HW-01



Description

The primary function of the Interstitial Hydrocarbon Liquid with Water Indicator Sensor is to sense liquid hydrocarbons and water in the interstitial area of a double-walled tank. The sensor has a carbon/polymer material that changes its resistance when it is touched by liquid hydrocarbons. The sensor also has a conductive strip to sense water. This lets the sensor tell the difference between hydrocarbon liquid and water. If there is a break in the cable it will cause an alarm condition in the system.

Specifications	
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
Dimensions:	Length: 35 cm (13.8 in.), Width: 2.5 cm (1.0 in.)
Nominal resistance (uncontaminated)	Less than 3,000 ohms per foot
Nominal resistance (contaminated)	More than 10,000 ohms
Cable:	Belden #88760 or Alpha #55371
Maximum Wiring Length*:	1,000’ (305 m) field wiring
Multi-Drop Restriction	Maximum points per channel = 12 points, 924B and DMP Probes = 4 points, ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield: = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

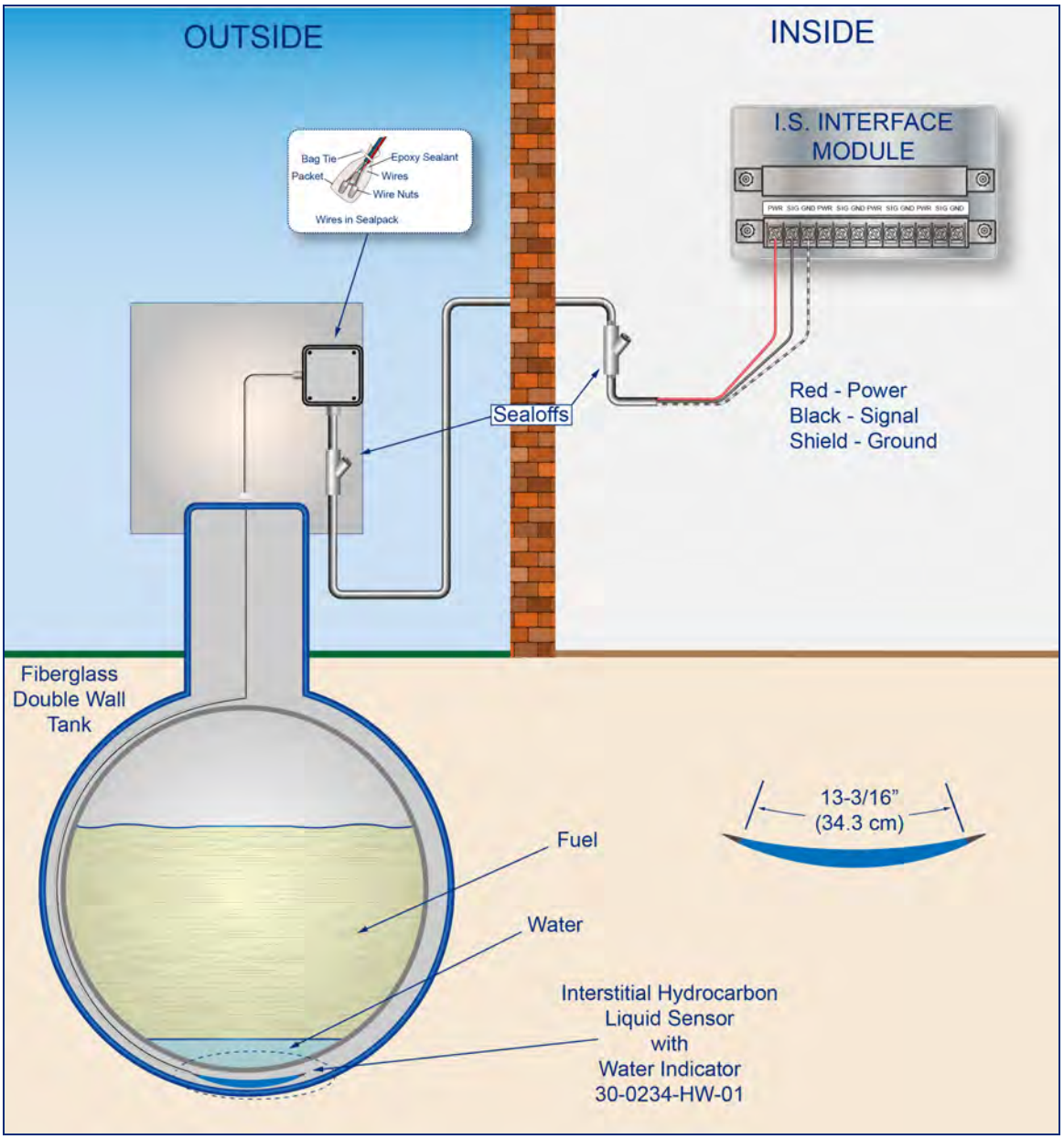
REMINDER: Hydrocarbons float on water. If the sensor is put fully in water, the polymer will not sense hydrocarbon liquid.

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black	Signal
Shield	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Interstitial Hydrocarbon Liquid Sensor with Water Indicator - Functional Test and Remove Contamination

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

NOTICE: **Do not use fuel (gasoline, diesel etc.) to test or clean the sensor!** Once the carbon/polymer material has touched liquid hydrocarbon, it is possible that the sensor will not return to its initial electrical resistance. This can have an unwanted effect on its operation. Replace the sensor if necessary. If you do not obey this instruction it can void your warranty.

Functional Test - Hydrocarbon Liquid Sensor of the Device

- Put the polymer fully into *Mineral Spirits* and wait approximately 10 minutes.
- Remove the sensor and let it hang to air dry for another 10 minutes.
- The test is satisfactory if an alarm condition or other event related to the hydrocarbon sensor of the device occurs. If the test results are unsatisfactory, replace the sensor.
- Disconnect the Hydrocarbon Sensor from the I.S. terminal strip in the controller. The test is satisfactory if an alarm condition occurs.
- Connect the sensor back to the I.S. terminal strip.
- Short across the power and signal terminals. This test is satisfactory if NO alarm condition occurs.

If the controller does not sense the alarm conditions simulated by these tests, look to see if the thresholds and alarms are correctly programmed in the system. A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

Functional Test - Water Sensor of the Device

- Put only the end of the sensor into *tap water*. The test is satisfactory if an alarm condition or other event related to the water sensor of the device occurs.
- Disconnect the Water Sensor from the I.S. terminal strip in the controller. The test is satisfactory if NO alarm condition occurs.
- Connect the sensor back to the I.S. terminal strip.
- Short across the power and signal terminals. This test is satisfactory if an alarm condition occurs.

If the controller does not sense the alarm conditions simulated by these tests, look to see if the thresholds and alarms are correctly programmed in the system. A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

Clean the Hydrocarbon Sensor of the Device

If it is necessary to clean hydrocarbon contamination from the sensor after a test or actual use:

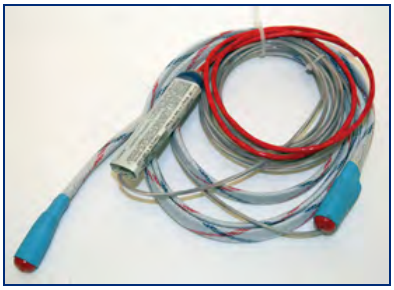
- Make sure the sensor is disconnected.
- Put the dirty part of the sensor fully into *denatured alcohol* for one (1) hour.
- Flush the sensor with water to remove all remaining contamination.
- Let the sensor dry in the air for one (1) hour.
- Reconnect the sensor.

NOTE: If the sensor does not return to near its original resistance after you do a functional test or contamination has been removed, it is recommended to replace the sensor.

13.10 Hydrocarbon Liquid Sensor with Water Indicator

Smart Sensor Equipped with Intellisense™ Technology

30-0234-HW-06, -15, -20



Description

The primary function of the Hydrocarbon Liquid Sensor with Water Indicator is to monitor wet wells with groundwater tables that can change levels. This sensor uses a carbon/polymer material that changes its resistance when it is touched by liquid hydrocarbons. The device also has a water sensor that has conductive material to sense water. This lets the device tell the difference between hydrocarbon liquid and water.

The sensor can tell the system if there is water in a containment area. It can also tell the system if there are fuel leaks in a containment area. If there is a break in the cable it will cause an alarm condition in the system.

Specifications	
Primary Use:	Monitoring Wells
Detects:	Liquid Hydrocarbons and Water
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
Dimensions:	Length: 6’ (1.9 m), 15’ (4.6 m) or 20’ (6.1 m) Diameter: 0.7” (1.8 cm)
Nominal resistance (uncontaminated)	Less than 3,000 ohms per foot
Nominal resistance (contaminated)	More than 30,000 ohms
Cable:	Belden #88760 or Alpha #55371
Maximum Wiring Length*:	1,000’ (305 m) field wiring
Multi-Drop Restriction	Maximum points per channel = 12 points, 924B and DMP Probes = 4 points, ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

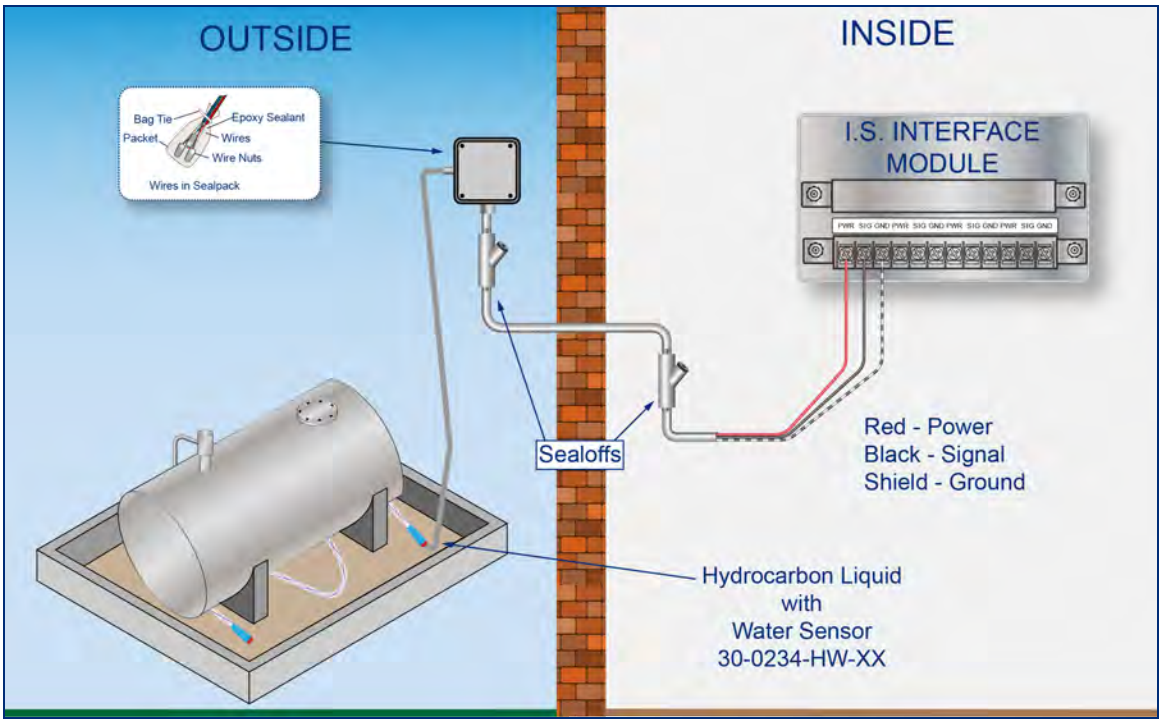
REMINDER: Hydrocarbons float on water. If the sensor is fully submerged in water, the polymer is unable to detect hydrocarbon liquid.

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black	Signal
Shield	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Hydrocarbon Liquid/Water Sensor - Functional Test and Remove Contamination

IMPORTANT: It is recommended to only do the procedures below when it becomes necessary and only as a last alternative. These procedures can cause a decrease in the original electrical resistance of the polymer. If possible, speak with a certified OPW-FMS technician before you do these procedures.

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

NOTICE: **Do not use fuel (gasoline, diesel etc.) to test or clean the sensor!** Once the carbon/polymer material has touched liquid hydrocarbon, it is possible that the sensor will not return to its initial electrical resistance. This can have an unwanted effect on its operation. Replace the sensor if necessary. If you do not obey this instruction it can void your warranty.

Functional Test - Hydrocarbon Liquid Sensor of the Device

- Put the polymer fully into *Mineral Spirits* and wait approximately 10 minutes.
- Remove the sensor and let it hang to air dry for another 10 minutes.
- The test is satisfactory if an alarm condition or other event related to the hydrocarbon sensor of the device occurs. If the test results are unsatisfactory, replace the sensor.
- Disconnect the Hydrocarbon Sensor from the I.S. terminal strip in the controller. The test is satisfactory if an alarm condition occurs.
- Connect the sensor back to the I.S. terminal strip.
- Short across the power and signal terminals. This test is satisfactory if NO alarm condition occurs.

If the controller does not sense the alarm conditions simulated by these tests, look to see if the thresholds and alarms are correctly programmed in the system. A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

Functional Test - Water Sensor of the Device

- Put only the end of the sensor into *tap water*. The test is satisfactory if an alarm condition or other event related to the water sensor of the device occurs.
- Disconnect the Water Sensor from the I.S. terminal strip in the controller. The test is satisfactory if NO alarm condition occurs.
- Connect the sensor back to the I.S. terminal strip.
- Short across the power and signal terminals. This test is satisfactory if an alarm condition occurs.

If the controller does not sense the alarm conditions simulated by these tests, look to see if the thresholds and alarms are correctly programmed in the system. A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

Clean the Hydrocarbon Sensor of the Device

If it is necessary to clean hydrocarbon contamination from the sensor after a test or actual use:

- Make sure the sensor is disconnected.
- Put the dirty part of the sensor fully into *denatured alcohol* for one (1) hour.
- Flush the sensor with water to remove all remaining contamination.
- Let the sensor dry in the air for one (1) hour.
- Reconnect the sensor.

NOTE: If the sensor does not return to near its original resistance after you do a functional test or contamination has been removed, it is recommended to replace the sensor.

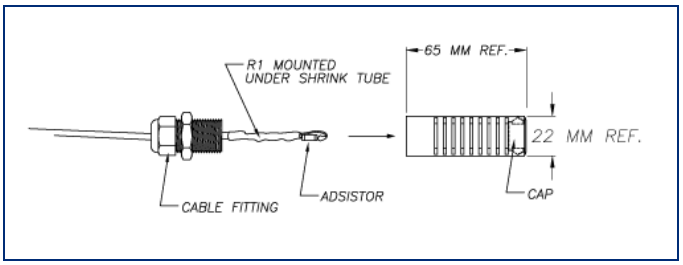
13.11 Hydrocarbon Vapor Sensor

Smart Sensor Equipped with Intellisense™ Technology

30-0235-V

Description

The primary function of the Hydrocarbon Vapor Sensor is to sense hydrocarbon vapors in monitoring wells and the interstitial areas of a double-walled tank. These vapors could indicate a possibly dangerous leak that could lead to safety and environmental problems. The sensor is made from a long-life resistive element that will increase in resistance when there are hydrocarbon vapors in the closed space where the device is installed. The sensor will return to normal resistance when hydrocarbon vapors are gone. If there is a break in the cable it will cause an alarm condition in the system.



Specifications	
Primary Use:	Monitoring wells
Alternate Use(s):	Interstitial areas of a double-walled tank
Detects:	Hydrocarbon vapor
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
Dimensions:	Length: 8.9 cm (3.5”), Diameter: 2.3 cm (0.9”)
Nominal resistance (uncontaminated)	Less than 5,000 ohms
Nominal resistance (contaminated)	More than 10,000 ohms
Cable:	Belden #88760 or Alpha #55371 3.6m (12 feet) of gas & oil resistant cable to the inline ISIM + 1.3m (4 feet) ISIM tail.
Maximum Wiring Length*:	305 m (1,000 ft.) field wiring
Alarm Threshold Configuration:	Fully Automatic
Diagnostic Reading on Sensor Setup:	0 to 1 (normal) above 5 (in-alarm)
Multi-Drop Restriction	Maximum points per channel = 12 points 924B and DMP Probes = 4 points ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

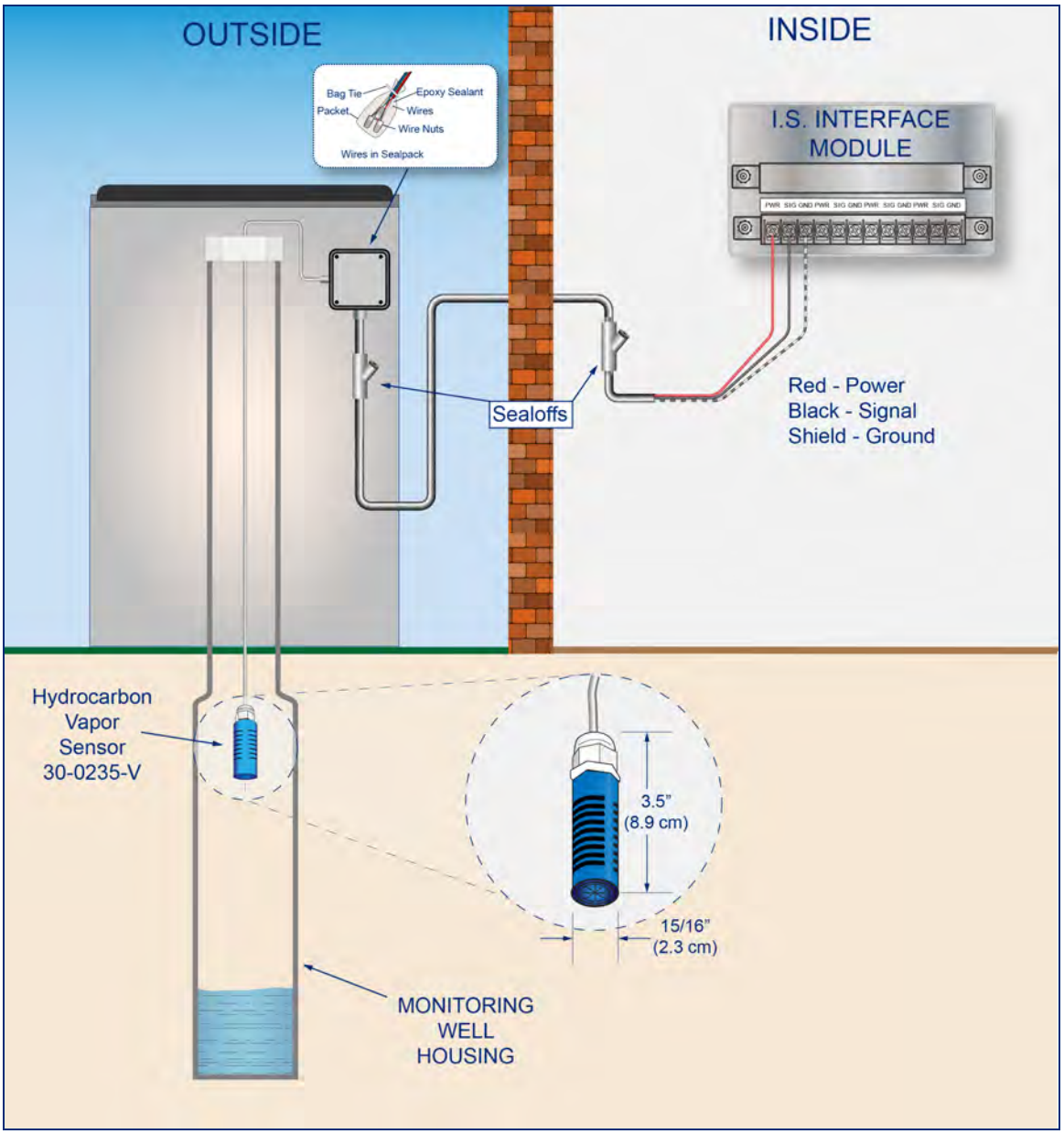
NOTE: The device will NOT sense hydrocarbon vapor if it is fully in water.

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Do a check to make sure there are no hydrocarbon vapors before you install this sensor in a Dry Monitoring Well.
- Install the sensor close to the top, above the water level, if applicable (if the sensor is under water it will not operate).
- Connect the sensor cable to the sensor.
- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black (hydrocarbon sensor)	Signal
Shield (or 3rd conductor)	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Test the Hydrocarbon Vapor Sensor

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

- Put the sensor in the air space of a container half full with Mineral Spirits.
- Wait approximately 10 minutes. The test is satisfactory if an alarm condition or other event occurs. If the test results are unsatisfactory, replace the sensor.

If the controller does not go into an alarm condition, look to see if the thresholds are correctly programmed in the system. A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

Clean the Hydrocarbon Vapor Sensor

- Put the sensor fully into Denatured Alcohol for one (1) hour.
- Remove the sensor and let it dry in the air for one (1) hour.
- Reconnect the sensor.

NOTE: If the sensor does not return to sufficient resistance, replace the sensor if necessary.

13.12 Discriminating Interstitial Sensor (Optical)

Smart Sensor Equipped with Intellisense™ Technology

30-0236-LW

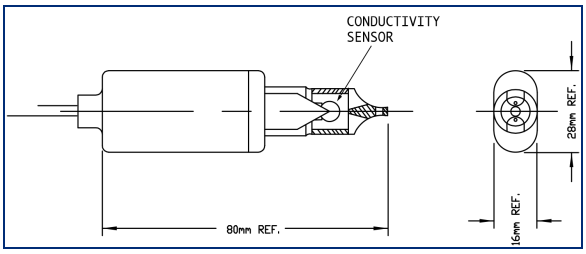
Description

The primary function of the Discriminating Interstitial Optical Liquid Sensor is to monitor the interstitial area of double-walled tanks. This sensor uses a long-life, solid-state optical prism. These sensors can also be used in sumps, fuel dispenser pans and other locations where there is liquid that could indicate that a leak has occurred.

The sensor can tell the difference between water and hydrocarbons and will cause an alarm condition when it senses a liquid. If there is a break in the cable it will cause an alarm condition in the system.

Specifications	
Primary Use:	Liquid detection in the interstitial space of double-walled tanks.
Alternate Use(s):	Fuel Dispenser Pans and STP Sumps
Detects:	Liquids: Hydrocarbon and Water
Operating Temperature:	-40°C to +70°C (-40°F to 158°F)
Dimensions:	0.7 inches (1.8cm) x 2.8 inches (7cm)
Nominal resistance (uncontaminated)	Less than 5,000 ohms
Nominal resistance (contaminated)	More than 30,000 ohms
Cable:	Belden #88760 or Alpha #55371 4.5 m (15 feet) of gas & oil resistant cable to the inline ISIM + 1.3 m (4 feet) ISIM tail
Maximum Wiring Length*:	305 m (1,000 ft.) field wiring
Alarm Threshold Configuration:	Fully Automatic
Diagnostic Reading on Sensor Setup:	**0.02 to 0.03 and 0.23 to 0.25** (normal), **0.02 to 0.03 and 0.02 to 0.03** (water alarm), **0.23 to 0.25 and 0.23 to 0.25** (hydrocarbon alarm)
Multi-Drop Restriction	Maximum points per channel = 12 points, 924B and DMP Probes = 4 points, ISIM Smart Sensors = 1 point Devices can be mixed in any combination to hold a maximum of 12 points on one channel
Connections:	Red = Power, Black = Signal, Shield = Ground

NOTE: *This is the maximum length of wire to be used to connect all sensors on one channel. This length includes the wire from the Barrier to each sensor board in the string.



30-0236-LW Dimensions

Installation

WARNING: Make sure you read and fully understand the warnings and information found in the **Hazardous Areas** section of your console's Installation Guide before you install or do the servicing of this sensor.

CAUTION: ALWAYS obey Local and National Electrical Codes applicable to the installation location.

Make sure that the cables (gas and oil resistant OPW Fuel Management Systems part # 12-1030) from the field wiring to the controller are in conduit that is dedicated to intrinsically safe wiring.

Use wire-nuts and epoxy-resin seal-packs for field connections (refer to M00-390008 Waterproof Electrical Connections for information).

- This sensor uses ONE Controller Interface I.S. Module position
- Start with the Connections table and “Typical Installation" drawing below.
- Measure the length of the circular space in the monitoring pipe from top to bottom and subtract 1.3 cm (0.5 in.) for a total measurement to be used for the sensor installation.
- Measure the calculated length from the sensor tip along the sensor cable and identify it with tape or a marker.
- Put the sensor and wire through the monitoring opening until the mark is level with the top of the opening.

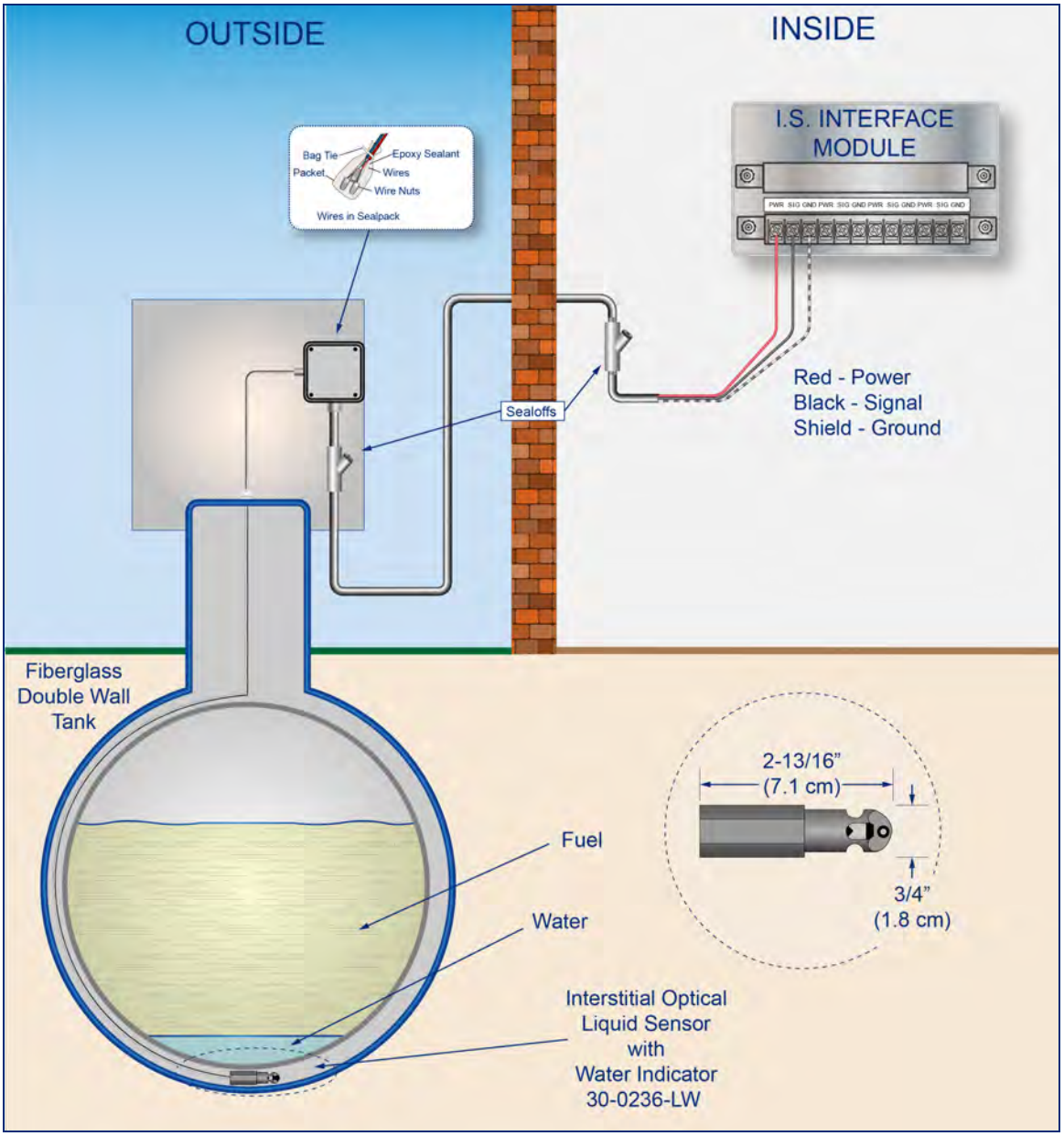
IMPORTANT: To prevent false alarms, the sensor must not touch the bottom of the monitoring tube

- Connect the sensor wires to the field wires in the junction box. Use the supplied cable gland and silicon wire nuts.
- Seal the electrical connections with the epoxy seal packs (refer to M00-390008 Waterproof Electrical Connections for instructions).
- Install explosion-resistant sealing fittings at both ends of the conduit. Refer to the **Probe-Cable Seal-offs** section of the console's Installation Guide for instructions.

Connections

Sensor Wire Color	12V Smart Sensor Interface Channel
Red	Power
Black (hydrocarbon sensor)	Signal
Shield (or 3rd conductor)	Ground

Typical Installation Drawing



Controller Setup

The sensor must be **Auto Detected** on the console. Refer to the M2051 MagLink LX4/LX Plus Cofiguration Manual, Admin Account > System Settings > Site Info for information for information about *auto-detection*. Alarm thresholds are configured automatically through the *Intellisense* mechanism between the sensor and the console.

Test the Optical Sensor

CAUTION: Use caution to prevent dangerous conditions when you do work in a hazardous area.

Make sure that the area has sufficient airflow when you do a test or remove contamination from the sensor. Make sure there are no open flames or hot surfaces near the work area.

IMPORTANT: Make sure to test the Optical Sensor in a dark area. The sensor's optical element is light sensitive. Light can cause the sensor to not test accurately.

Test the Water Sensor of the Device

- Put the sensor fully into water. The test is satisfactory if an alarm condition or other event related to the water part of the sensor occurs.
- Remove the sensor from the water. Make sure that the controller is not in an alarm condition.

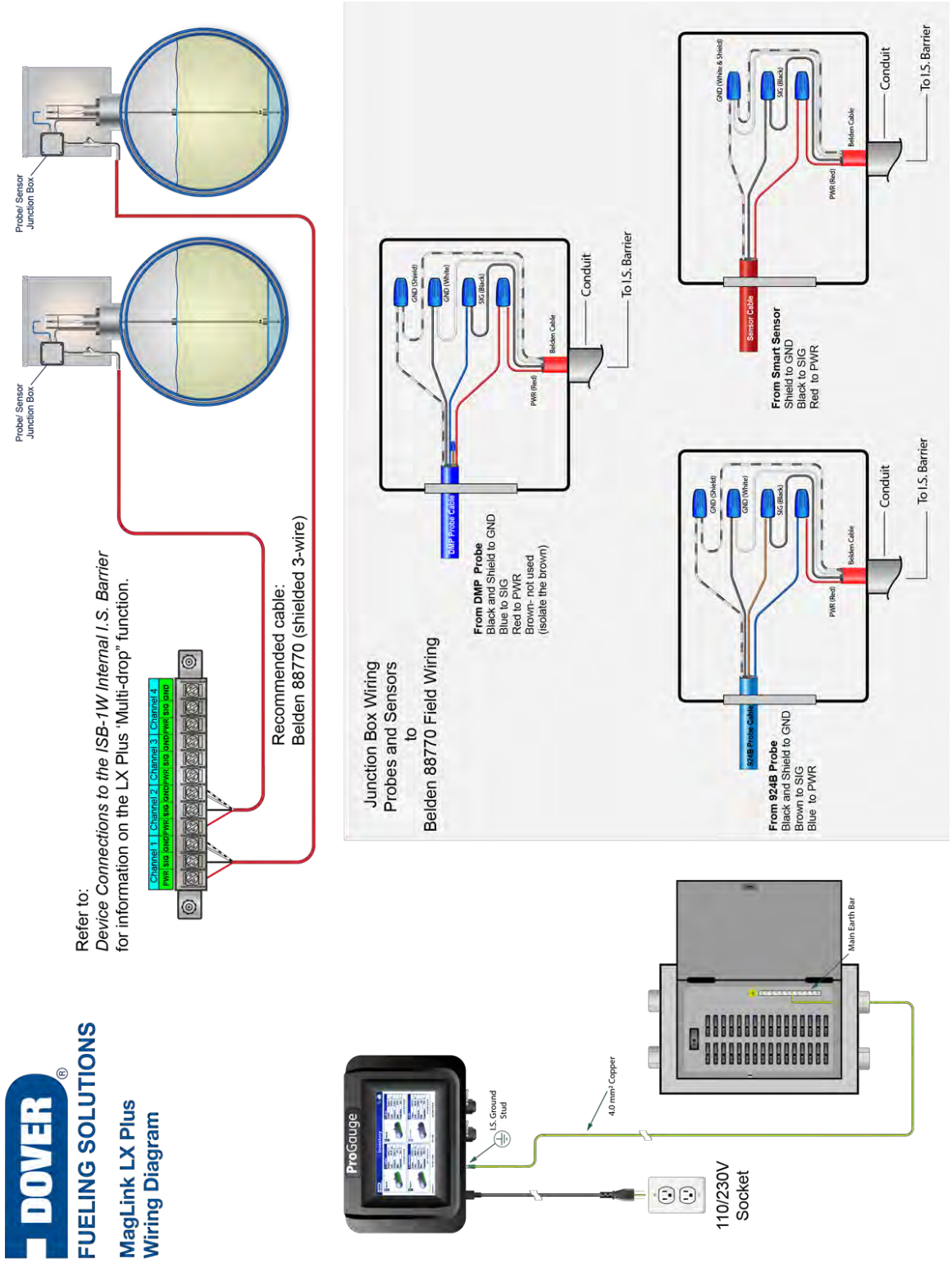
Test the Hydrocarbon Liquid Sensor of the Device

- Put the sensor fully into a non-conductive hydrocarbon (or equivalent) liquid. The test is satisfactory if an alarm condition or other event related to the hydrocarbon part of the sensor occurs. If the test results are unsatisfactory, replace the sensor.
- Remove the sensor from the hydrocarbon liquid. Make sure that the controller is not in an alarm condition.

If the controller does not go into an alarm condition, look to see if the thresholds are correctly programmed in the system. A sensor or wiring fault will cause a system alarm. Do a continuity test in the wiring and junction boxes. Make sure there is continuity with no short circuits.

TIP: This sensor can be cleaned with a dry cloth and put back into service again immediately.

Section 14 Probe and Sensor Wiring



Section 15 Close and Startup

Connect the ribbon cable.

Assemble the Front Panel of the console with the Rear Panel that was attached to the wall.

Install the three (3) cover screws.

Connect the power cord.

Energize the main electrical panel

Put the power switch of the console in the ON position.

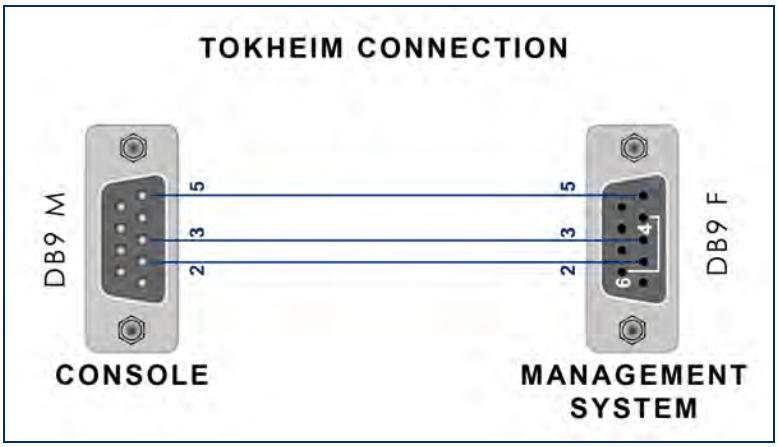
Section 16 Connections to Management Systems (POS-FCC)

The LX Plus console can be connected through the RS232 COM ports or through the TCP/IP port to management systems.These connections use a range of tank gauging protocols such as OPW PV4 and VR TLS350.

The RS232 schematics for different forecourt controllers (FCC) are shown below.

16.1 TOKHEIM FUEL POS / DIALOG

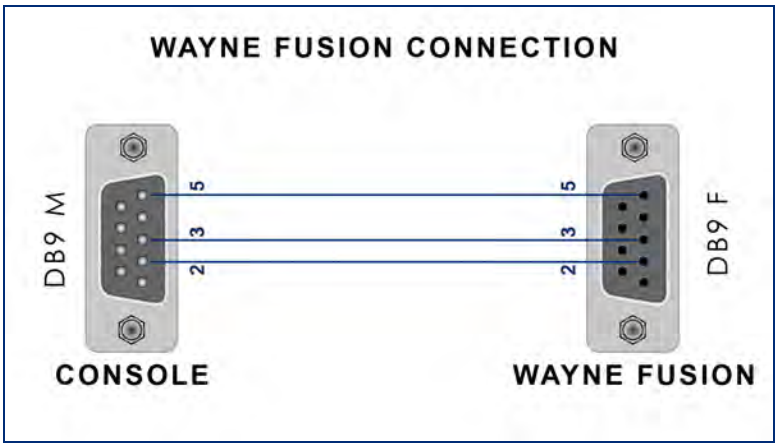
The illustration and table below show the connection for the FUELS POS / DIALOG Fuel management systems:



Console (DB9)	DIALOG System (DB9)
PIN 2	PIN 2
PIN 3	PIN 3
PIN 5	PIN 5
---	Connect PIN 4 with PIN 6

16.2 Wayne Fusion

The illustration and table below show the connection for the Wayne Fusion management system:

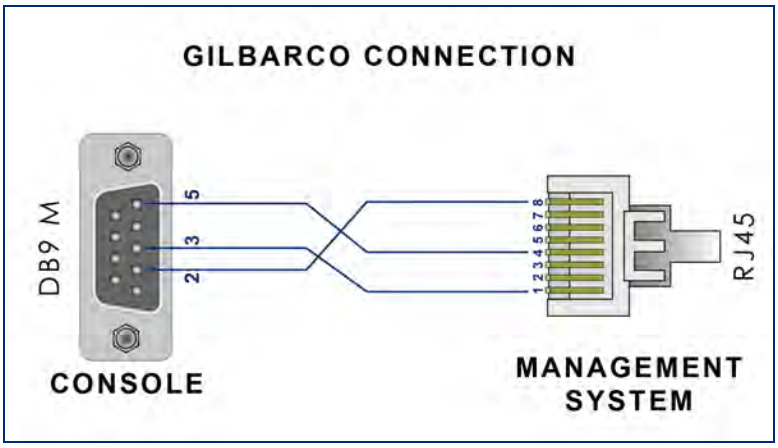


Console (DB9)	DRESSER (PIGNONE) System (DB9)
PIN 2	PIN 2
PIN 3	PIN 3
PIN 5	PIN 5

IMPORTANT: It is recommended to not have more than 15 meters for serial connections between the console and the management system through RS232.

16.2.1 GILBARCO Fuel Management System

The illustration and table below show the connection for the Gilbarco fuel management system:



Console (DB9)	GILBARCO System (RJ45)
PIN 2	PIN 8
PIN 3	PIN 1
PIN 5	PIN 4

Section 17 Maintenance

Refer to and obey the maintenance procedures as specified in ***EN 60079-17*** for maintenance and inspection in explosive atmospheres.

WARNING: It can be dangerous to open this console! Maintenance must only be done by approved personnel or the manufacturer of this unit.

Maintenance of electrical connections must only be done by approved and certified personnel (refer to this installation manual).

NOTICE: Changes to this console are not permitted unless they are approved by the manufacturer.

IMPORTANT: Do regular inspections to make sure the console is clean and that the condition of the console and its connections operate satisfactorily.

Do not use compressed air or liquid detergents to clean the touchscreen or the console. Clean the touchscreen and the outside of the console with a monitor/TV cleaning cloth.

Section 18 Technical Support

When you ask for technical support from DFS, it is recommended that you give direct access to the console over the internet through ports 3000 and 22. As an alternative, the console can be connected to a site computer and technical support can get access through a third-party program (such as TeamViewer). If technical support cannot get access to the console in one of these two methods, the user must supply technical support with the log files and the database backup of the console.

Refer to the "Utility" section of the M2051 LX 4 Configuration manual for for information on log files and the database backup in the console.

Appendix A - NWGLDE Certifications

Issue Date: October 21, 2022

Dover Fueling Solutions
MagLink LX
(Dover Fueling Solutions 924B probe with 2 inch dia Floats)

AUTOMATIC TANK GAUGING METHOD

Certification	Leak rate of 0.2 gph with PD = 99.70% and PFA = 0.30% Leak rate of 0.1 gph with PD = 95.56% and PFA = 4.41%.
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.
Applicability	Gasoline, diesel, aviation fuel, fuel oil #4, solvents, waste oil, other bio-diesel and ethanol blends compatible with probe floats
Tank Capacity	Maximum of 20,650 gallons. Tank must be minimum 14% full for leak rate of 0.2 gph. Tank must be minimum 15% full for leak rate of 0.1 gph.
Waiting Time	Minimum of 8 hours between delivery and testing for leak rate of 0.2 gph. Minimum of 12 hours between delivery and testing for leak rate of 0.1 gph. There must be no delivery during waiting time.
Test Period	Minimum collection time of 2 hours for leak rate of 0.2 gph. Minimum collection time of 4 hours for leak rate of 0.1 gph. Test data are acquired and recorded by system's computer. There must be no dispensing or delivery during test.
Temperature	Average for product is determined by a probe containing 5 thermistors.
Water Sensor	Minimum detectable water level that can be detected is 1.016 inch. Minimum detectable change in water level that can be detected is 0.0098 inch.
Calibration	Thermistors and probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.
Comments	Not evaluated using manifolded tank systems. Therefore, this certification is only applicable when there is a probe used in each tank and the siphon is broken during testing. Evaluated with 2" diameter OPW fuel floats and 2" diameter DMP water floats. Tests only portion of tank containing product. As product level is lowered, 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.

Dover Fueling Solutions
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200
E-Mail: atg@doverfs.com
URL: www.doverfuelingsolutions.com

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 09/15/2021; 9/21/2021

| Home | Vendors: A - F | Vendors: G - M | Vendors: N - S | Vendors: T - Z | Method Index | Glossary |

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. For full details, please refer to our expanded "DISCLAIMER" page.

Issue Date: October 21, 2022

Dover Fueling Solutions
MagLink LX
(Dover Fueling Solutions DMP probe with 2 inch dia Floats)

AUTOMATIC TANK GAUGING METHOD

Certification	Leak rate of 0.2 gph with PD = 97.49% and PFA = 2.51%. Leak rate of 0.1 gph with PD = 97.10% and PFA = 2.90%.
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.
Applicability	Gasoline, diesel, aviation fuel, fuel oil #4, solvents, waste oil, other bio-diesel and ethanol blends compatible with probe floats.
Tank Capacity	Maximum of 20,650 gallons. Tank must be minimum 14% full for leak rate of 0.2 gph. Tank must be minimum 15% full for leak rate of 0.1 gph.
Waiting Time	Minimum of 8 hours between delivery and testing for leak rate of 0.2 gph. Minimum of 12 hours between delivery and testing for leak rate of 0.1 gph. There must be no delivery during waiting time.
Test Period	Minimum collection time of 2 hours for leak rate of 0.2 gph. Minimum collection time of 4 hours for leak rate of 0.1 gph. Test data are acquired and recorded by system's computer. There must be no dispensing or delivery during test.
Temperature	Average for product is determined by a probe containing 5 thermistors.
Water Sensor	Minimum detectable water level that can be detected is 0.681 inch. Minimum detectable change in water level that can be detected is 0.0098 inch.
Calibration	Thermistors and probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.
Comments	Not evaluated using manifolded tank systems. Therefore, this certification is only applicable when there is a probe used in each tank and the siphon is broken during testing. Evaluated with 2" diameter OPW fuel floats and 2" diameter DMP water floats. Tests only portion of tank containing product. As product level is lowered, 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.

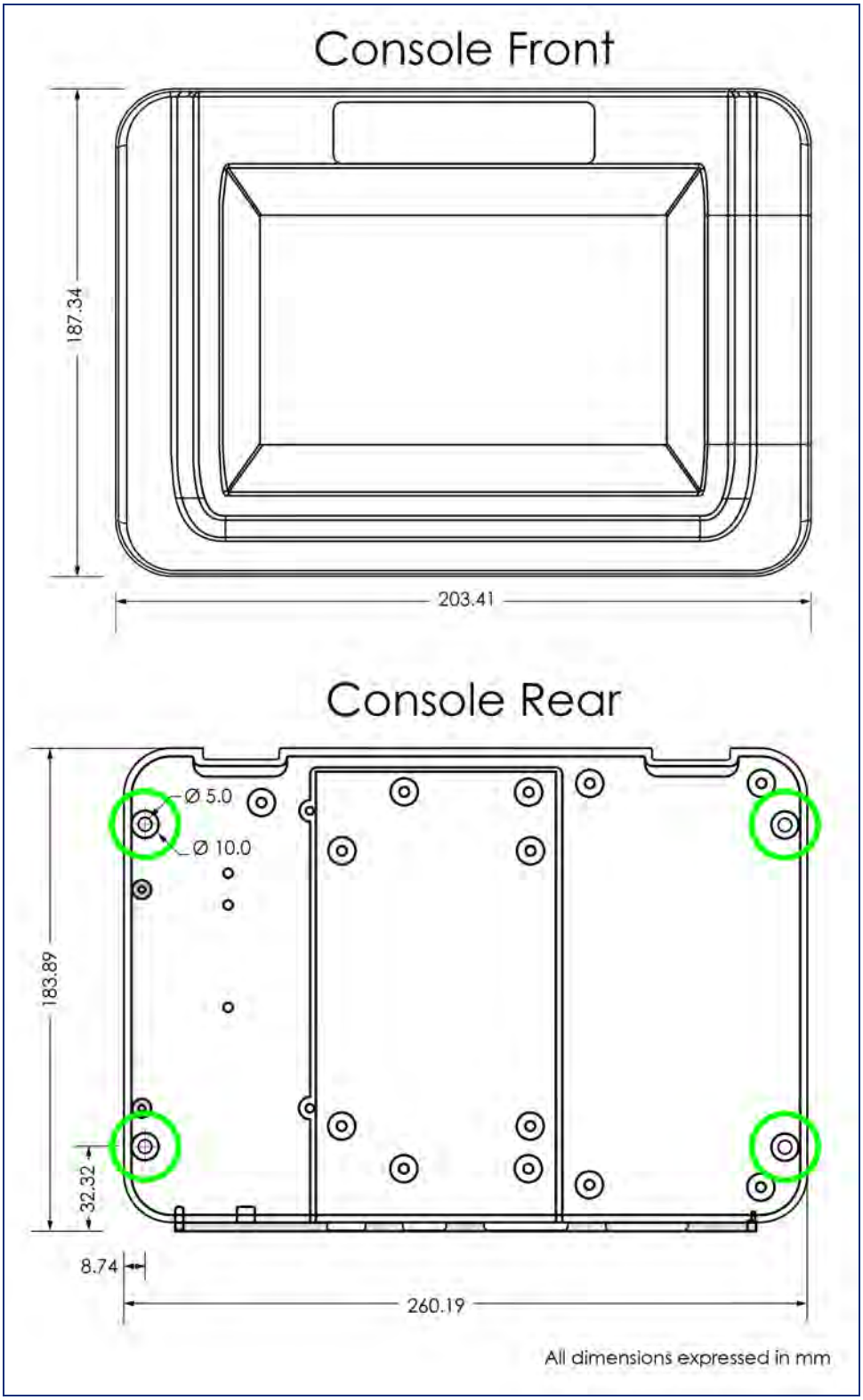
Dover Fueling Solutions
6900 Santa Fe Dr.
Hodgkins, IL 60525-9809
Tel: (708) 485-4200
E-Mail: atg@doverfs.com
URL: www.doverfuelingsolutions.com

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 09/15/2021; 9/21/2021

| Home | Vendors: A - F | Vendors: G - M | Vendors: N - S | Vendors: T - Z | Method Index | Glossary |

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. For full details, please refer to our expanded "DISCLAIMER" page.

Appendix B - Console Dimensions



Revisions-M2050-PLUS

Revision #	ECO	Effective	Software Version	Key Changes
0	TBD	TBD		Initial Release

NOTE: It is possible that older software versions might not support all features

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INNOVATIVE SOLUTIONS FUELING BUSINESS SUCCESS WORLDWIDE

Dover Fueling Solutions Global Locations

Corporate Headquarters
3814 Jarrett Way
Austin, Texas 78728
United States
Phone: +1 512 388 8311
www.doverfuelingsolutions.com

North America
Richardson, TX, USA
Hodgkins, IL, USA
Perkasie, Pennsylvania, USA
Brighton, Ontario, CAN

Latin America
Rio de Janeiro, Brazil*

Europe
Dundee, UK*
Skelmersdale, UK
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Milan, IT
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Turnhout, BE
Malmö, SE
Krakow, PL

Asia Pacific
Guangzhou, CN*
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* Regional Headquarters

ProGauge

ProGauge MagLink LX 4 and LX Plus Configuration Manual

Part Number: - M2051

Revision: - 3

MagLink LX 4 and LX Plus

NOTE: Before you use this manual, make sure you have the most recent revision. Look at the revision of this document to make sure it agrees with the most current revision found at https://www.opwglobal.com/opw-fms/tech-support/manuals-how-to-videos/technical-manuals.
Download the latest revision if necessary.

FUELING SOLUTIONS

ProGauge is a part of Dover Fueling Solutions.

Contact

ProGauge

START ITALIANA S.r.l.
Via Natta 6

20823 Lentate Sul Seveso (MB)

Italy

Tel. +39 0362 1581465
Fax +39 0362 1581464

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Section 1 Preface

Start Italiana S.r.l. has made every effort possible to see that this document is complete, accurate and updated. With every revision of the console, the related information is added to the document. Start Italiana S.r.l. reserves the right to make unannounced improvements and/or changes in the product and/or associated programs. Start Italiana S.r.l. is not liable for damages of any kind, including those resulting in the document, including typographical errors.

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Section 2 General Warnings

Carefully read the instructions in this manual before you do the installation procedures.

Only approved persons are permitted to install this equipment and configure the console.

The manufacturer is not responsible for operations that are not included in this manual.

The manufacturer is not liable in regard to competent bodies for changes to the equipment and software that are not approved.

In case of failure or defect, refer directly to an authorized service provider or manufacturer.

The manufacturer is not liable for injury and/or damage to persons and/or property and/or pets caused by the failure to obey safety instructions.

All approved personnel must know all safety requirements in this manual, the configuration manual and the user manual.

Refer directly to an approved service provider or manufacturer for questions about the operation of the equipment.

IMPORTANT: You must read and obey all safety instructions in this manual before you use this equipment.

WARNING: Incorrect use of this equipment that does not agree with the instructions in this manual can cause a risk to safety.

WARNING: A minimum insulation thickness of 0.25 mm is necessary for all internal wiring of different intrinsically safe circuits.

A grounding conductor must be connected between the I.S. ground terminals of the Intrinsic safety barrier in the console and the power distribution panel. This connection must have a cross-sectional area of at least 4 mm2 for the added earth connection.

WARNING: Substitution of components can decrease intrinsic safety.

ADVESTISEMENT: La substitution des composants peut compromettre la sécurité intrinsèque

READ CAREFULLY: The control drawing shown in ILL. 14 shall be provided with all devices.

IMPORTANT: If a replacement power supply cable is necessary, use an applicable, approved ELBZ/7 type power cord. Do not use another type of power cable.

Section 3 Introduction

This manual was prepared in accordance with IEC 82079-1 standards. “Preparation of instructions for use - Structuring, content and presentation - Part 1: General principles and detailed requirements and according to the ATEX Directive 2014/34/EU concerning equipment and protective systems intended for use in potentially explosive atmospheres."

This manual gives all necessary information about the configuration of the MagLink LX 4/LX Plus console.

IMPORTANT: This manual must be used together with the related product manuals:

- M2050-EU MagLink LX 4 /LX Plus Installation Manual
- M2052-EU MagLink LX 4/LX Plus User Manual

You must install the console as shown in the M2050-EU MagLink LX 4 /LX Plus Installation Manual, configure the console as instructed in this manual and use the console in the field as shown in the M2052-EU MagLink LX 4/LX Plus User Manual.

WARNING: This device must not be discarded with household waste. This device is labeled in accordance with European Directive 2012/19/UE concerning used electrical and electronic appliances (waste electrical and electronic equipment – WEEE).

This guideline gives the methods for the return and recycling of used electronic devices as applicable throughout the EU. To return your used device, use the return and collection systems available to you.

The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 50°C or incinerate.

The table that follows lists reference data of the manufacturer:

Data	Description
Name	START ITALIANA S.r.l.
Address	Via Natta 6 20823 Lentate Sul Seveso, (MB) Italy
Telephone	+39 0362 1581465
Fax	+39 0362 1581464
Website	www.startitaliana.com
e-Mail	support@startitaliana.it

INFORMATION: The units of measurement contained in this manual refer to a specified selection by the user. Refer to "System" on page 20 for more information on how to set units of measure.

3.1 Safety Warnings

This manual contains many important Safety Alerts. There can be a risk of injury or damage to property if you do not obey these alerts. The panels below show the types of safety warnings that can be seen and how each is specified.

DANGER: Indicates an immediately hazardous condition that, if not prevented, will result in death or serious injury.

WARNING: Indicates a possibly hazardous condition that, if not prevented, could result in death or serious injury.

CAUTION: Indicates a possibly hazardous situation that, if not prevented, could result in minor or moderate injury.

NOTICE: Indicates important information not related to hazards. A condition that, if not prevented, can result in property damage.

SAFETY INSTRUCTIONS: Indicates instructions and procedures related to safety or gives the location of safety equipment

3.2 Information Panels

NOTE: This panel gives more information about an instruction or procedure.

IMPORTANT: This panel contains special information that is important and must be read and obeyed.

REMINDER: This panel shows information that has been given before in the manual that is important to show again.

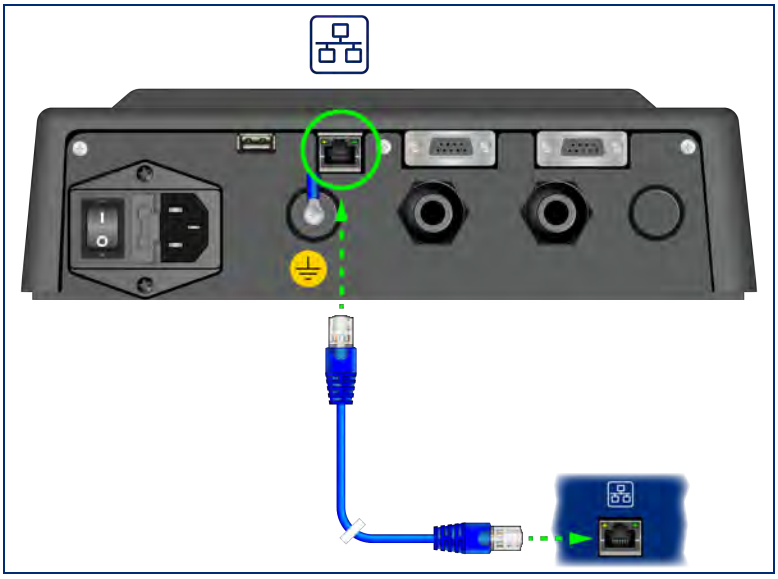
TIP: A step or procedure that is recommended to make another step or procedure easier.

INFORMATION: This panel shows references to more information in other sources.

Section 4 Direct Connection

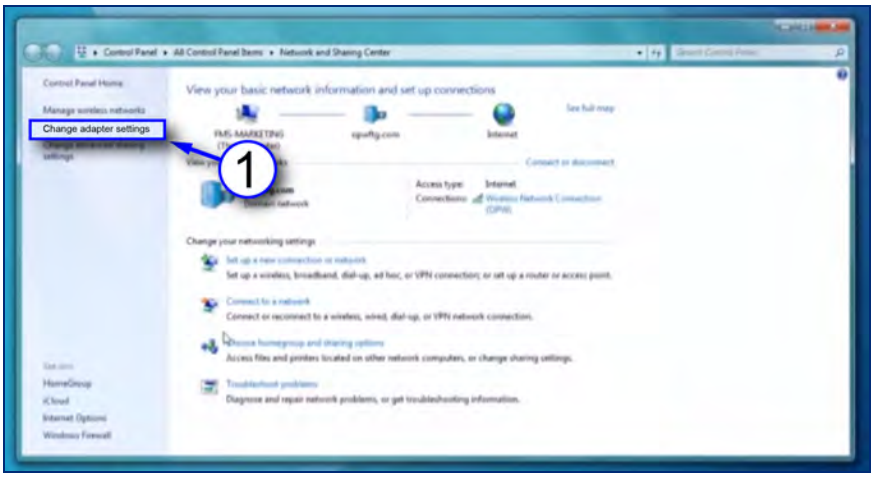
This section covers how to connect directly to the console using a standard RJ45 cable.

NOTE: If you have a connection problem with a standard RJ45, as an option, try an **RJ45 Crossover cable**.

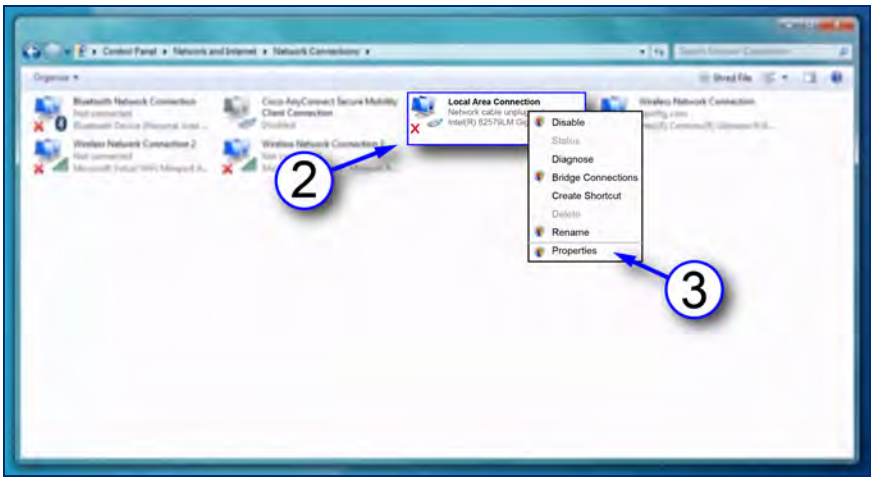


Connect an RJ45 cable from your laptop Ethernet port to the Ethernet port on the bottom panel of the console.

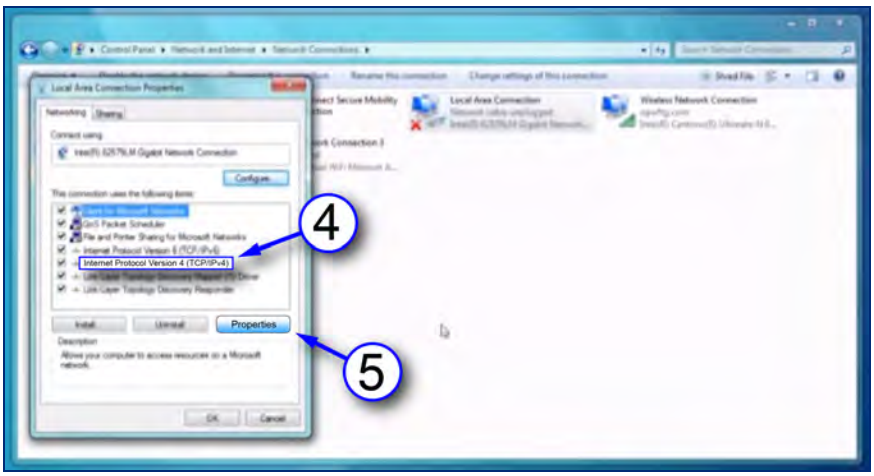
Navigate to Control Panel > All Control Panel Items > Network and Sharing Center on your laptop.



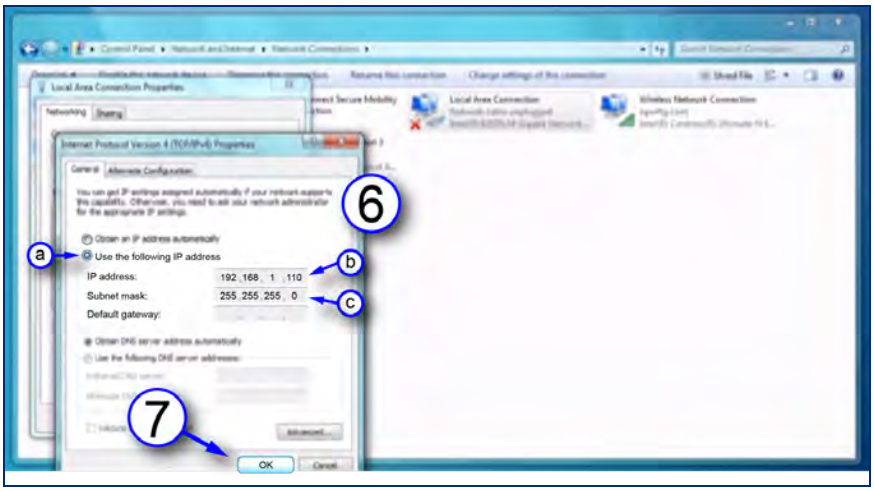
1. Click **Change adapter settings** in the left-side panel.



2. Right-click **Local Area Connections**.
3. Select **Properties** from the menu.



4. Select to highlight **Internet Protocol version 4 (IPv4)** on the list in the pop-up.
5. Click **Properties**.

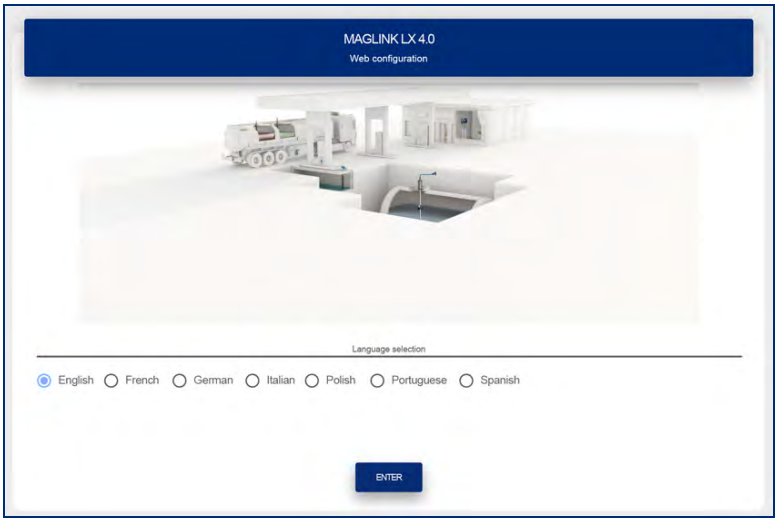


6. Set the **IP address**. The unit comes shipped from the factory with the IP address 10.90.10.92. Your laptop must be set one number higher or one number lower to connect to the console. The connection must be made on port 3000.
    a. Click the button next to **Use the following IP address**.
    b. Enter the IP address: **10.90.10.92.3000**.
    c. Enter the Subnet mask: **255.255.255.0**.
7. Click **OK**.

Your laptop is now set up to communicate directly with your MagLink LX 4 console. Enter the IP address into your browser to connect.

Section 5 Login Procedure

The Home Screen shown below will come into view after you enter the IP Address into your browser.

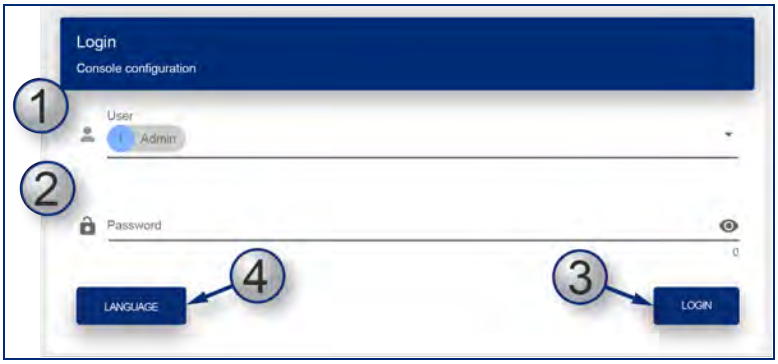


Under **Language selection**, select the radio button adjacent to the language that will be used for the configuration.

The table that follows shows the languages that can be selected:

English	French	German	Italian
Polish	Portuguese	Spanish	

Push the **Enter** button. The Login page will come into view.



1. Select a **User** type from the drop-down. There are three (3) types of Users:
   - **Guest**: Can only see Tank Status, Sensor Status and Reports (measures, deliveries, leakages, sudden loss). A Guest User cannot make changes to the configuration.
   - **Admin**: Has the same rights as Guest and can also make changes to the configuration.
   - **SuperAdmin**: This is for internal use only.
2. Enter the **Password**.

NOTE: The initial password for a Guest user is GUEST-LX4. The initial password for an Admin User is ADMIN-LX4. These passwords are case-sensitive.
Only an Admin user can change passwords.

IMPORTANT: The administrator must change the password as soon as possible to prevent access by personnel that are not approved. See "Change Password" on page 59 for information.

TIP: As you type your password only neutral "bullet" characters will show (e.g. • • • • • •). Select the "eye" icon 👁 to show the password characters as you type.

3. Push the LOGIN button to log in to the console with the selected user type.
4. If you did not select the applicable language in the Home screen you can push the LANGUAGE button to go back to the Home screen.

The table that follows shows the types of data that can be seen by the two User types:

Data Type	Guest	Admin
Inventory	X	X
Historical Data Table	X	X
Alarm status	X	X
Delivery/Leakage	X	X
Login	X	X
Logout	X	X
Association of alarm to relays (per tank)		X
Managing internal and external sensors		X
Automatic print features		X
Managing strapping tables		X
Configuring email address book		X
Configuration of all dispensers		X
TCP/IP address configuration, DNS		X
Utility operations (Backup/restore, Clean historical data: Historical readings, alarms, reconciliation, shift reports, Touch screen calibration of the console; Restarting the console, Restarting the operating system of the console)		X
Reconciliation (if enabled)		X
Shift report with scheduling		X
Sensors current status	X	X
Autocalibration Analysis		X

Section 6 Admin Account

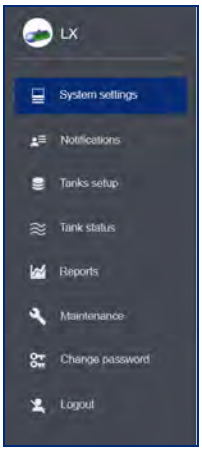
1. When an Admin User is logged in, the screen will show a *Main Menu* on the right side of the display.
2. When a **menu item** is selected, its related *tabs* will come into view along the top of the display (the selected menu item will be highlighted by a blue background).
3. When a **Tab** is selected in the *Tabs Bar* it is highlighted by a yellow line.
4. When an entry in a tab has a *character limit* it is shown as "number of characters entered / character limit" to the right of its entry line.
5. Each tab has a **SAVE** button that is used to save that tab's configuration data after it is entered.

IMPORTANT: Make sure you save the configuration data that you entered before you continue to another tab.

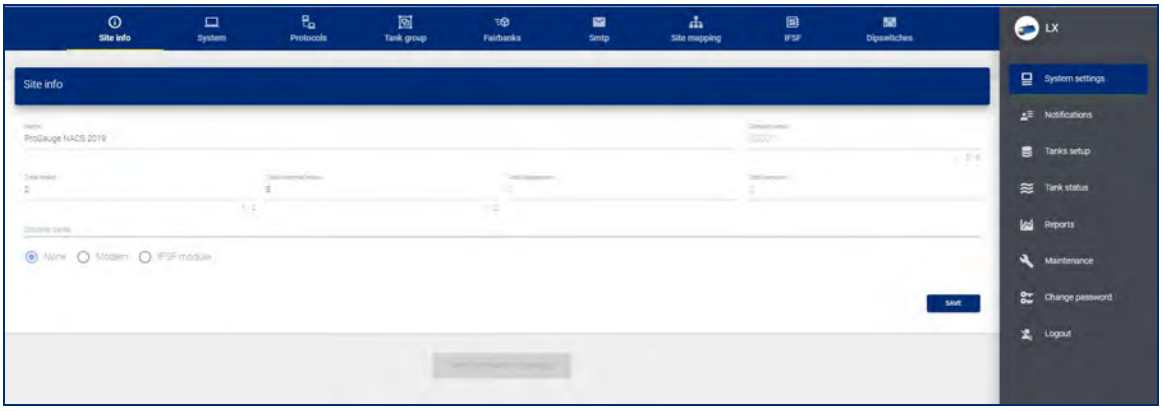
6. When all applicable tabs have been configured you can click the **APPLY SETTINGS TO CONSOLE** button to save all of the configuration data to the console.

TIP: It is recommended to start from the Site Info tab and complete all applicable fields. Then, continue to the next tab to the right and complete all applicable fields. Continue this procedure until you have completed all tabs.

6.1 System Settings



6.1.1 Site Info

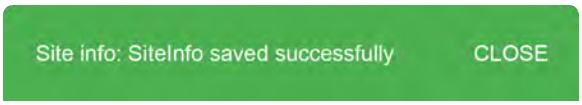


Enter the applicable information into the fields and make the correct selections as shown in the table that follows:

Field	Description
Name	The name of your site or station.*
Console serial	Enter your console's serial number. This field is read-only. Only a superuser can change it.
Total Tanks	This field shows the number of probes connected to the console. Enter 1-32*
Total external relays	This field shows the number of external output relays connected to the console. Enter 1-32*
Total dispensers	This *read-only* field shows the number of pumps configured for reconciliation/autocalibration.
Total sensors	This field shows the number of environmental sensors configured in the console.
Detect Button	**For model LX Plus only**. This will start an auto-detect for 924B probes, DMP 1-wire probes and Smart Sensors with the iSIM module. Devices found during auto-detection will show in the drop-down list.

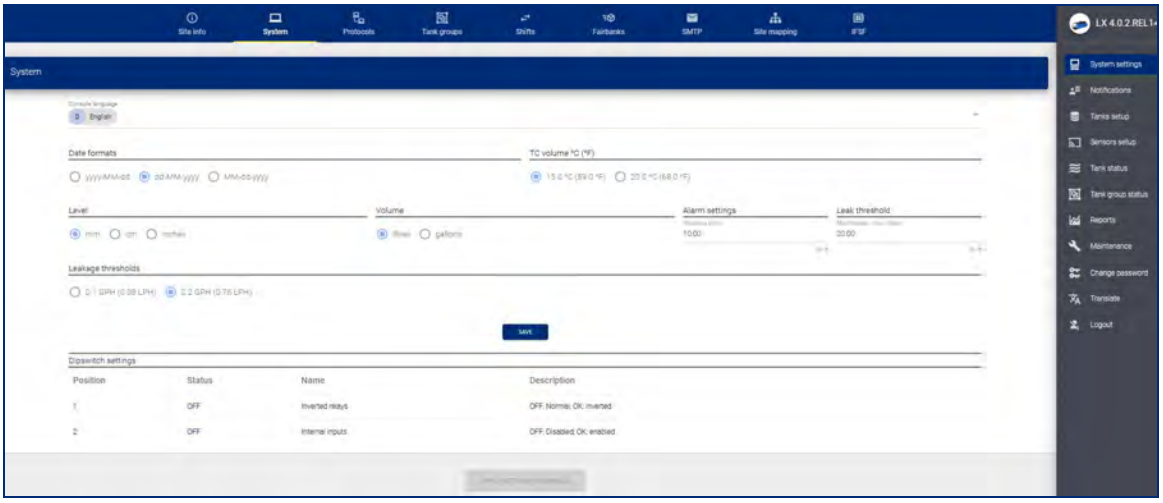
*Fields marked with an asterisk are mandatory.

Click **Save**. A confirmation message will come into view.

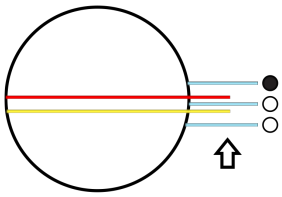
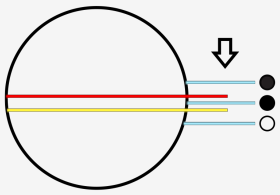


Select **CLOSE**.

6.1.2 System



NOTE: All fields have selections (but not Alarm settings/Tolerance & Leak threshold) with default values. Changes to level and/or volume unit and number of decimals can automatically change with the selection.

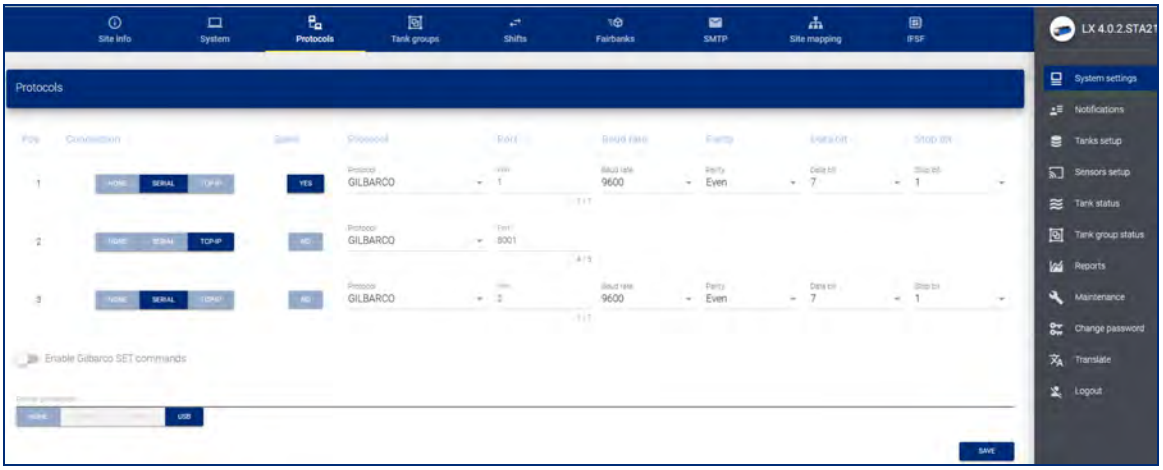
Field	Description
Console language	Select the language for the graphical user interface .
Date formats	Date format used in the console
TC vol (°C)	Select the temperature used for the temperature compensated volume calculations
Level	Measurement units of the product and water height
Volume	Measurement units of the product and water volume
Alarm Settings	The alarm hysteresis text box is used ONLY in when there is NO alarm. This is used when there is turbulence in the tank. This is important for relay management. In the examples below, Hysteresis is the value interval between the yellow and red lines. Recommended setting: 10 mm
	 STARTING FROM **NO** ALARM STATUS Relay 1 is linked to H_2O Alarm • $H_2O \leq H_2O$ Alarm Threshold - Hysteresis Value → Alarm OFF ○ • $H_2O \leq H_2O$ Alarm Threshold → Alarm OFF ○ • $H_2O > H_2O$ Alarm Threshold → Alarm ON ●
	 STARTING **FROM** ALARM STATUS Relay 1 is linked to H_2O Alarm • $H_2O > H_2O$ Alarm Threshold → Alarm ON ● • $H_2O > H_2O$ Alarm Threshold - Hysterisis Value AND $H_2O < H_2O$ Alarm Threshold → Alarm ON ● • $H_2O < H_2O$ Alarm Threshold - Hysterisis Value → Alarm OFF ○
Leak threshold (liters)	Used for the Dynamic Tank Leak Detection function*. Defines the maximum leak rate per hour that can be detected. A loss over that threshold will be considered as an unregistered sale and will abort the Dynamic Leak test. Recommended setting: 20 liters *Tank Leak Detection: The console automatically starts a tank leak test (refer to the US EPA procedure) when the tank is idle. The Leak Test can also be started manually from the Tank Status web page. The system must have 2 hrs of continuous idle time to do a 0.2 gph tank test and 3 hrs of idle time to do a 0.1 gph tank test. The tank must be filled to a 50% minimum and the last tank delivery must have occurred at least 6 hours before for the system to automatically start a test. A sale or a delivery will cause the tank test in progress to abort.

Field	Description
Leakage Thresholds	This is the threshold for the tank leak test

Click **Save** when you complete the *System* tab configuration.

The system will also show the status of the Dip-switches 1 & 2.

6.1.3 Protocols



This section specifies the protocol to use to communicate with a POS (point of sale) system or a FCC (forecourt controller system).

Field	Description
Connection	Select the type of connection: » **None**: If no device communicates with the console. » **Serial**: If a serial RS232 connection is made between the POS/FCC and the console. » **TCP/IP**: If a TCP-IP connection is made between the POS/FCC and the console.
Sales	Click **YES** if the POS/FCC will transmit the dispenser sales transactions to the console. The Gilbarco BCD protocol is supported for this function. Note, that only one connection at a time can support the sales transactions.
Protocol	Select one of the three: » **Gilbarco**: To permit the GVR TLS350 protocol commands. » **DOMS OPC**: To permit the DOMS OPC protocol commands. » **PV4**: To permit the OPW PV4 protocol commands.
Port	» If serial communication was selected above, select which serial port will be used (COM1 or COM2). » If TCP-IP communication was selected above, configure the TCP-IP port that to be used.
Baud rate / Parity / Data bits / Stop bits	Theses fields are in operation if serial communication has been selected. Configure the settings for the serial ports.
Enable Gilbarco Set Commands	Select this button for a range of GVR TLS350 set commands to be used.
Printer Connection	Select: » **None**: If no printer is connected » **USB**: If a printer is connected through the USB port. » **COM1/COM2**: If a printer is connected to the serial port (baud rate for the printer should be set to 9600 bps). Note that this is necessary for the fields to become available if the serial ports have not been configured for POS/FCC communication.

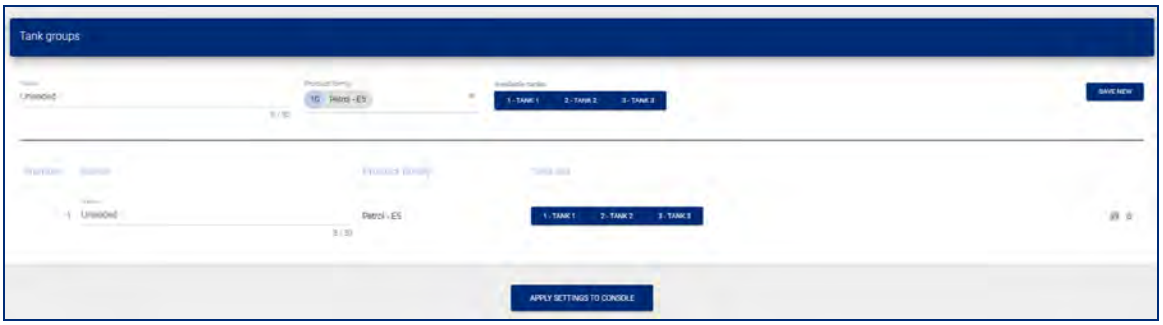
Click **Save** and **Apply settings to console** when you complete the *Protocols* tab configuration.

6.1.4 Tank Group

NOTE: The number of tanks are configured in the Site Info tab. Tank parameters are configured in Tanks setup from the Main Menu.

This tab is used to make Siphon (Manifold) groups.

IMPORTANT: Tanks in a Siphon (Manifold) group must contain the same product.

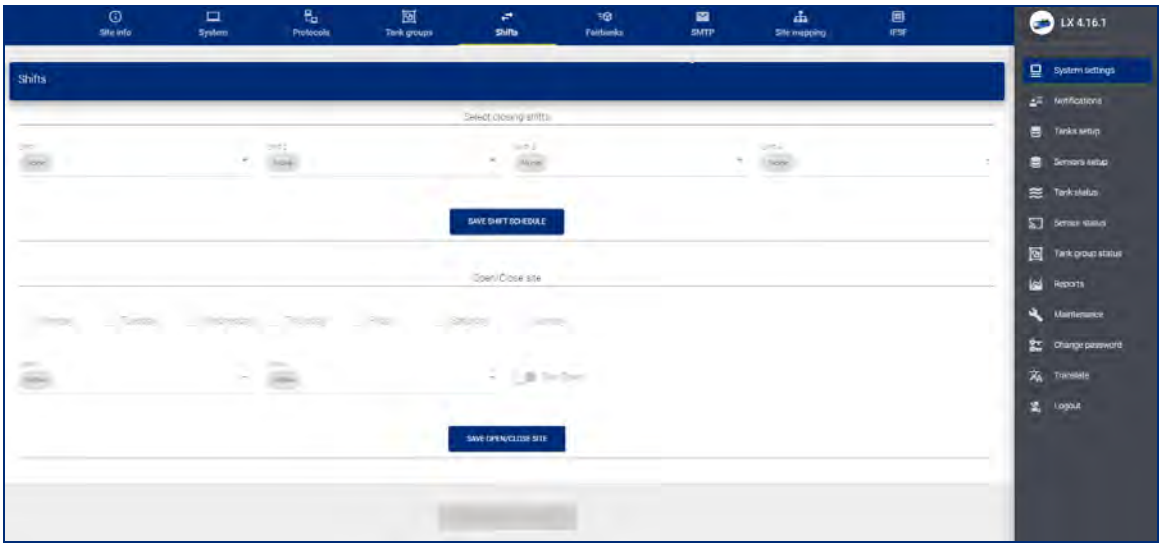


There are two (2) panels to configure in the "Tank Group" screen.

- In the top panel:
  - Enter a **Name** for the Tank Group.
  - Select a **Product Family** from the drop-down for this Tank Group. The tanks that contain the selected product family will automatically come into view under *Available Tanks*.
  - Click the **Save New** button.
- In the bottom panel:
  - Add the applicable tanks to the Tank Group
  - Click the **Save** icon on the right side of the panel.
  - Click **Apply settings to console** to complete the procedure.

To delete a group, click the **Delete** icon on the right side of the panel.

6.1.5 Shifts



The "Shifts" screen is used to configure shift reports. A shift report shows the tank contents at the beginning and end of the shift. The shift report is made in another menu.

Configure the **Closing Time** for up to four shifts (use the drop-down lists)

When complete, click the **Save Shift Schedule** button. Click **Apply Settings to Console** to complete the procedure.

Open/Close site: This will be applicable to future releases. This functionality has not been implemented at this time. This will be used to enter specified site open and close times. After the site close time, the tank can be monitored for a theft (sudden loss) event. This is applicable to tanks in Standard mode only.

6.1.6 Fairbanks

The console can send information to a Fairbanks server through FTP if applicable. This information includes:

- Inventory stock levels
- Deliveries
- Alarms
- Pump transactions (if connected to a POS/FCC that uses the Gilbarco BCD protocol).

Field	Description
Server	The IP address of the server that will receive the files (given by the server administrator).
Folder	The folder in the server where the files are to be sent, provided by the server administrator (optional, can be left blank)
User	User name provided by the server administrator
Password	Password provided by the server administrator
ID	Console identifier. If set to 0, the FTP transfer gets disabled.
Port	FTP port, provided by the server administrator
Interval	How often the console will attempt to establish connection to the server in order to send the files
Transfer mode	Active or Passive, info provided by the server administrator.
Enable SSL	Activate for SSL connections

Click **Save** when you complete the *Fairbanks* tab configuration.

6.1.7 SMTP

The console can send email notifications related to tank information, tank events and console events.

Configure the SMTP connection parameters in this page. Notifications and email recipients are configured under "Notifications Menu" on page 28.

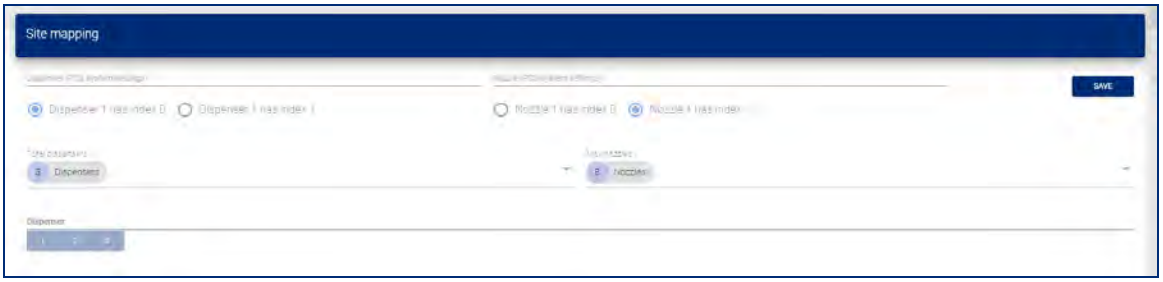
Field	Description
Server	The email server that handles the email functionality
Sender	Email of the sender
User	Username provided by the mail Server
Password	Password provided by the mail Server
Port	SMTP port, provided by the mail Server
Enable SSL	Activate it for SSL connections.

Use the TEST button to send a test email to a specified recipient.

REMINDER: The recipient must first be configured under "Contacts" on page 28.

Click **Save** when you complete the *SMTP* tab configuration.

6.1.8 Site Mapping (for Reconciliation/Autocalibration mode only)



A POS/FCC that uses the Gilbarco BCD Dispenser Interface Protocol must be used to communicate pump sales. Configure the tank-to-nozzle mapping on this tab.

Field	Description
Dispenser (POS system settings)	This field identifies the index of the first pump (refer to the Gilbarco BCD Dispenser Interface Protocol). Select Index 0 if the first pump in the POS/FCC is identified as Pump 0. Select Index 1 if the first pump in the POS/FCC is identified as Pump 1. The word “Pump” refers to the Fueling Position as shown in the Gilbarco BCD Dispenser Interface Protocol.
Nozzle (POS system settings)	This field identifies the index of the first nozzle of the pump (refer to the Gilbarco BCD Dispenser Interface Protocol). Select Index 0 if the first nozzle in the POS/FCC is identified as Nozzle 0. Select Index 1 if the first nozzle in the POS/FCC is identified as Nozzle 1. The word “Nozzle” refers to the Meter Identifier as shown in the Gilbarco BCD Dispenser Interface Protocol.
Total dispensers	Identifies the total number of pumps (Fueling Positions) that are connected to the tanks monitored by the console
Max nozzles	Identifies the maximum number of nozzles for each pump.

Click **Save** when you complete the top section of the *Site mapping* tab configuration.

6.1.8.1 Map Dispensers and Nozzles to Tanks

1. Select a **Dispenser**.
2. Map each **Nozzle** to a Tank.
3. The offset is the "meter drift" value of the dispenser (the meter drift is set during a pump calibration).
4. Use the swipe button to Enable the Nozzle to Tank mapping.

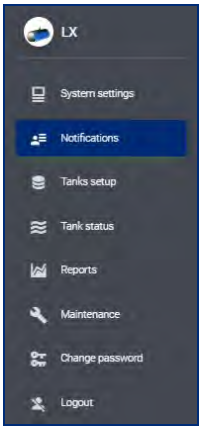
IMPORTANT: Nozzle-to-tank mapping must be done correctly or the console will communicate incorrect sales data for the tanks and the autocalibration / reconciliation function will not operate correctly.

NOTE: When manifolded tanks are in use, the first tank in the Manifold Group should be mapped to the related nozzles. The reconciliation reports and the delivery reports for the full manifold Group will be shown under the 1st tank.

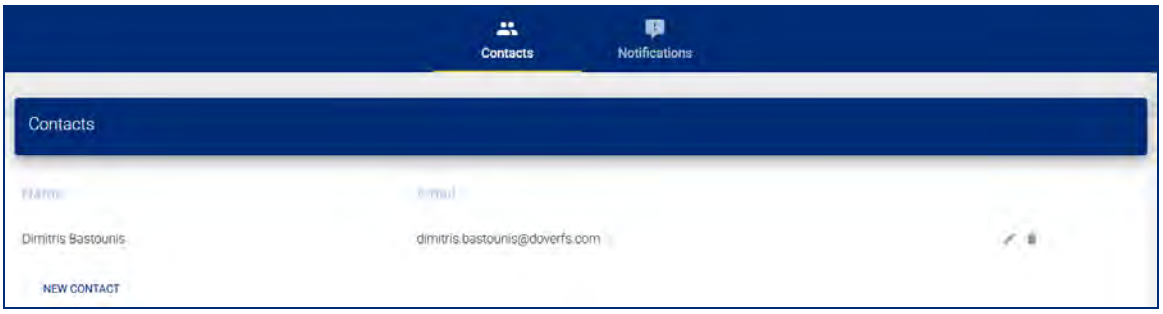
Autocalibration cannot be performed in a tank that is part of a Manifold Group.

Click the **Save Mapping** button at the bottom of the panel to save the configuration.

6.2 Notifications Menu



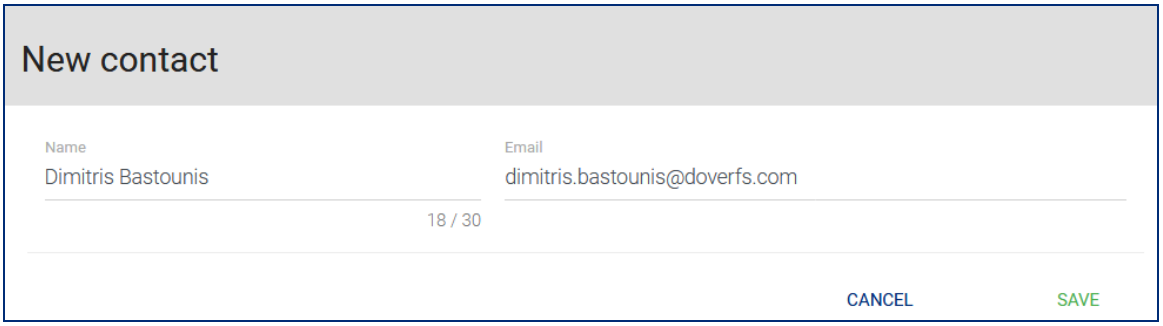
6.2.1 Contacts



When the contacts tab is selected, all contacts that have been entered can be seen.

Click the **Edit** icon to change information for a contact. Click the Delete icon to remove a contact.

Click **NEW CONTACT** to configure notification information for a new contact name. The New Contact window will come into view.



Complete the fields:

- Name
- Email: To receive notifications by email

Click **Save** when you complete the *New Contact* configuration.

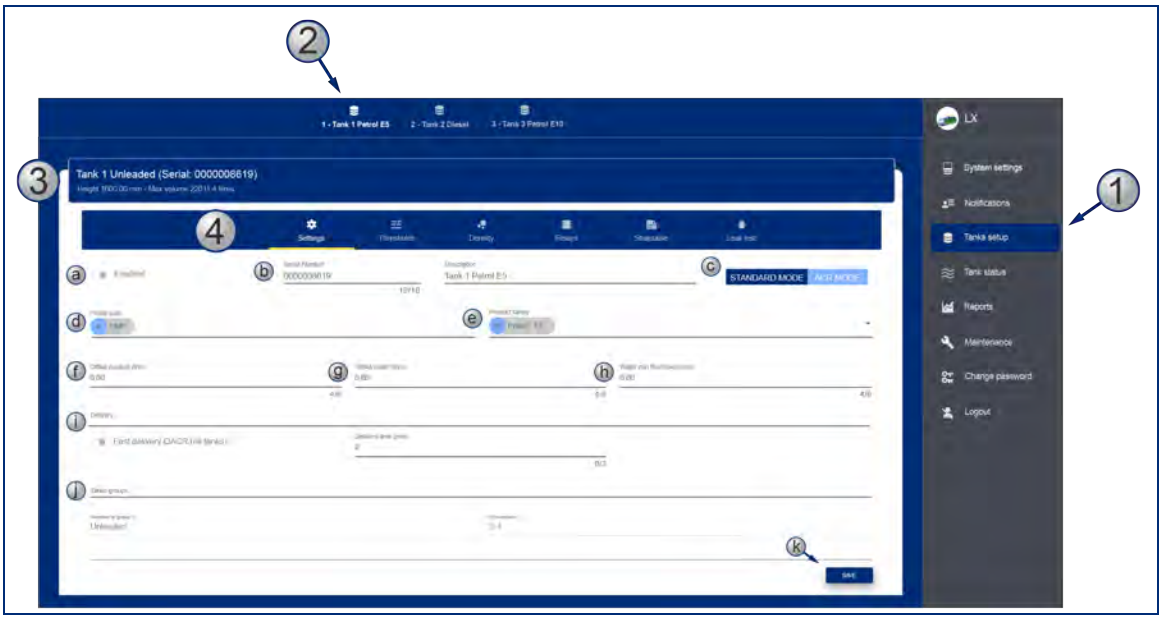
6.2.2 Notifications

Set up the contact name(s) and notification type for each of the Notification Events.

Field	Alarm Description
System alarm	Probe alarm, Strapping table alarm, Wrong offset alarm (mm<0), Out of Scale alarm
Tank alarm	High-high product, High product, Low product, Low-low product, Water
Delivery	End of delivery report
Leakage	Leakage detected
Stock	Inventory report
Shift	Shift report
Sudden loss	Sudden loss report (not applicable at this time)
Sensor	Sensor alarm

Click **Save** when you complete the *Notifications* tab configuration.

6.3 Tank Setup Menu



1. Select **Tank setup** from the Main Menu. The number of Tanks configured in "Site Info" on page 19 will show in the Tabs bar.
2. Select a Tank to configure.
3. An information bar below the tabs bar will show the **Height** and **Max Volume** of the selected tank. This is read-only data from the last line of the tank strapping table ("Straptable" on page 36).

6.3.1 Settings

NOTE: If the tank does not do autocalibration / reconciliation, then select the Standard mode button and configure as below.

4. The bar below the information bar shows the configuration parameter selections. **Settings** is the first selection.
    a. Move the **Enabled** swipe button to ON to let the application query the installed probe during the read cycle. A probe query does not occur if this button is OFF.
    b. Serial: This is the Probe address (if it is incorrect, there will be no reading).
    c. Select a button for Standard or ACR Mode (to turn on the ACR function).
    d. Select a **Probe type** from the drop-down:
        - DMP (DMP-SI-485 wired)
        - DMP AEF (DMP-SI probe with AEF)
        - DMP DENSITY (DMP-SI with density float)
        - DMP DENSITY & AEF FLOAT (DMP-SI with density float & AEF)
        - XMT/XSI (XMT-SMT / XMT-SI-485)
        - XMT/XSI AEF (XMT-SMT / XMT-SI-485)

- XMT/XSI AEF RF (XMT-SMT / XMT-SI-RF with AEF)
- XSI RF

e. Select the **product type** from the *Product family* drop-down.

f. **Offset product**: This value is used to calibrate the position of the product float. Possible value range: ±5000 mm (197 in).

g. **Offset water**: This value is used to calibrate the water float Possible value range: ±5000 mm (197 in).

h. **Water Min Float Level**: This is the threshold to set the water volume at zero and show the water level.

- If “Water level from probe + water offset” > Water Min Float level, the Water volume *and* Water level will be shown.
- If “Water level from probe + water offset” < Water Min Float level, the Water volume will not be shown but the Water level will be shown.

i. Move the **Fast delivery QACR**swipe button to ON to let the application turn on QACR Set the delivery time (in minutes).

j. The **Tank groups** show read-only information that identifies:

- The name of the tank group of which the selected tank is a member.
- A list of all of the tanks in the tank group.

k. Click **Save** when you complete the *Settings* configuration.

6.3.2 Thresholds

1. Select **Thresholds** from the configurations parameters. Use one of two methods to adjust each of the parameter values:

   a. Move the slider until you get the correct values.

i. The slider for **Safe working capacity** adjusts by ***%***. The Level and Volume values will adjust automatically.

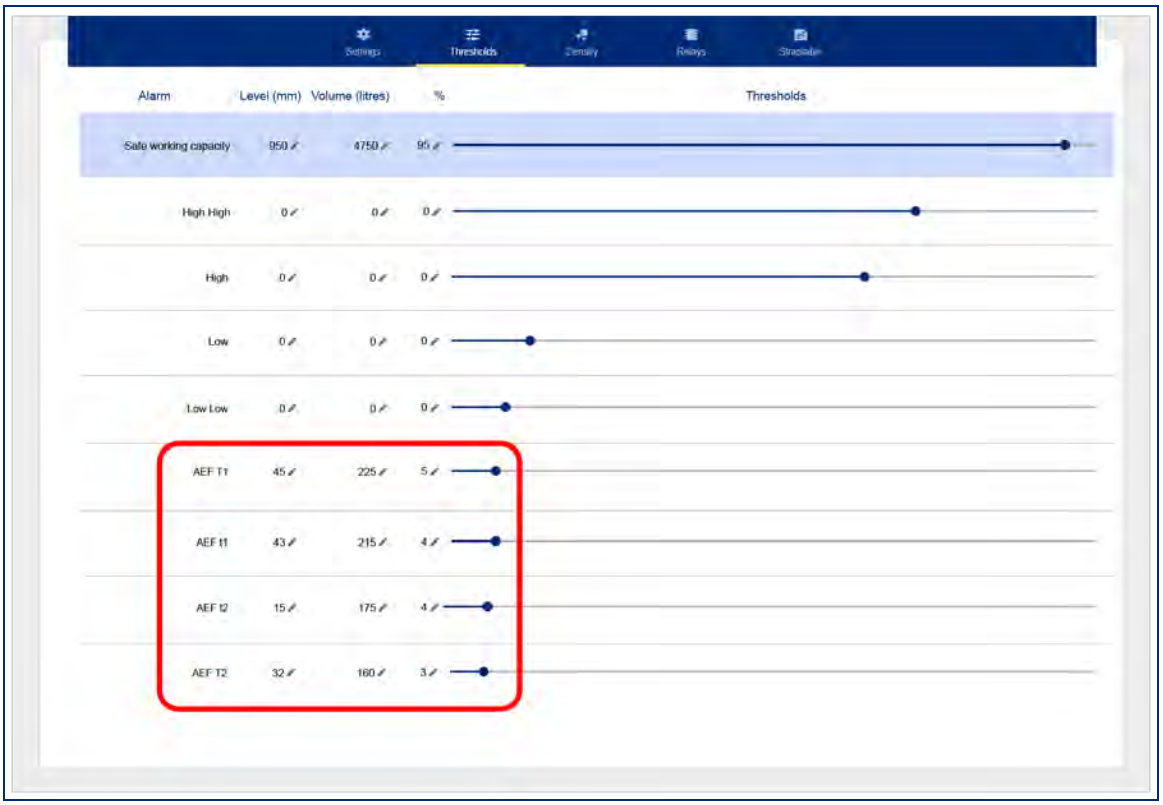
ii. The slider for all other parameters adjusts by ***Level***. The Volume and % values will adjust automatically.

b. Click the **Edit** icon for one of the values. Enter the correct value in the pop-up. Click **OK** to save the value. The other values for that parameter will adjust automatically.

2. Click **Save** when you complete the *Thresholds* configuration.

NOTE: From the top Threshold down, each of the Threshold value sets (Level, Volume and %) must be lower than the one above it. For example, the Low Threshold must have lower values than the High Threshold. If the values are not set correctly, the SAVE button will not be on.

6.3.3 AEF Thresholds



When an AEF is selected in the probe type, the thresholds screen will show four different AEF thresholds (see the example above).

- When the water indication from the AEF is below the T2 threshold, then the system thinks that the liquid in the bottom of the tank is gasoline and no alarm is triggered.
- If the water indication of the AEF increases over the t2 threshold, a possible phase separation of the ethanol has occurred at the bottom of the tank.
- If the water level is between the t2 and t1 threshold, an ETHANOL alarm will be triggered.
- If the water level of the AEF continues to increase over the T1 threshold, it is possible that only water has collected at the bottom of the tank. When this occurs, a WATER alarm will be triggered.

To configure the AEF thresholds, do the procedure that follows:

- Remove the probe from the tank. Put the probe flat on the ground. Move the AEF element to its lowest point.
- Read the water height shown on the console. This will be the T0 level.

NOTE: The water height will not be shown if the Delivery status is “In progress”. During a delivery, the AEF reading is discarded and alarms will not occur to avoid incorrect measurements.

- Adjust the AEF thresholds as shown below:

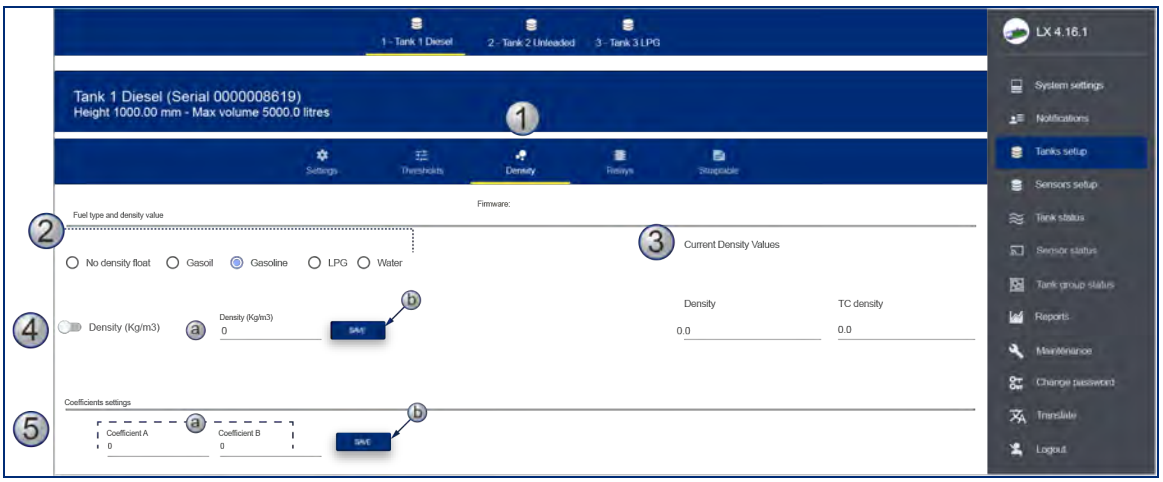
  T2 = T0 + 17

T2 = T0 + 20

T1 = T0 + 28

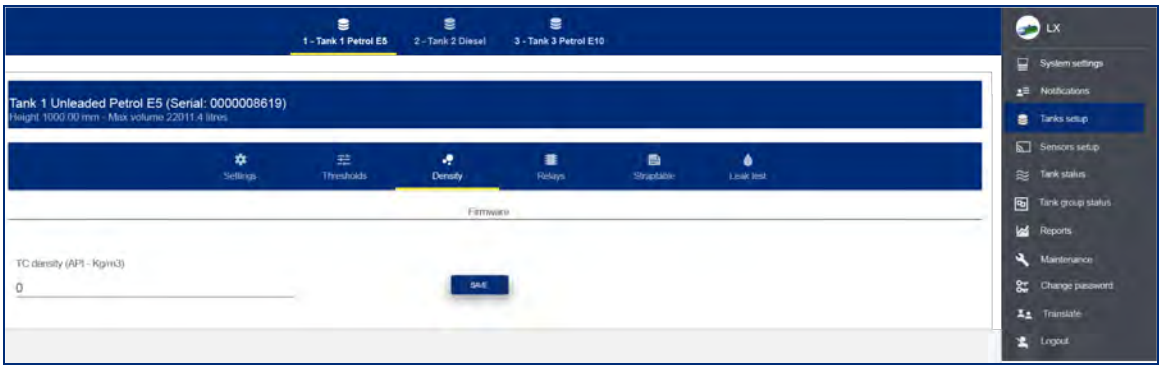
T1 = T0 + 30

6.3.4 Density



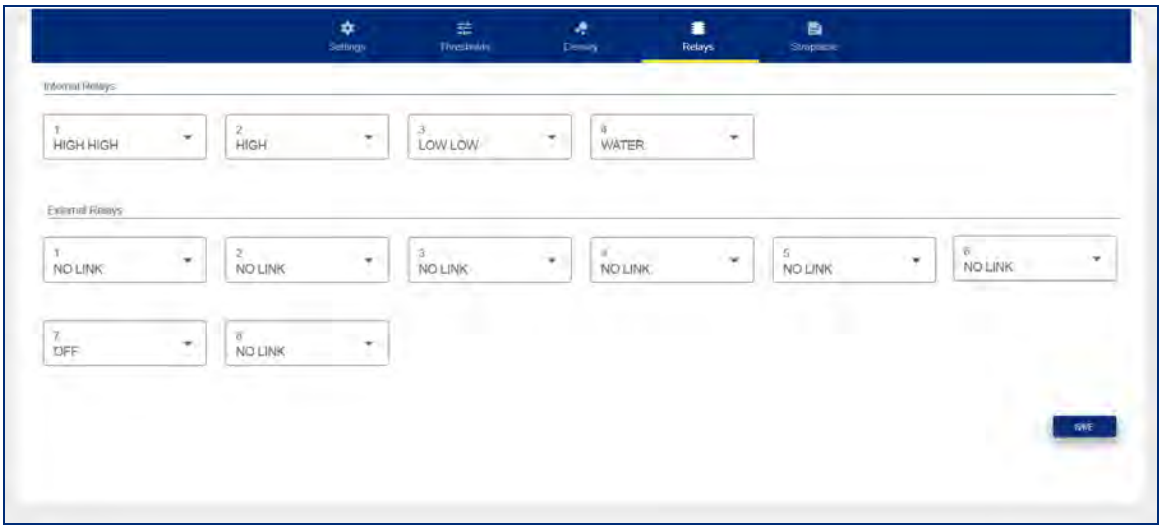
Configure a probe with an installed density float in this screen. The parameters that show in the illustration above are only available when the ***DMP Density*** Probe type is selected in "Tank Setup Menu" on page 30 > "Settings" on page 30.

1. Select **Density** from the configurations parameters.
2. Select the applicable **Fuel type**(product in the tank).
3. Current Density Values: The density values as read by the sensor.
   - Density: This is the density value at ambient temperature
   - TC density: This is the density value compensated at reference temperature.
4. Use the swipe button to select the density flag if applicable:
   a. Enter a **value** in the field to self-calibrate the sensor.
   b. Click **Save**.
5. The **Coefficients settings** are values that are given with the density sensor.
   a. Enter the Coefficient A (negative) and Coefficient B (positive) values in the fields.
   b. Click **Save** after you enter the values.



For all other probes types, enter the product density at the reference temperature. Values are permitted in API format or in Kg/m3 format.

6.3.5 Relays



The four internal relays of the console can be configured in this screen.

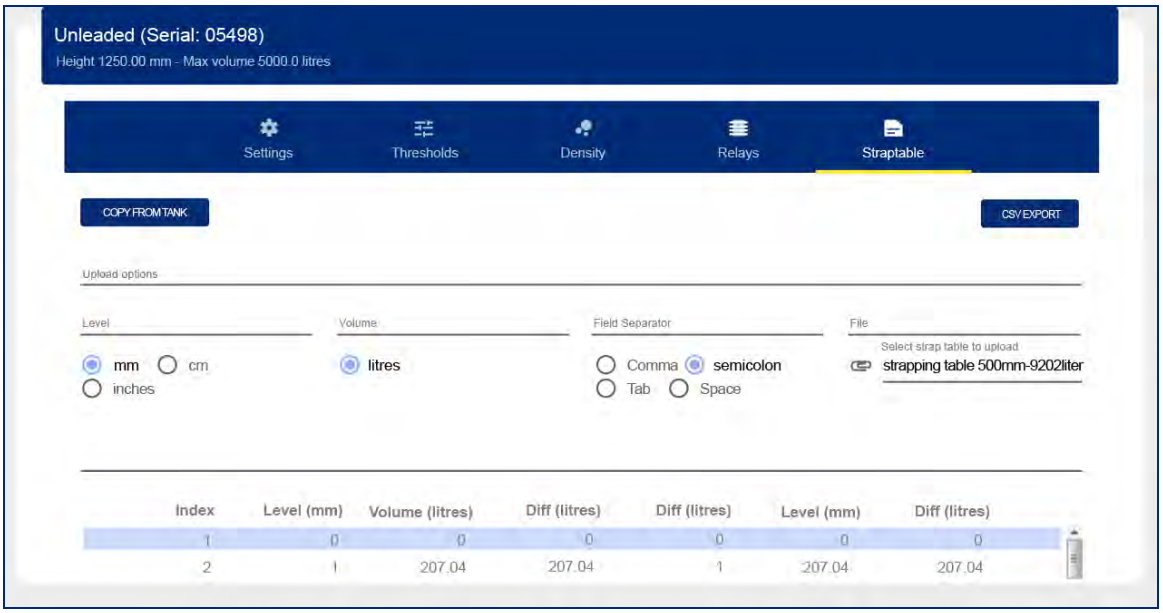
NOTE: The External Relays that show must first be set up in "Site Info" on page 19.

The available alarms/actions that can be linked to a relay:

- Disabled
- No Link
- High
- Leak
- Low
- Out of scale
- Probe
- Very high
- Very low
- Communication
- Water
- Ethanol
- Not Initialized

Click **Save** when you complete the *Relays* configuration.

6.3.6 Straptable



The Strapping table shows the related mm / litre value of the Tank Volume.

You can enter a Strapping table in one of two methods:

1. You can import a table form a csv or txt file. You must configure the import parameters:
    a. Level units
    b. Volume units
    c. The Field separator

IMPORTANT: The Field separator for a tank table/strapping chart from a 3D Laser MUST be set as a semicolon (;).

when using the tank table/strapping chart from the 3D Laser the field separator needs to be set as Semicolon.

Select a file from the attachment list

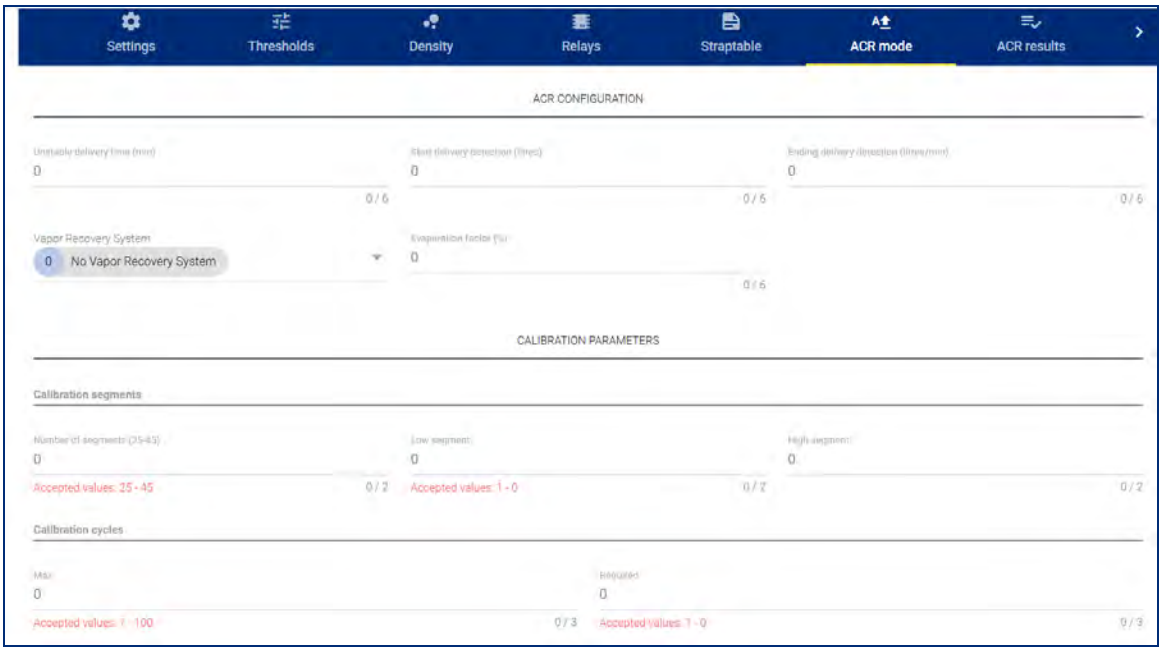
2. You can copy a strapping table from a different tank. Click the **Copy from tank** button and select an available strapping table from the list that comes into view.

When a strapping table upload is complete, the strapping points (Index) can be seen in the table at the bottom of the screen. Use the scroll bar to see more points

A selected strapping table can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

6.3.7 ACR mode

The menu in the image below will show when the tank is in ACR Mode.



6.3.7.1 ACR Configuration Parameters

- **Unstable delivery timer**: Enter the time necessary to let the product settle at the end of delivery.

  Turbulence can occur during and after a delivery. This can cause incorrect indications. Enter a time from 0 (disable) to 59 minutes. After this time a probe can be monitored as usual.

  The recommended value is five (5) minutes.

- **Start delivery detection**: This shows the minimum quantity of product increase necessary to start delivery detection. The recommended value is 100 liters.
- **End delivery detection**: This is the quantity (in gallons/liters) for each minute to show the end of delivery. The recommended value is 20 liters (5.25 gallons).
- **Vapor Recovery system**:
- **Evaporation factor (%)**: This is used only when ACR tank mode is selected to calculate evaporation loss as a percentage of unit volume. For diesel products enter “0,” for unleaded products enter “0.17.”

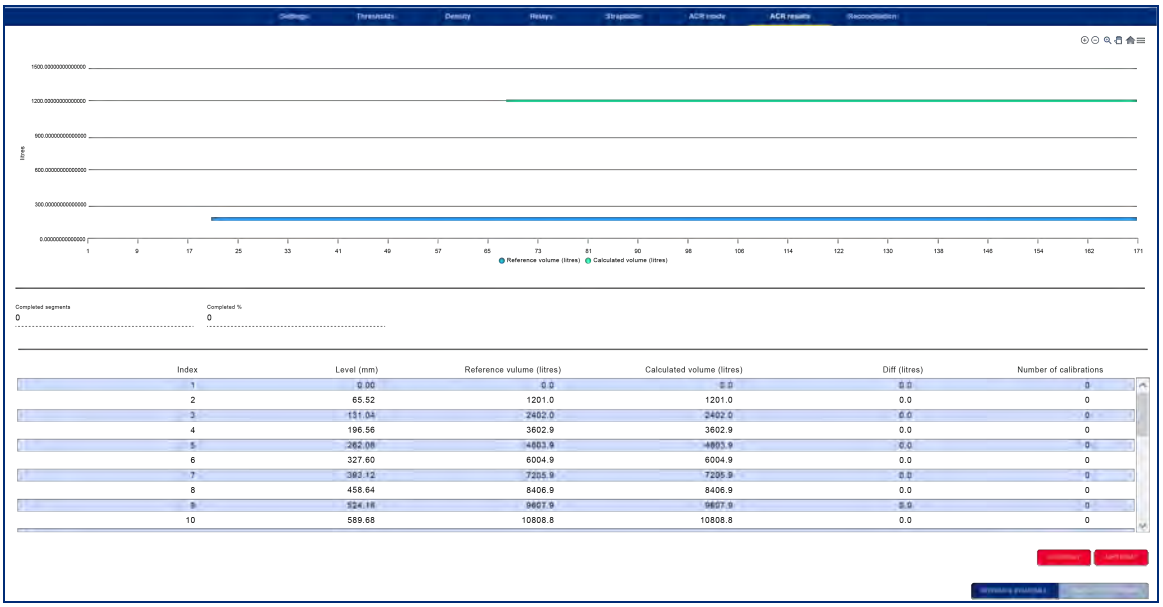
6.3.7.2 Calibration Parameters

- **Number of segments**: The tank is divided into a specified number of segments for Autocalibration. The permitted range is 25-45 segments. The higher number of segments selected, the more precision in the Autocalibration. This would also increase the time to complete Autocalibration.
- **Low segment**: This shows the lowest segment of the calibration range.
- **High segment**: This shows the top segment of the calibration range.
- **Calibration cycles max**: This is the maximum calibration cycles value parameter. This sets the number of auto calibration cycles in which the segments will not be changed if the auto calibration process is not complete. the minimum value is 5 and the maximum is 10.
- **Calibration cycles required**: This value specifies the Autocalibration status percentage (%).

  When each segment of the specified auto calibration volume range is at this value, Autocalibration is complete. Because there can be segments in an Autocalibration cycle that are not changed, some

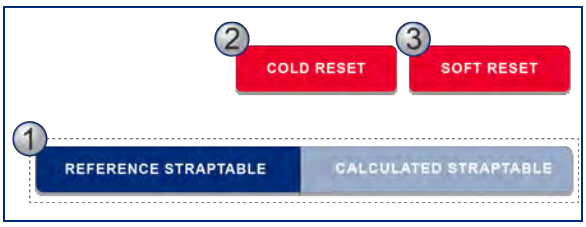
segments can be changed more than the required value.

6.3.8 ACR Results



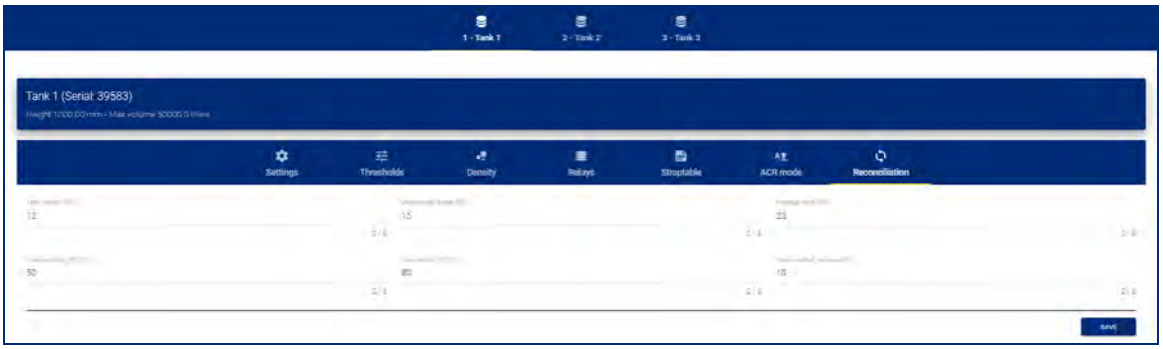
Index	Level (mm)	Reference vulume (litres)	Calculated volume (litres)	Diff (litres)	Number of calibrations
1	0.00	0.0	0.0	0.0	0
2	65.52	1201.0	1201.0	0.0	0
3	131.04	2402.0	2402.0	0.0	0
4	196.56	3602.9	3602.9	0.0	0
5	262.08	4803.9	4803.9	0.0	0
6	327.60	6004.9	6004.9	0.0	0
7	393.12	7205.9	7205.9	0.0	0
8	458.64	8406.9	8406.9	0.0	0
9	524.16	9607.9	9607.9	0.0	0
10	589.68	10808.8	10808.8	0.0	0

The graphic shows the reference chart (entered by the user) and the autocalibration chart.



1. The **Reference straptable** and **Calculated straptable** buttons control which of the two straptables to use for the current volume conversions. When autocalibration is complete, the user must select one of the two buttons to use the “Reference” table or to use the “Autocalibration” table.
2. The **Cold reset** button will delete all data (autocalibration table and number of calibrations) and the procedure will start again.
3. The **Soft reset** button will delete the number of calibrations but will keep the autocalibration table. This lets the user improve the autocalibration if the autocalibrated data is not sufficient.

6.3.9 Reconciliation



- **Test vend**: This is the quantity of product used in the calibration of hose meters. In meter calibration, there is a product quantity removed from the tank without a related sale. if *Unaccounted variance* is greater than Test vend threshold, then it is reported as “Test vend” and it is not thought of as a “Loss”.
- **Unexpected sales (liters)**: An alarm will be caused when the tank is in a quiet mode (there are no sales) and product loss is sensed.
- **Average time**: This specifies the time for the loss warning or loss alarm.
- **Loss warning (liters)**: A difference more than this threshold will cause a Loss Warning
- **Loss alarm (liters)**: A difference more than this threshold will cause a Loss Alarm.
- **Unaccounted variance (%)**: If a difference in the daily reconciliation is more than this threshold, it will cause an alarm.

Section 7 Sensor Setup

7.1 Settings

1. Tap the "**+**" sign to add a new sensor.
2. Enter a Sensor Id **number** (e.g. 1, 2, 3 etc.).
3. When the **Enabled** button is on (blue), the sensor is enabled in the system. To disable a sensor, tap this button again so it is "grayed-out." The sensor's configuration will stay but alarm conditions cannot be caused.
4. Select a **Sensor Type** from the drop-down:

On/off: ProGauge sensor with one float only.

Discriminating: ProGauge sensor with two floats. One float that can sense product and one float to sense water.

2 Ch Wireless sensor: ProGauge wireless RF sensor with two floats (product, water).

1 Ch Wireless sensor: ProGauge wireless RF sensor with one float (product).

Other selections refer to OPW-FMS **Smart Sensors (for the LX Plus model only)**.

5. Enter a **Name** for the sensor (up to 30 characters).
6. **Sensor Channel**: This is applicable only when a ProGauge On/off or Discriminating sensor has been selected. Select where the sensor is to be connected. Internal refers to the internal CN10 connector (only EXd sensors can connect to the CN10). For Intrinsically Safe sensors, select the MagLink I/O.
7. **Position of Product / Position of Water**: This field is enabled only when a ProGauge discriminating sensor has been selected. The user must give a slot number on the CN10 connector or on the input card of the MagLink I/O
8. **Alarm status**: Select the method that will cause an alarm:

Open: For normally open sensors, the alarm is caused when the sensor contact closes.

Closed: For normally closed sensors, the alarm is caused when the sensor contact opens.

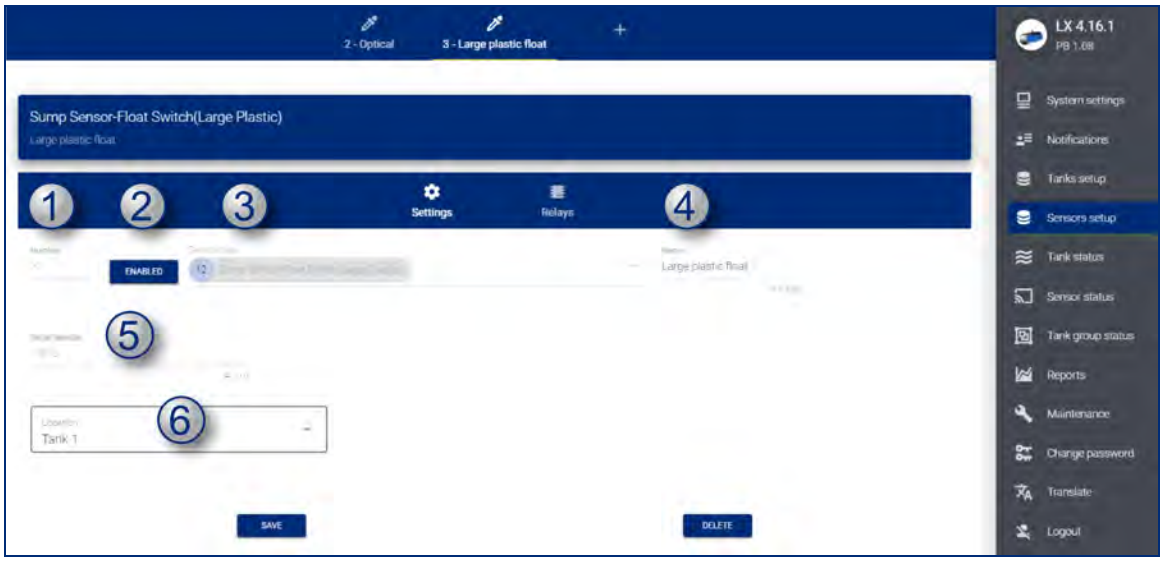
NOTE: The ProGauge on/off and discriminating operate as normally closed sensors.

9. OPW FMS smart sensors (model LX Plus only).

OPW-FMS Smart Sensors are automatically detected and will come into view next to the “+” sign. The sensor type and serial number will show automatically on the relevant fields (fields 3,5).

10. Click **Save** to save the Settings configuration.

7.1.1 OPW FMS smart sensors (model LX Plus only).



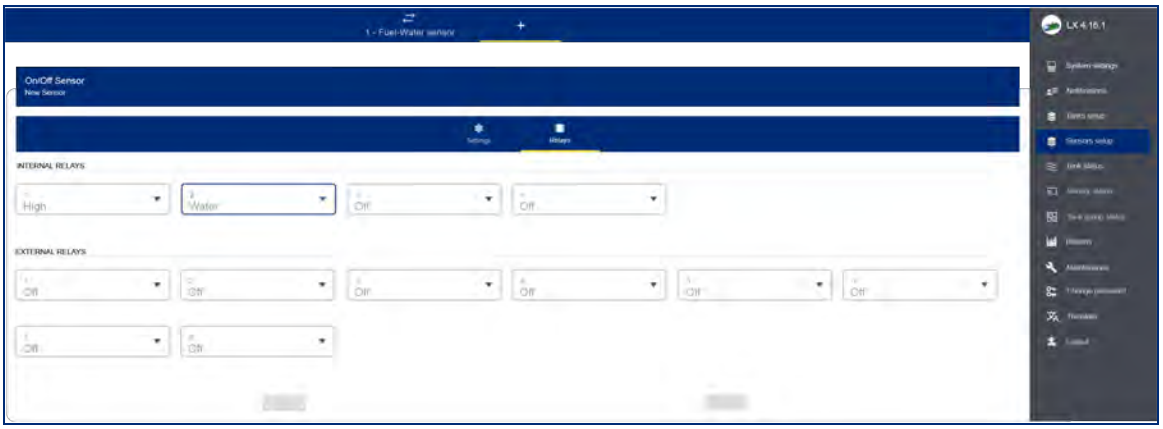
OPW-FMS Smart Sensors are automatically detected and will come into view next to the “+” sign in the header. The sensor type and serial number will show automatically on the relevant fields (fields 3,5).

To configure the sensor:

1. Make sure the applicable sensoris selected in the header. Enter a number for the sensor to identify the sensor in the configuration.
2. Push the **Enable** button. If the sensor is not enabled (and the button is "grayed-out") the system cannot read the sensor status (but the sensor configuration can continue to be saved).
3. The **Sensor Type** will automatically show when the sensor is detected.
4. Enter a **name** for the sensor
5. The **Serial Number** will automatically show when the sensor is detected.
6. Select a **Location** from the drop-down. This is used for information only.

Click **Save** to save the Settings configuration.

7.2 Relays



Use this screen to trigger a relay when a sensor is in an alarm condition.

Select between the internal relays or the external relays on the MagLink I/O. The external relays must first be configured in the System Settings > Site Info menu).

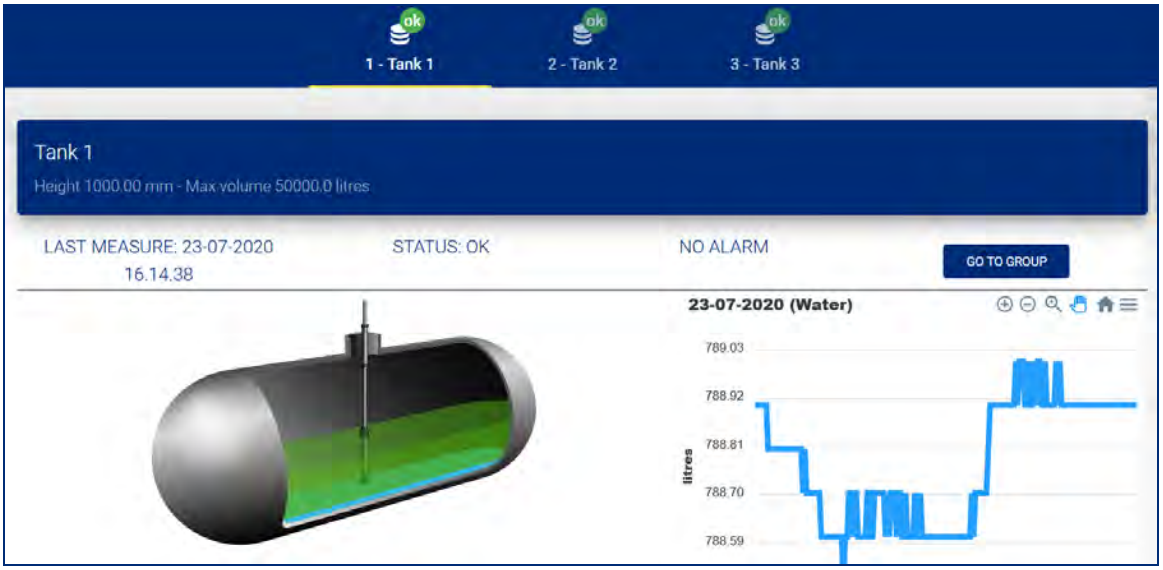
Then, select the sensor alarm that will trigger the relay:

High: An alarm that is triggered by the product float of a discriminating sensor.

Water: An alarm that is triggered by the water float of a discriminating sensor

Active: An alarm that is triggered by the float of a on/off sensor

Section 8 Tank Status

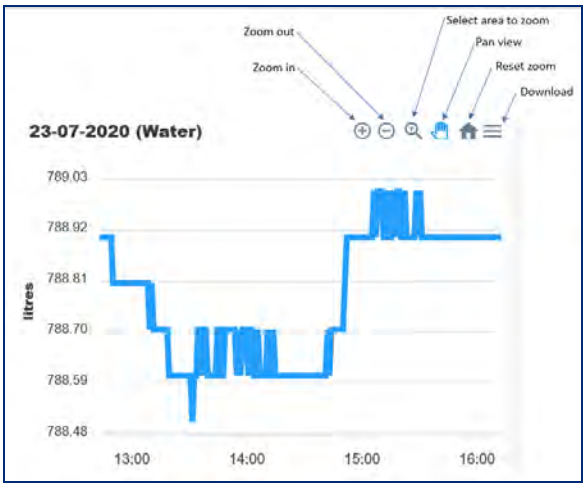


A colored icon next to each tank icon in the top bar shows the status of the tanks:

- Yellow: Alarms are active and they have been acknowledged.
- Red: Alarms are active but they have not been acknowledged.
- Green: There are no alarms for this tank.
- Grey: The tank is disabled.

The graph on the right side of the screen will scroll automatically to show the information that follows:

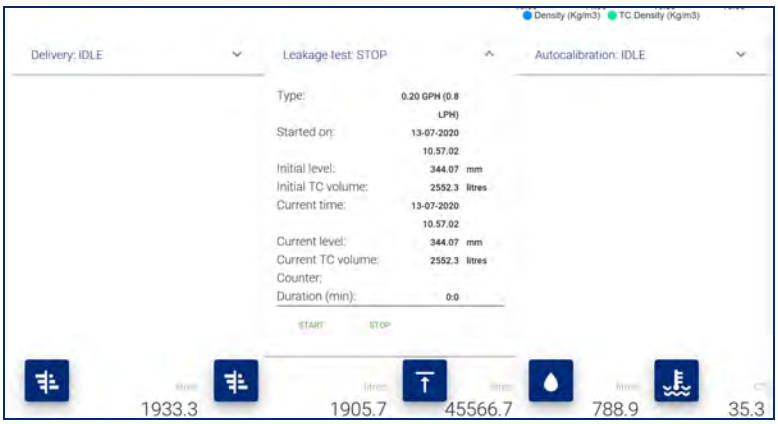
- Product / water height
- Product volume / Product volume TC
- Water volume
- Density / TC density
- Temperature



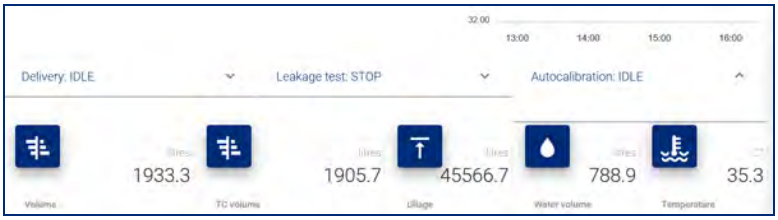
The bottom of the screen shows information on the Deliveries, Leak Tests and Autocalibration.

- **Delivery**: Click on the Delivery drop-down menu to show information on the last delivery recorded.

- **Leakage test**: Click on the Leakage drop-down menu to show information on the status of the leakage function. The user can manually start and stop a leak test from this menu.



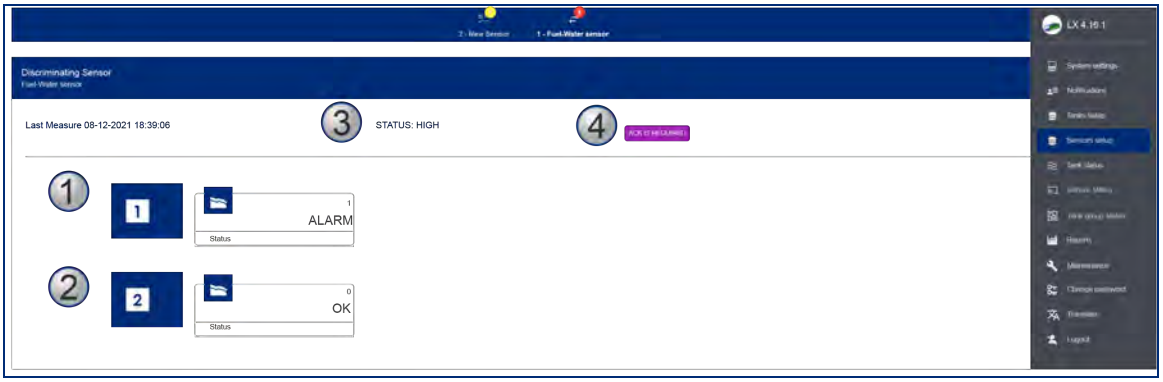
- **Autocalibration**: Click the Autocalibration drop-down menu to show information on the status of the autocalibration function.



Tank inventory is shown at the bottom of the page.

TC volume refers to the temperature compensated volume. This is calculated through the API tables.

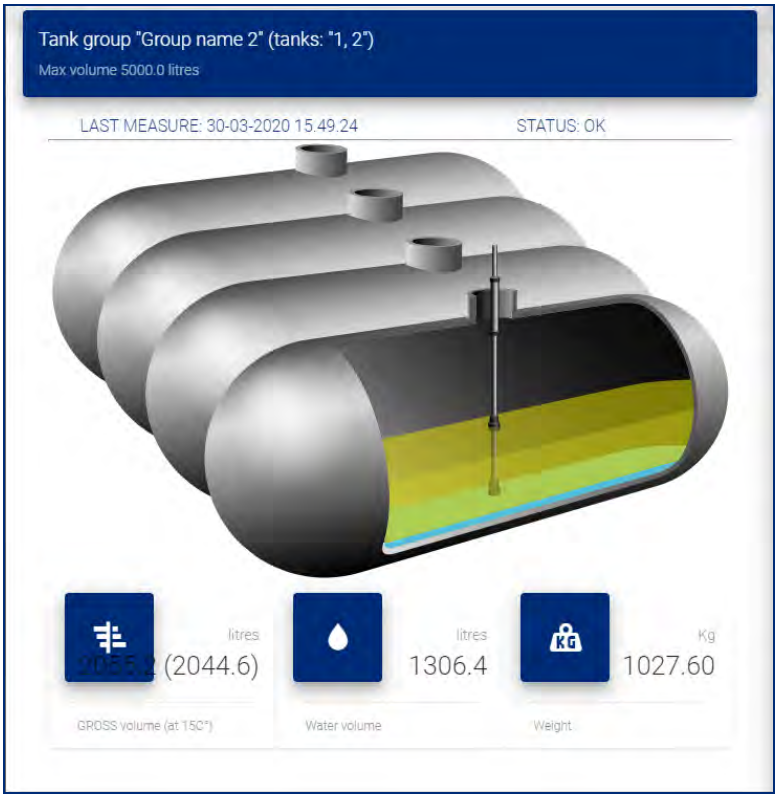
Section 9 Sensor Status



The Sensor Status screen is shown in the image above. The icons in the example refer to a ProGauge Discriminating Sensor with two floats.

1. Icon 1 shows the status of the **Product** float.
2. Icon 2 shows the status of the **Water** float.
3. The full sensor status is shown at the top of the panel.
4. Push the ACK IS REQUIRED button to acknowledge the alarm. This will also stop the alarm buzzer.

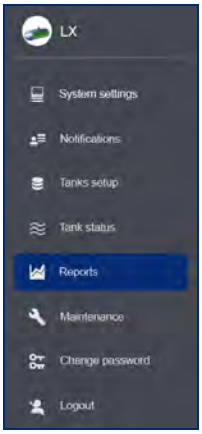
Section 10 Tank Group Status



A summary of the tank group is shown on this screen:

- Gross volume (at 15°C)
- Water volume
- Mass (in Kg)

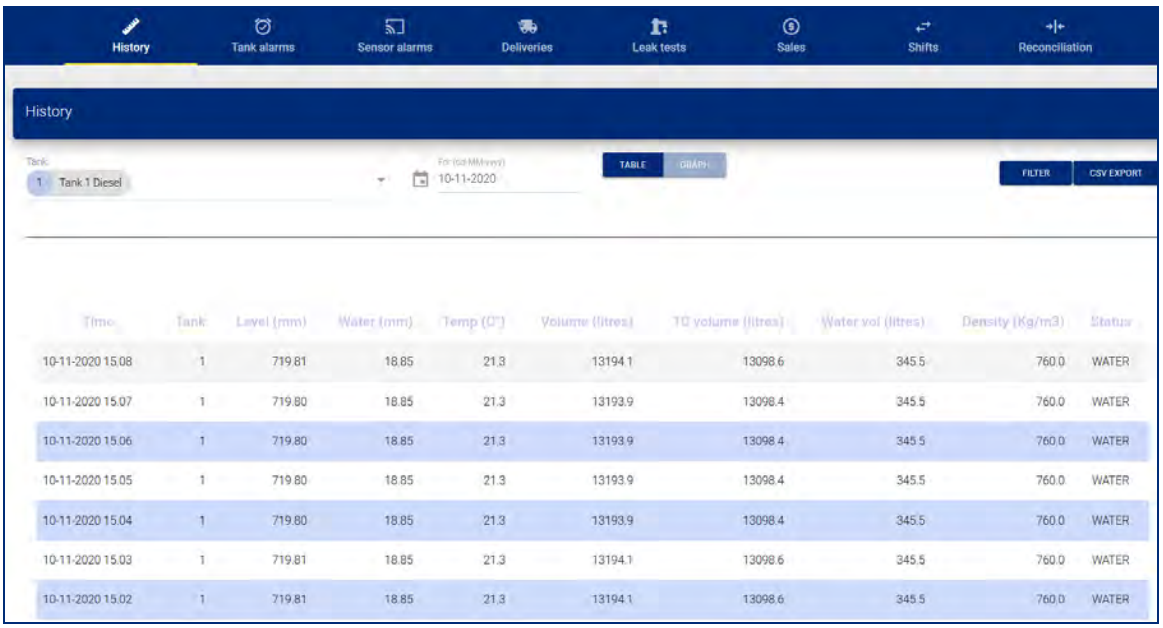
Section 11 Reports Menu



Reports can be made for eight (8) types of information:

- Tank inventory History
- Tank Alarms
- Sensor Alarms
- Product Deliveries
- Leak Tests
- Pump Sales
- Shifts
- Reconciliation

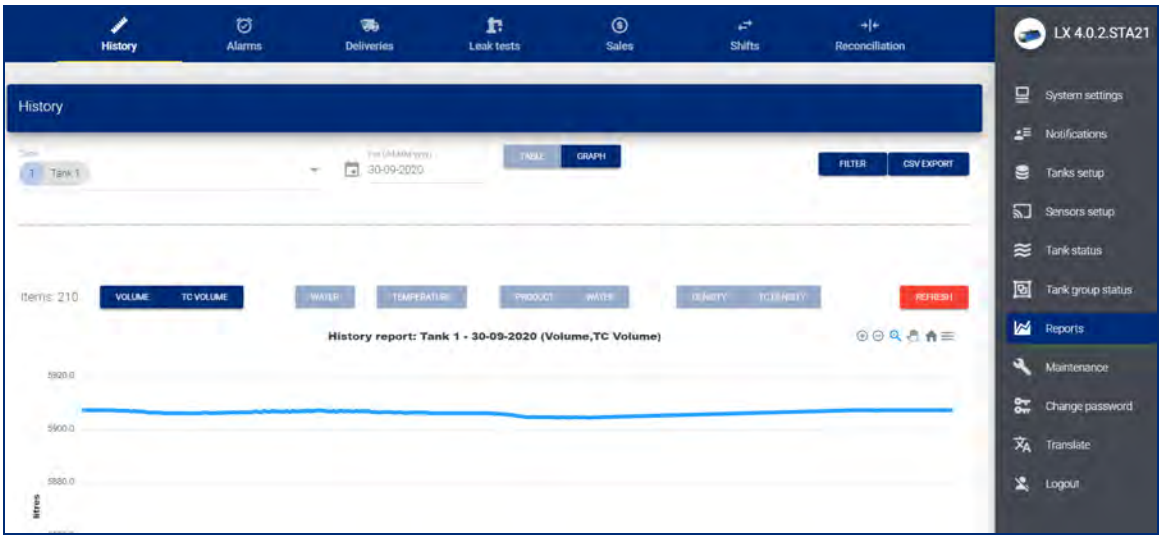
11.1 History



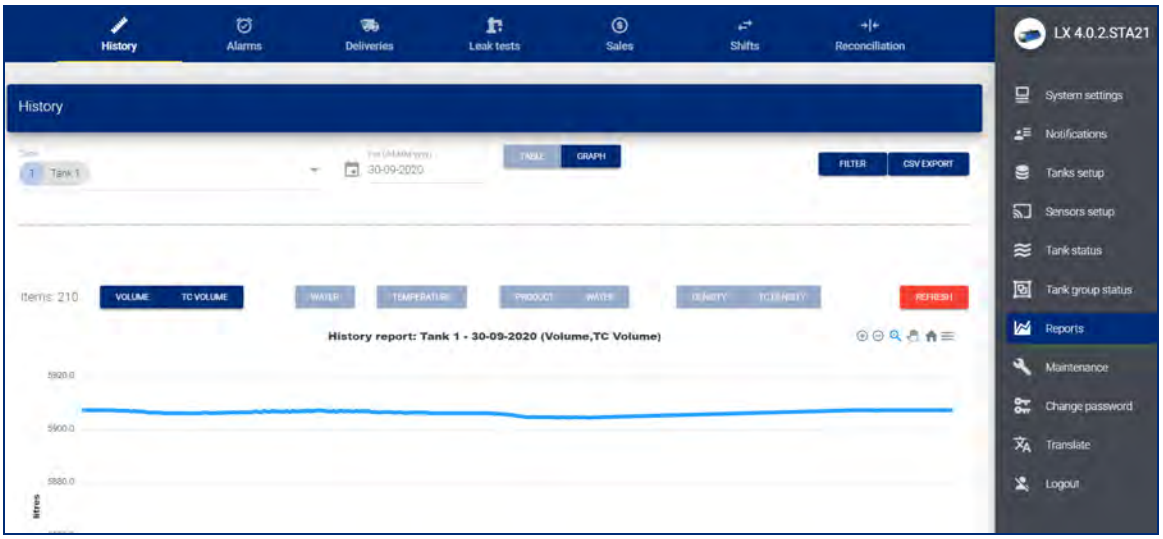
Time	Tank	Level (mm)	Water (mm)	Temp (C°)	Volume (litres)	TC volume (litres)	Water vol (litres)	Density (Kg/m3)	Status
10-11-2020 15:08	1	719.81	18.85	21.3	13194.1	13098.6	345.5	760.0	WATER
10-11-2020 15:07	1	719.80	18.85	21.3	13193.9	13098.4	345.5	760.0	WATER
10-11-2020 15:06	1	719.80	18.85	21.3	13193.9	13098.4	345.5	760.0	WATER
10-11-2020 15:05	1	719.80	18.85	21.3	13193.9	13098.4	345.5	760.0	WATER
10-11-2020 15:04	1	719.80	18.85	21.3	13193.9	13098.4	345.5	760.0	WATER
10-11-2020 15:03	1	719.81	18.85	21.3	13194.1	13098.6	345.5	760.0	WATER
10-11-2020 15:02	1	719.81	18.85	21.3	13194.1	13098.6	345.5	760.0	WATER

To set up a History Report:

- Select a **Tank Number** from the drop-down or use the swipe button to select **All tanks**.
- Use the date-picker to select a **From Date** for your report.
- Select to see the data in a **Table** or **Graph**.



- Push the **Filter** button to show the data. The image below shows data as a Graph.

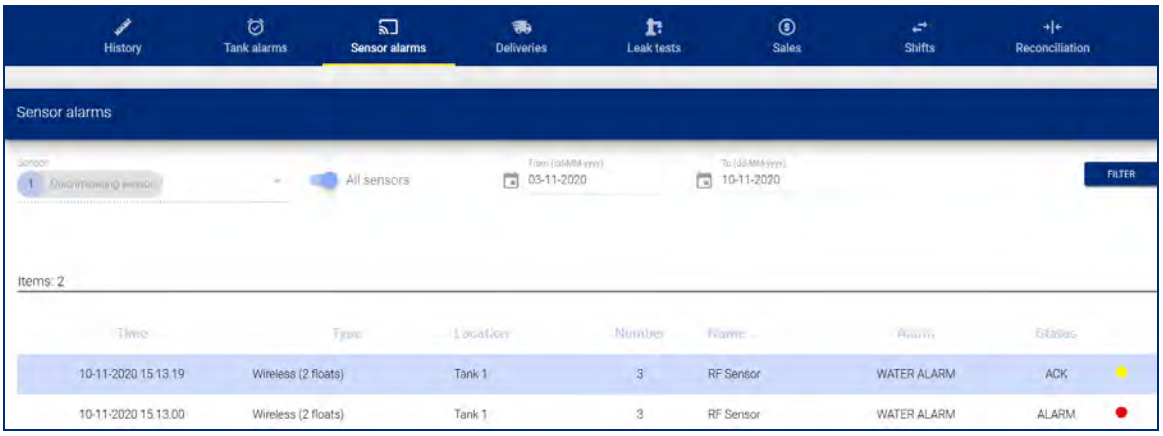


- The History Report can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

11.2 Tank Alarms

1. Select a **Tank Number** from the drop-down or use the swipe button to select **All tanks**.
2. Use the date-picker to select a **From Date** and **To Date** for your report.
3. Push the **Filter** button to show the data.
4. The Tank Alarms Report can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

11.3 Sensor Alarms



1. Select a **Sensor** from the drop-down or use the swipe button to select **All sensors**.
2. Use the date-picker to select a **From Date** and **To Date** for your report.
3. Push the **Filter** button to show the data.
4. The Sensor Alarms Report can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

11.4 Delivery

1. Select a **Tank Number** from the drop-down.
2. Use the date-picker to select a **From Date** and **To Date** for your report.
3. Push the **Filter** button to show the data.
4. The Delivery Report can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

11.5 Leak Tests

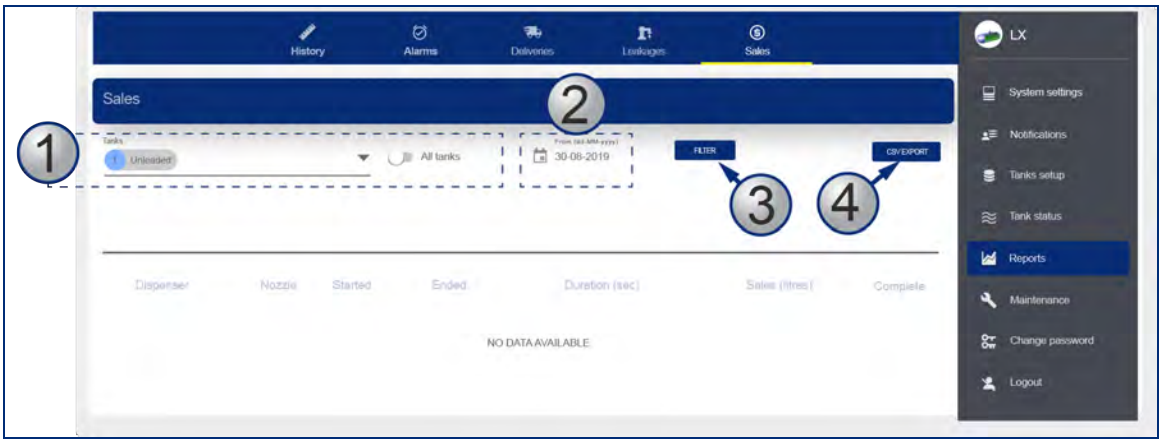
1. Select a **Tank Number** from the drop-down.
2. Use the date-picker to select a **From Date** and **To Date** for your report.
3. Push the **Filter** button to show the data.
4. The Leakages Report can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

This report will show the results of leak tests that have been done in the tanks.

The report will show:

- The start and end time of the test
- The Leak threshold
- The volume difference between the start-end (at ambient temperature and temperature compensated)
- The result of the test and if the test was aborted.

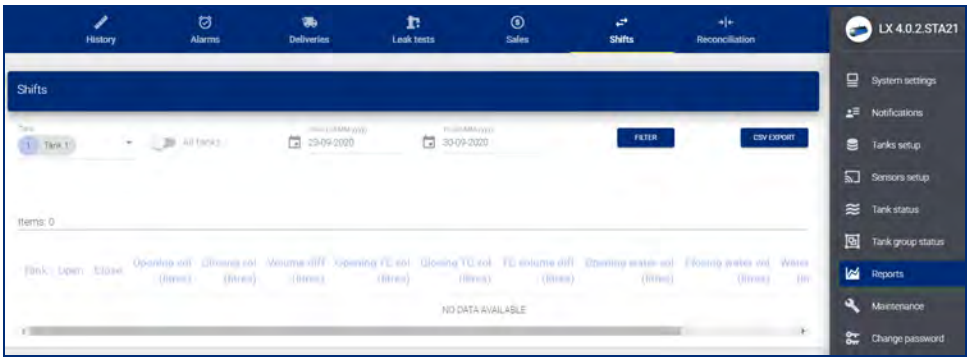
11.6 Sales



NOTE: Pump Sales Reports related to tanks can oly be made when the reconciliation function is in operation and there is communication with a forecourt controller.

1. Select a **Tank Number** from the drop-down or use the swipe button to select **All tanks**.
2. Use the date-picker to select a **From Date** and **To Date** for your report.
3. Push the **Filter** button to show the data.
4. The Sales Report can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

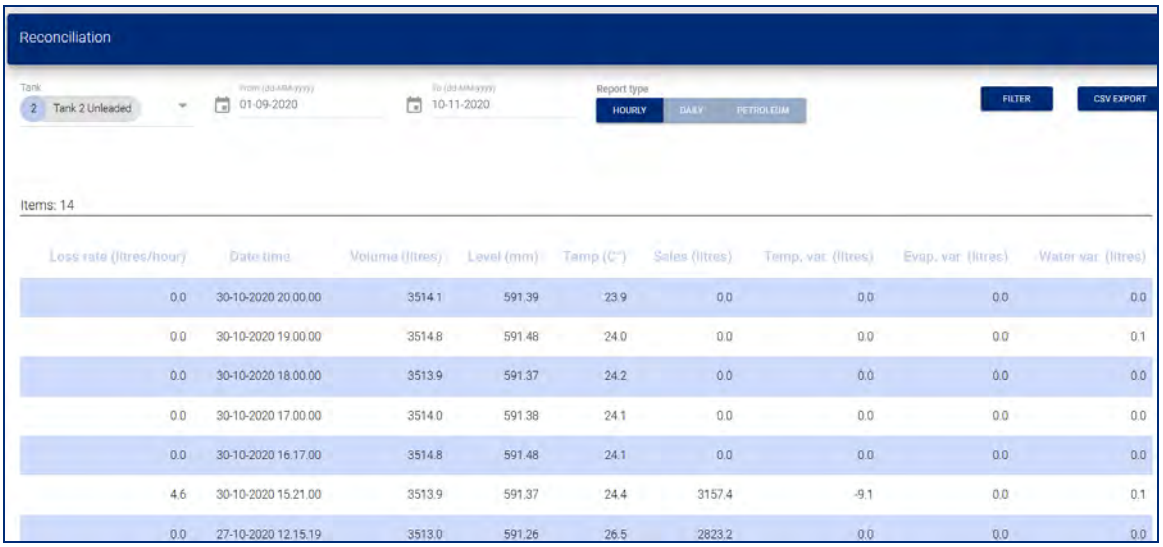
11.7 Shifts



This report will show the shifts related to specified tanks.

- Select a **Tank Number** from the drop-down or use the swipe button to select **All tanks**.
- Use the date-picker to select a **From Date** and **To Date** for your report.
- Push the **Filter** button to show the data.
- The Shift Report can be exported to a csv format that can be saved in a spreadsheet or text editor. Click the **CSV Export** button to continue.

11.8 Reconciliation



Loss rate (litres/hour)	Date time	Volume (litres)	Level (mm)	Temp (C°)	Sales (litres)	Temp. var. (litres)	Evap. var. (litres)	Water var. (litres)
0.0	30-10-2020 20.00.00	3514.1	591.39	23.9	0.0	0.0	0.0	0.0
0.0	30-10-2020 19.00.00	3514.8	591.48	24.0	0.0	0.0	0.0	0.1
0.0	30-10-2020 18.00.00	3513.9	591.37	24.2	0.0	0.0	0.0	0.0
0.0	30-10-2020 17.00.00	3514.0	591.38	24.1	0.0	0.0	0.0	0.0
0.0	30-10-2020 16.17.00	3514.8	591.48	24.1	0.0	0.0	0.0	0.0
4.6	30-10-2020 15.21.00	3513.9	591.37	24.4	3157.4	-9.1	0.0	0.1
0.0	27-10-2020 12.15.19	3513.0	591.26	26.5	2823.2	0.0	0.0	0.0

There are three types of reconciliation reports available:

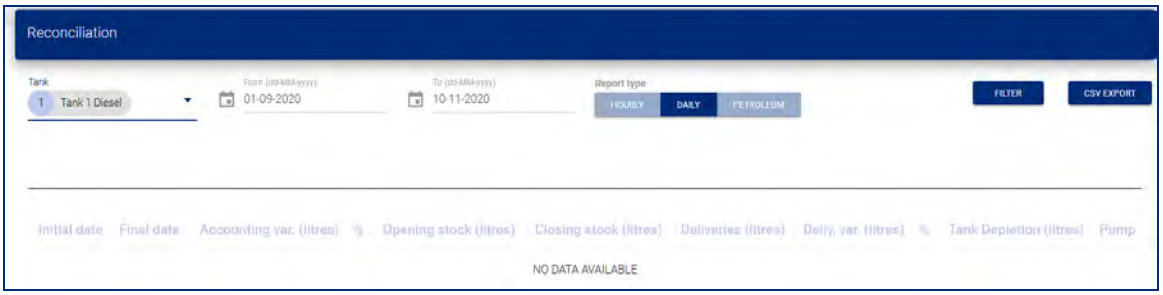
- Hourly
- Daily
- Petroleum (periodic)

1. Select a **Tank Number** from the drop-down.
2. Use the date-picker to select a **From Date** and **To Date** for your report.
3. Select a report type (Hourly, Daily, Petroleum).
4. Push the **Filter** button to show the data.

HOURLY REPORT

This report will show (see the image above):

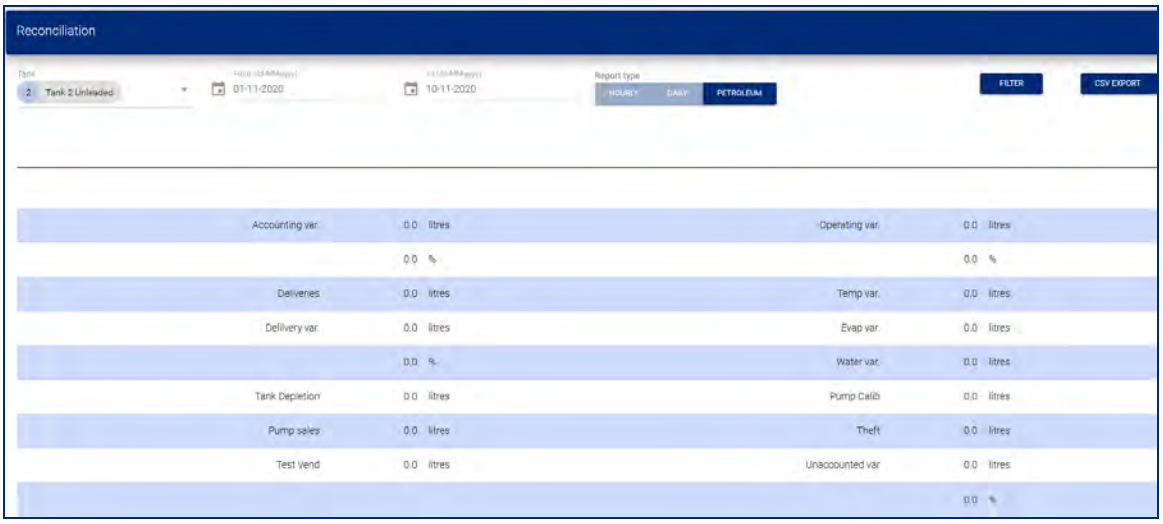
- The Loss rate in liters / hour up to that hour (cumulative figure).
- The volume, the level and the temperature at the end of the hour.
- The cumulative dispenser sales (field Sales) up to that hour.
- The difference in liters because of the temperature difference between the current hour and the hour before.
- The difference in liters because of the evaporation between the current hour and the hour before (only if an evaporation factor has been programmed in the ACR settings in the Tank Setup).
- The difference because of the water change in liters between the current hour and the hour before.



DAILY REPORT

This report will show (see the image above):

- The opening and closing stock for the day.
- The delivered volume for the day.
- The delivery variance for the day.
- The tank depletion for the day.
- The pump sales for the day.



PETROLEUM REPORT

For a given time period, this report will show (see the image above):

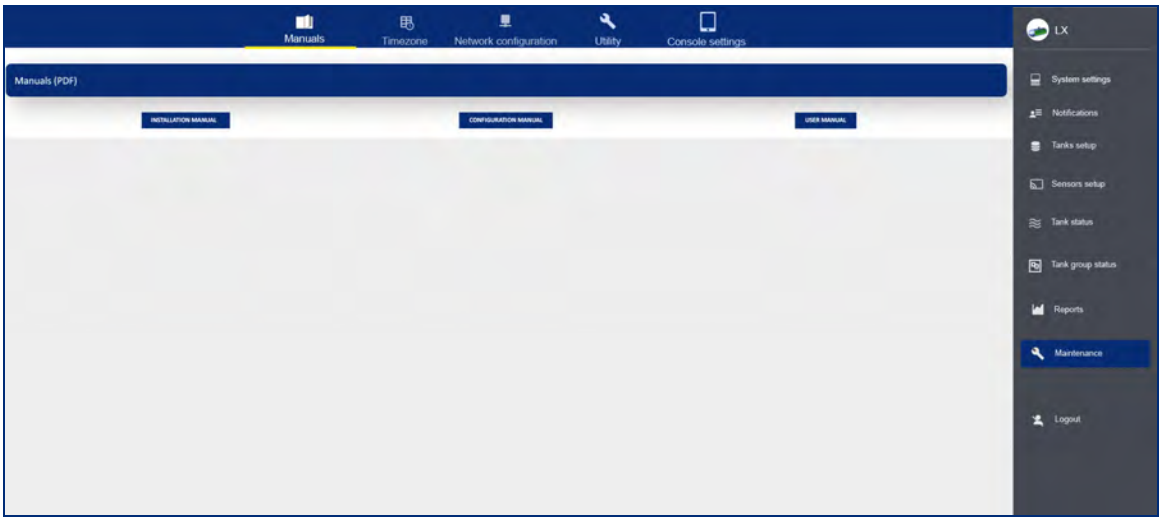
- **Accounting var** (variance): This is the sum of Operating variance and Delivery variance, shown in liters and as a % of tank sales
- **Deliveries**: The quantity of liters delivered.
- **Delivery var** (variance): This is the Delivery variance. This is calculated as the difference between ATG measured delivery and invoiced delivery (invoice detail entered manually during delivery report). The result is shown in liters and as a % of tank sales.
- **Tank depletion**: The quantity of liters physically kept in the tank.
- **Pump sales**: The quantity of liters that were sold by the tank (as recorded by the dispensers).
- **Test vend**: The quantity of fuel that was pumped out of the tank during a pump calibration check.

- **Operating var** (variance): This is the difference between Tank Depletion and Pump Sales, In liters and as a % of tank sales.
- **Temp var** (variance): This is a temperature difference for the given time period.
- **Evap var** (Evaporation variance): This is an evaporation difference for the given time period.
- **Water var** (variance): This is a difference because of a change in the water volume for the given time period.
- **Pump calib** (calibration): This is a difference because of the dispenser meter drift (this is only applicable if a meter offset has been programmed in the Site Mapping).
- **Theft**: This is a difference that was recorded as a theft (it will be necessary for the Unexpected Sales threshold to be programmed in the Reconciliation settings in the Tank Setup).
- **Unaccounted var** (variance): This is calculated as:
    - Unaccounted variance = Operating variance – Temp variance – Evap variance – Water variance - Pump calibration – Theft.
    - This is calculated in liters and as a % of sales.

Section 12 Maintenance

The Maintenance Menu has five (5) tabs to get access to technical manuals, configure the console's Timezone (and Time and date), Network Configuration, Utility functions and Console settings.

12.1 Manuals

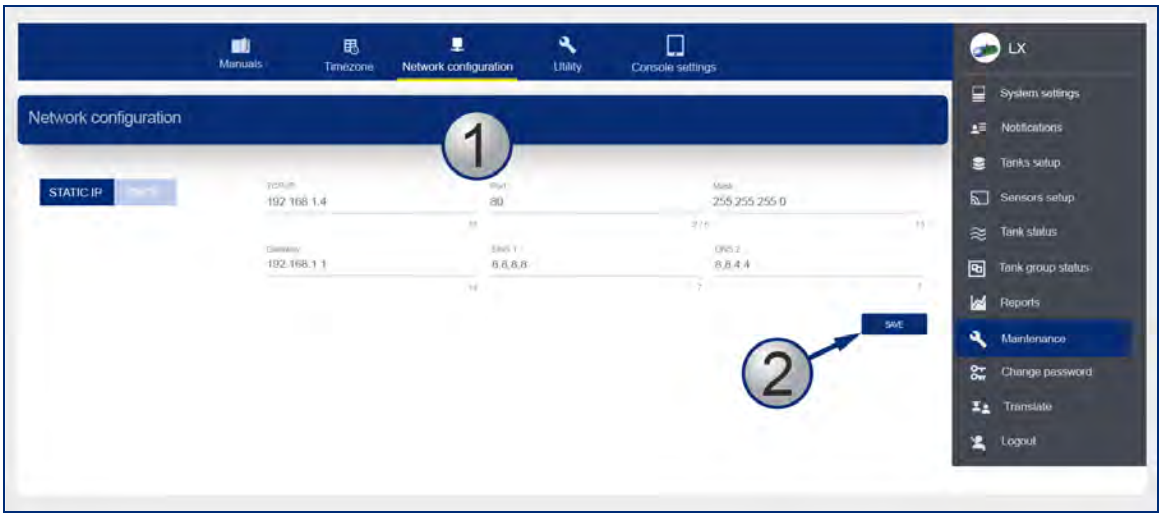


Click the **Manuals** icon to get access to the Installation, Configuration and User manuals for the LX 4 console.

12.2 Timezone

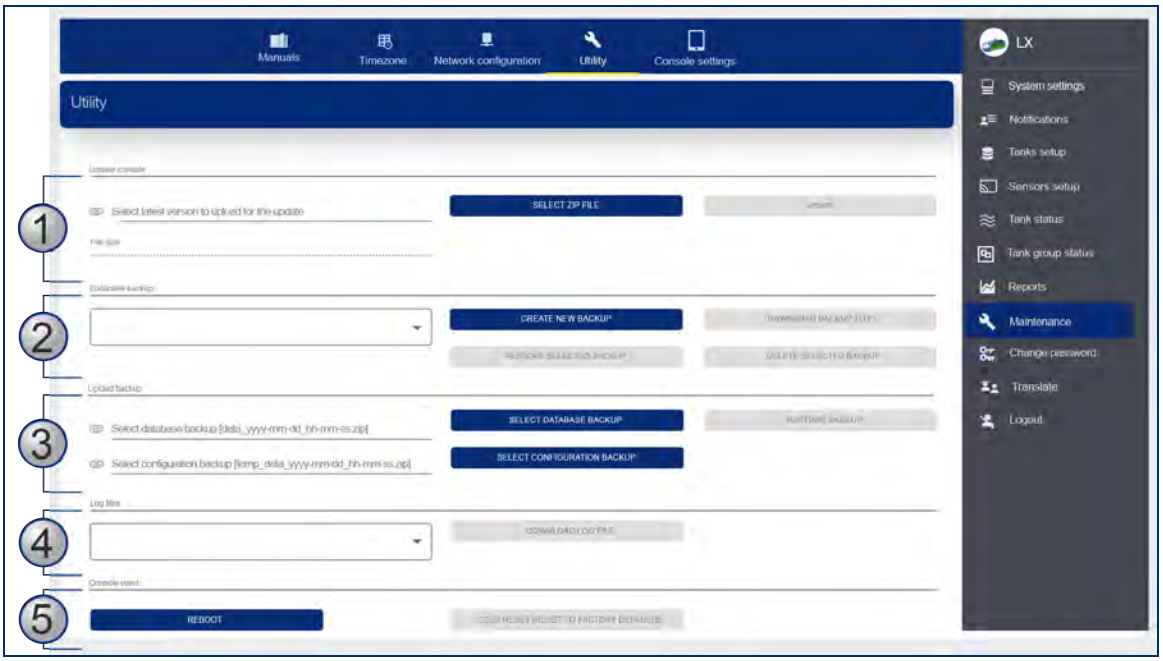
1. Use the calendar and clock tools to select the date and time.
2. Select the applicable **time zone** from the drop-down.
3. Click **Save**. The console application will restart.

12.3 Network Configuration



1. Enter the **network parameters** into the applicable fields
2. Click **Save** when you have completed all applicable fields.

12.4 Utility



Five (5) Utility functions can be done in this screen.

1. **Update Console**: Use this function to do a software update. You must get the update zip file through DFS.
   - Click the **Select zip file** button to select the update file.
   - Click the **Update** button to install the update.
2. **Database backup**: In this part of the screen you can;

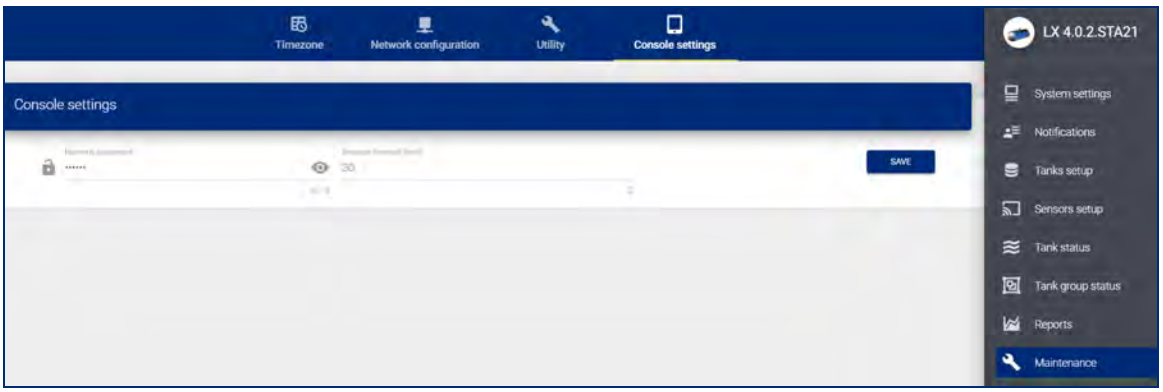
- Make a database backup and store it on the SD card. Click the **Create new backup** button. A new, date-stamped backup file is stored on the SD card.
- Download the backup to your computer. Select the applicable file from the drop down menu. Click the **Download backup to PC** button. The console will automatically reboot.

> **NOTE:** The download procedure downloads two (2) files:
> » data_yyyy-mm-dd_hh-mm-ss.zip. This is the database backup that contains the configuration and events.
> » temp_data_yyyy-mm-dd_hh-mm-ss.zip. This is the configuration backup only.

- Restore the backup that is stored on the SD card: Select the applicable file from the drop-down menu. Click the **Restore selected backup** button.
- Delete the backup that is stored on the SD card: Select the applicable file from the drop-down menu. Click the **Delete selected backup** button.

3. **Upload backup**: Use this part of the screen to upload the database backup file **data_yyyy-mm-dd_hh-mm-ss.zip** and the configuration backup **temp_data_yyyy-mm-dd_hh-mm-ss.zip**.
   - Select the applicable **database backup**file.
   - Select the applicable **configuration backup** file.
   - Click the **Restore backup** button to install these backup files.
4. **Log files**: To download log files to your computer:
   - Select the applicable **log file** from the drop down menu.
   - Click the **Download Log File** button.
5. **Console reset**:
   - Click the **Reboot** button to restart the console.
   - Click the Cold Reset button to put the console back in original factory default settings. This procedure will remove the database.

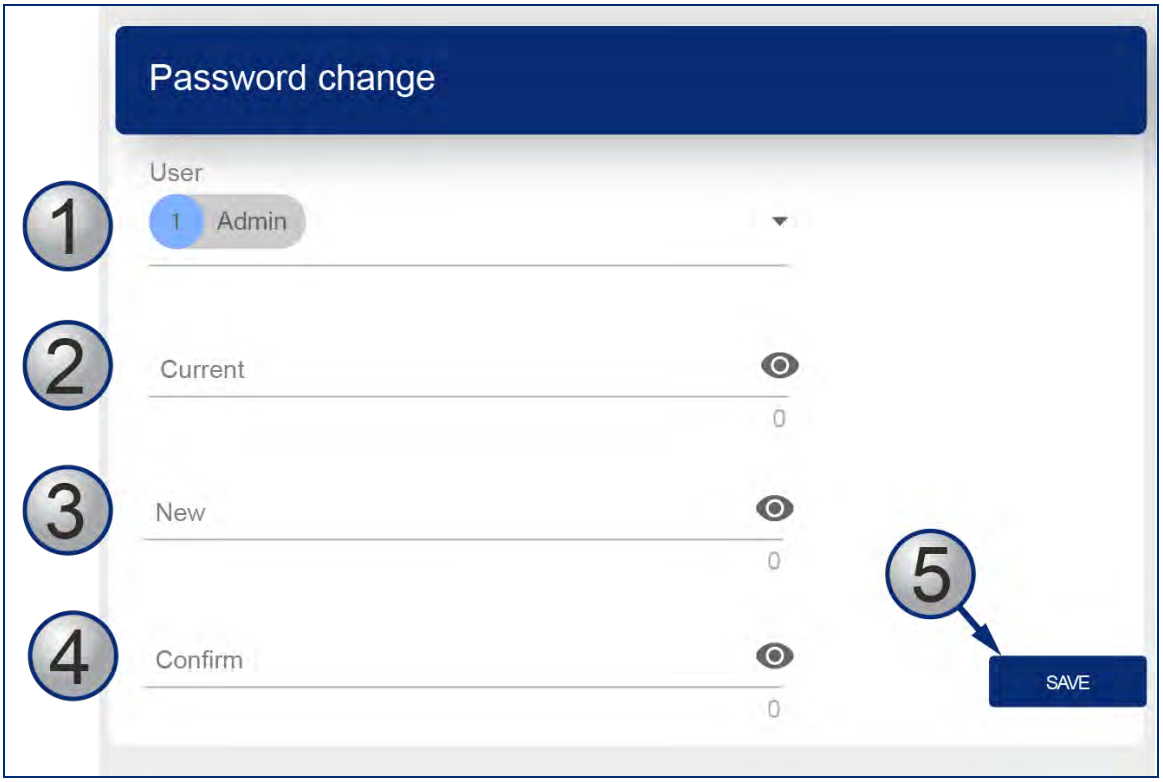
12.5 Console Settings



In this section, the numeric password to get access to the Maintenance section on the Graphical User Interface of the console can be changed.

The timeout session gives the time that the user can be logged in to the Maintenance section before the system automatically logs the user out.

Section 13 Change Password

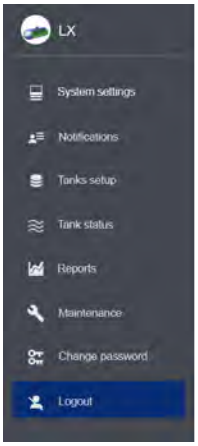


NOTE: Only an Admin user can change passwords.

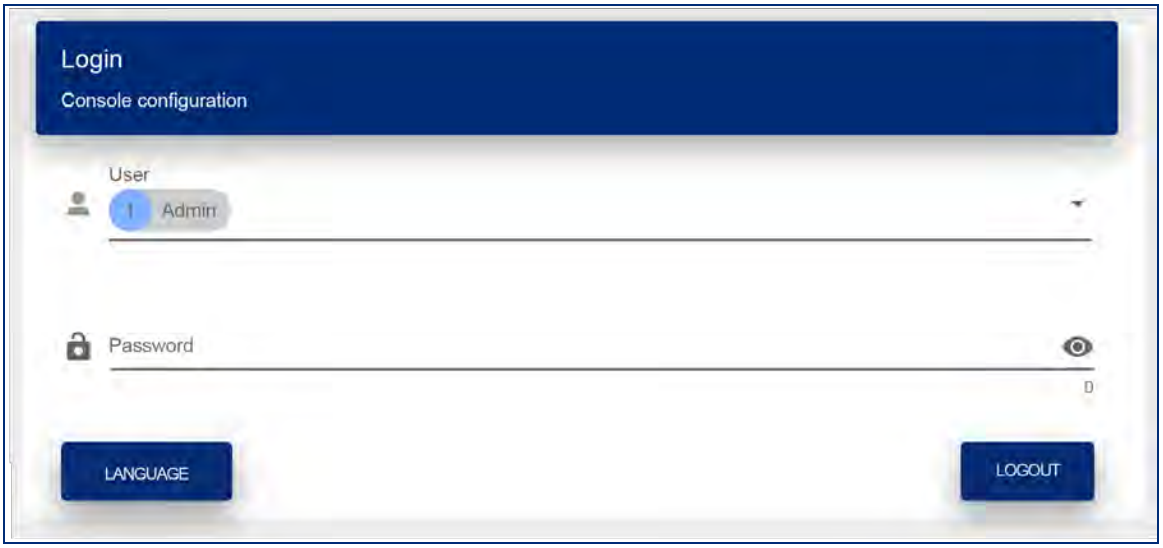
1. Select the applicable **User** from the drop-down.
2. Enter the **Current password** for the selected user.
3. Enter the **New password**.
4. Enter the **new password** again in the *Confirm* field.
5. Click **Save** when you have completed all fields.

TIP: As you type your password only neutral "bullet" characters will show (e.g. • • • • • •). Select the "eye" icon to show the password characters as you type.

Section 14 Logout

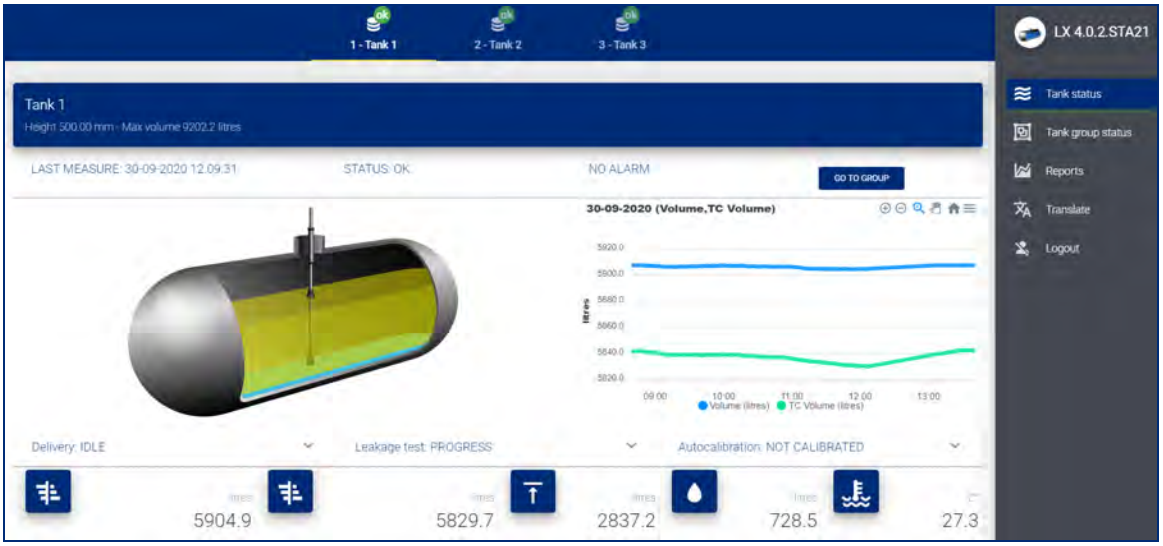


Select **Logout** from the *Main Menu*. The Login screen will come into view.



Click the **Logout** button to log out of the console.

Section 15 Guest Account



A Guest account only gives access to the Tank Status page and a view of data from Reports.

Section 16 Technical Support

When you ask for technical support from DFS, it is recommended that you give direct access to the console over the internet through ports 3000 and 22. As an alternative, the console can be connected to a site computer and technical support can get access through a third-party program (such as TeamViewer). If technical support cannot get access to the console in one of these two methods, the user must supply technical support with the log files and the database backup of the console.

Refer to "Utility" on page 57 for information on log files and the database backup in the console.

Revisions-M2051

Revision #	ECO	Effective	Software Version	Key Changes
0	1784	8/19/20		Initial Release
1	1836	12/3/2020		Added Autocalibration and Reconciliation. Updated screens and procedures
2	1944	10/8/2021		New Start Italiana address, update ip address set up, available languages, new system screen, removed DIP-Switch section, Density and ACR Results update, new Tech Support procedure.
3	1998	TBD		General Updates, screen updates, AEF Thresholds,Sensor relays.

NOTE: It is possible that older software versions might not support all features

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Dover Fueling Solutions Global Locations

Corporate Headquarters
3814 Jarrett Way
Austin, Texas 78728
United States
Phone: +1 512 388 8311
www.doverfuelingsolutions.com

North America
Richardson, TX, USA
Hodgkins, IL, USA
Perkasie, Pennsylvania, USA
Brighton, Ontario, CAN

Latin America
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Asia Pacific
Guangzhou, CN*
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Victoria, AU

* Regional Headquarters

OPW Fuel Management Systems • 6900 Santa Fe Dr. • Hodgkins, Illinois, USA 60525 • Tel: (708) 485-4200

DFS *Worldwide* Brands

Wayne OPW TokheimVeeder
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ProGauge

ProGauge MagLink LX 4 and LX Plus Operator Manual

Part Number: - M2052

Revision: - 4

MagLink LX 4 and LX Plus

DFS *Worldwide* Brands

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NOTE: Before you use this manual, make sure you have the most recent revision. Look at the revision of this document to make sure it agrees with the most current revision found at https://www.opwglobal.com/opw-fms/tech-support/manuals-how-to-videos/technical-manuals.
Download the latest revision if necessary.

FUELING SOLUTIONS

ProGauge is a part of Dover Fueling Solutions.

Contact

ProGauge

START ITALIANA S.r.l.
Via Natta 6

20823 Lentate Sul Seveso (MB)

Italy

Tel. +39 0362 1581465
Fax +39 0362 1581464

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Section 1 Preface

Start Italiana S.r.l. has made every effort possible to see that this document is complete, accurate and updated. With every revision of the console, the related information is added to the document. Start Italiana S.r.l. reserves the right to make unannounced improvements and/or changes in the product and/or associated programs. Start Italiana S.r.l. is not liable for damages of any kind, including those resulting in the document, including typographical errors.

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Section 2 General Warnings

Carefully read the instructions in this manual before you do the installation procedures.

Only approved persons are permitted to install this equipment and configure the console.

The manufacturer is not responsible for operations that are not included in this manual.

The manufacturer is not liable in regard to competent bodies for changes to the equipment and software that are not approved.

In case of failure or defect, refer directly to an authorized service provider or manufacturer.

The manufacturer is not liable for injury and/or damage to persons and/or property and/or pets caused by the failure to obey safety instructions.

All approved personnel must know all safety requirements in this manual, the configuration manual and the user manual.

Refer directly to an approved service provider or manufacturer for questions about the operation of the equipment.

IMPORTANT: You must read and obey all safety instructions in this manual before you use this equipment.

WARNING: Incorrect use of this equipment that does not agree with the instructions in this manual can cause a risk to safety.

Section 3 Introduction

This manual was prepared in accordance with IEC 82079-1 standards. “Preparation of instructions for use - Structuring, content and presentation - Part 1: General principles and detailed requirements and according to the ATEX Directive 2014/34/EU concerning equipment and protective systems intended for use in potentially explosive atmospheres."

This manual gives all necessary information about the installation of the MagLink LX console.

IMPORTANT: This manual must be used together with the related product manuals:

- M2050-EU MagLink LX Installation Manual
- M2051-EU MagLink LX Configuration Manual

You must install the console as shown in M2050-EU MagLink LX Installation Manual, configure the console as instructed in the M2051-EU MagLink LX Configuration Manual, and use the console in the field as shown in this manual.

WARNING: This device must not be discarded with household waste. This device is labeled in accordance with European Directive 2012/19/UE concerning used electrical and electronic appliances (waste electrical and electronic equipment – WEEE).

This guideline gives the methods for the return and recycling of used electronic devices as applicable throughout the EU. To return your used device, use the return and collection systems available to you.

The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 50°C or incinerate.

The table that follows lists reference data of the manufacturer:

Data	Description
Name	START ITALIANA S.r.l.
Address	Via Natta 6 20823 Lentate Sul Seveso, (MB) Italy
Telephone	+39 0362 1581465
Fax	+39 0362 1581464
Website	www.startitaliana.com
e-Mail	support@startitaliana.it

NOTE: The units of measurement contained in this manual refer to a specified selection by the user. Refer to the M2051-EU MagLink LX Configuration Manual for more information on how to set units of measure.

Section 4 General Description

This console is used to monitor probe levels and gives tank alarm notifications. The console can hold up to 16 on-board probes, four (4) on-board relays with six (6) inputs and an external expansion module that can hold up to four (4) expansion cards.

NOTE: A maximum of two (2) MagDirect consoles with 8 probes each can be added.

NOTE: Each expansion card can have 8 relay outputs, 8 digital inputs or 4-20mA. These cards can be put together so that the system can have 32 relays and 0 inputs, 32 inputs and 0 relays and a mixture of both in increments of 8.

The console can interface with a site's FCC/POS through serial or Ethernet connection.

The console has a resistive type touchscreen that can be used with fingers (also with gloves), stylus pens for touchscreens and other applicable tools. To use the screen, it is necessary to contact the screen and apply a light force.

The table below shows the technical characteristics of the console:

MagLink LX Technical Characteristics	
Characteristic	**Value**
Power supply	100 - 240 V~, 50-60 Hz
Consumption	15 VA
Operating temperature	(-10 - +50) °C
Relative humidity	(5 - 95)%, non-condensing
Number of probes	32 (16 probes through internal barrier and 16 probes with added MagDirect modules)
Number of ON-OFF external sensors	Up to 32 non-discriminating sensors, up to 16 discriminating sensors
Number of ON-OFF internal sensors	6 (only when Dipswitch 2 is ON)
External relay outputs	Up to 32
Internal relay outputs LX4 model	4
Internal relay outputs LX Plus model	2
Lower power of the relay output	0,5 A, 33 V~, or 2 A, 30 V DC
Output power for the probes	12 V DC, 100 mA per output for each probe, connectors MR3 MR4 (up to 8 probes for each connector)
Serial communication of the probes	RS485
Host communication (management)	RS232 and TCP/IP
Printer communication	RS232 and USB
Integrated web server for remote configuration, consultation, communication, and emails as well as HOST COMMUNICATION	TCP/IP
Case	Plastic
Protection	IP40
Dimensions	265 x 190 x 95 mm

4.1 Compatible Probes

The probes in the list below are compatible with the MagLink LX:

- XMT EXD 485
- XMT SI 485
- XMT RF (an RF receiver is necessary)
- DMP-IS-485
- 924B (FMS) - **(924B probes are only compatible with LX Plus)**

NOTE: ALL the floats used on probes have more than 10 years of life time in the fuel tanks

Auxiliary equipment that can be used with the MagLink LX console include:

- Expansion cards, up to 32 relays and 0 inputs, up to 32 inputs and 0 relay, and a mixture of both in increments of 8.
- Local Printer

4.2 Correct Use

Only use the MagLink LX console for use as given in this manual. The console must be installed in a safe area. The console includes an intrinsic safety barrier and two (2) channels (BRA-2SIP) to connect XMT-SI-485 and DMP-IS-485 probes.

The table below shows the characteristics of use of the intrinsically safe barrier contained in the console:

MAGLINK LX Features (barrier)	Description
Group (area of use)	II (Surface industries different from mines)
Category and type of potentially explosive atmosphere	(1) G
Protection mode	ia
Group of substances (gases, vapors or mists)	IIB

The specifications of use for console security and for the Barrier are given in this manual and on the product label.

IMPORTANT: Safety instructions constitute an attachment to this manual and users must acknowledge it before using the equipment.

WARNING: The Console must not be used in hazardous areas (because there is a risk of fire and explosion). The probes of the XMT-SI-485 family are installed in hazardous areas and must be connected to the Barrier contained in the console.

4.3 Incorrect Use

Incorrect and alternative uses include:

- **Resistive touch screen**: Only use fingers or special tools made for resistive touchscreens to select screen options.
- **USB and USB Port devices**: Only use this port for firmware updates, console backup and USB printer connection.
- **Serial ports**: Only use the serial ports for printer and PC connection with management programs that interface with the protocols given by Start Italiana S.r.l.
- **Network cable**: Only use the network cable connection for console configuration, and local network connections (Refer to the M2051-EU Configuration manual).

Section 5 Power ON/OFF

IMPORTANT: Only authorized/trained personnel can energize the console and must obey the manufacturer's instructions. Operation must obey the safety instructions shown in the Installation Manual (M2050-EU).

To energize the console:

1. Make sure that the power button is in the OFF position (0).
2. Connect the power cable.
3. Connect the corporate network cable, if necessary.
4. Push the power button to the ON position (1).

If the console is not configured when it is energized it will cause an alarm because it does not communicate with a tank. Push the **red arrows** up or down until you see the page "ALARM LOG." Push the **ACK** button to stop the alarm.

To make changes to the console configuration, refer to the MagLink LX Configuration Guide M2051-EU.

To de-energize the console, push the power button to the OFF position.

NOTE: The MagLink LX console uses an industrial grade SD card. Safe data storage is available if there is power loss.

Section 6 Product Labels

- Name and address of the manufacturer
- CE marking with the Notified Body
- Product Name
- The "Caution" symbol (0434B of 01/2004), according to ISO 7000
- Serial number
- Year of production
- Power Supply(VAC and Hz)
- Power consumption (VA)
- Operating temperature (°C)
- Ingress protection (IP grade)
- Fuse rating
- Indication that inside there is intrinsically safe circuit

- Name and address of the manufacturer
- Equipment Type (BRA-SIP, or BRA-2SIP)

- ATEX Reference number of the certificate
- ATEX Marking: Ex II (1) G [Exia] IIB FISCO power supply UM=250 V [Exia] IIB
- Serial number
- Electrical data

Section 7 Graphical User Interface

7.1 Inventory

The Inventory page shows information related to tanks. Up to four (4) tanks can be shown on a page.

TIP: Move your finger across the display to the right to see the information for more tanks.

Tap on a tank image to get more information about that tank.

A screen will open that shows information related to the categories in the tables that follow:

Volume	
Product	Gross Product volume at the current temperature (includes the water volume)
Comp. prod	Compensated product volume temperature (at 15° C or 20° C: refer to the configuration)
Water	Current water volume
Ullage	Empty space calculated from the safe working capacity (refer to the configuration)
Capacity	The total capacity of the tank (refer to the strapping table).

Level	
Product	Current product height
Water	Current water height
Safe capacity	Refer to the configuration
Maximum height	Tank height (refer to the strapping table).

NOTE: The density data in the table that follows will show only if a Density Measurement sensor is installed.

Density	
Density	The density at current temperature
Tc Density	The density at the reference temperature
Weight	The weight of the product calculated by the measured density

Temperature	
Current	The current product temperature.
Compensated	The temperature setting that is used for volume compensation (refer to the configuration).

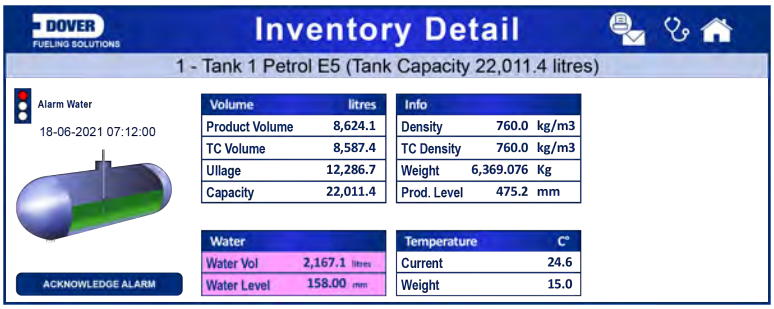
NOTE: The Density value will be the same as the TC Density unless there is a Density Float installed on the probe. The console will show the density value at the current temperature only when there is a Density Float installed on the probe.

7.1.1 Status Icons

Status OK (Green) No Alarm

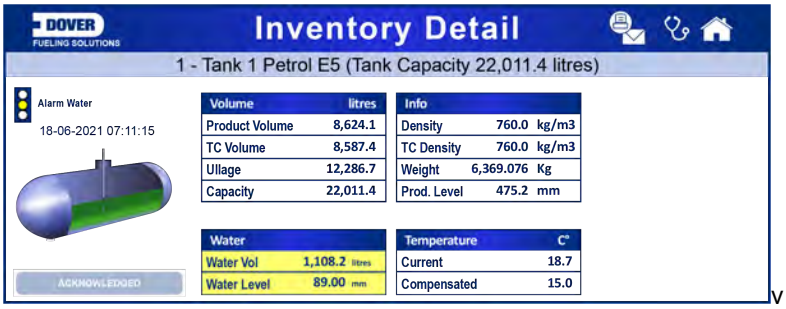
- The "Traffic Light" is green.
- There are no Alarms.
- The NO ALARM button is "grayed out."

Status Alarm HH, H (Red) In Alarm



- The "Traffic Light" is red.
- The alarms are HH (High-High) and H (High).
- The color in the related fields is changed to pink.
- The “Acknowledge Alarm” button is On. Push the Acknowledge Alarm button to acknowledge the alarm in the system.

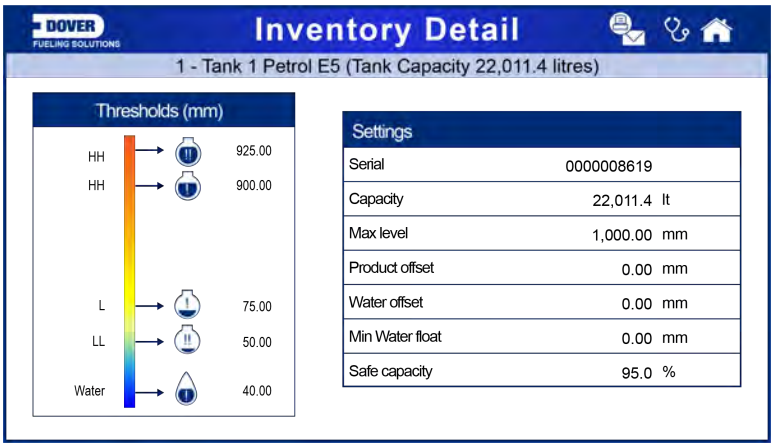
Status Alarm AH, H (Yellow) Alarm Acknowledged



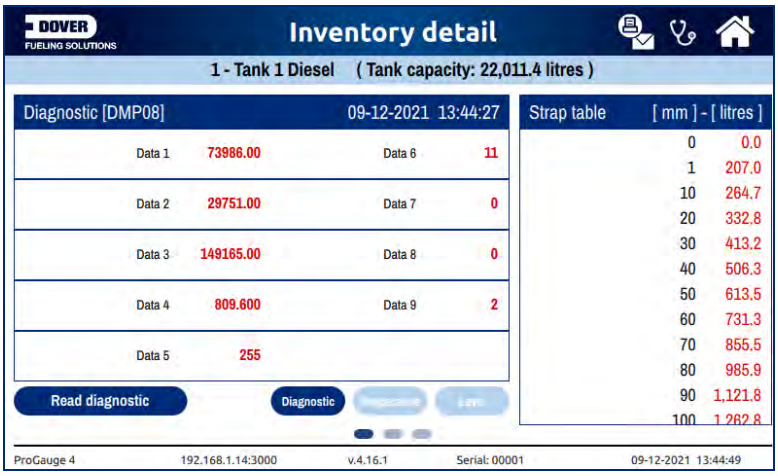
v

- The "Traffic Light" is yellow.
- The alarms HH (High-High) and H (High) have been acknowledged
- The color in the related fields is changed to yellow.
- The ACKNOWLEDGED button is "grayed out."

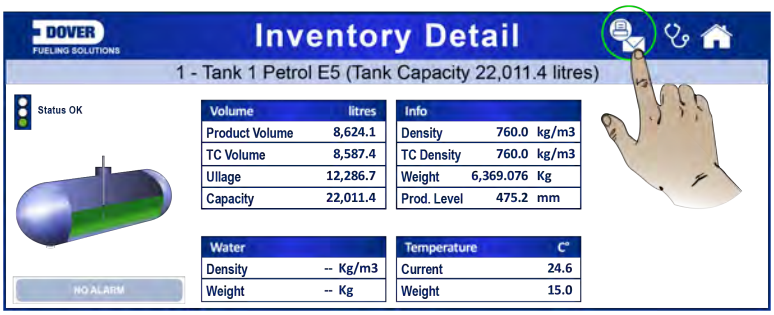
TIP: Move your finger down the display to see the next screen. The screen will show the configured tank thresholds and other data from the tank setup.



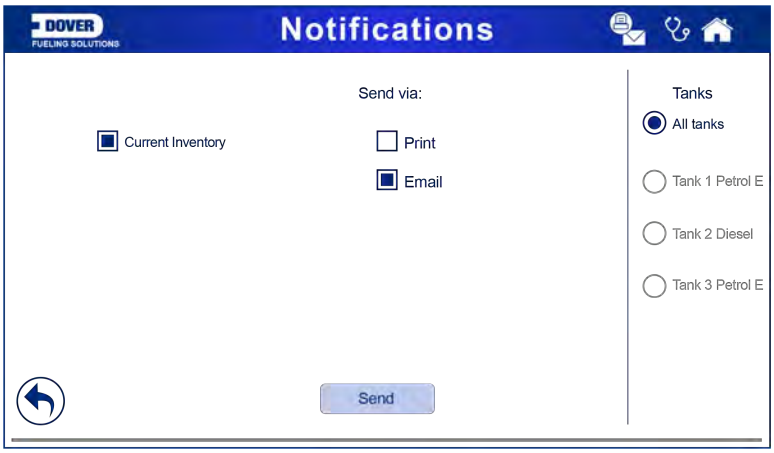
TIP: Move your finger down the display to see diagnostics information and the Tank Strapping table.



7.2 Print/Email Current Inventory On Demand



Push the **Email/print** button in the top right of the Tank Inventory Detail" screen.



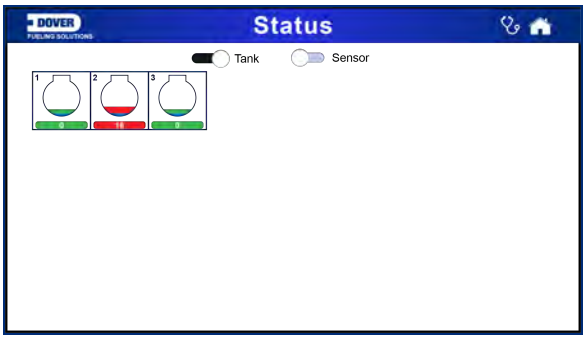
- Select a radio button on the right panel of the screen for the applicable tanks.
- Select the method to send, Print or Email.
- Push Send

Print will send a print job to a local printer. Email will send an email notification to all configured contacts (see the M2051 LX4 Configuration manual for information about contacts).

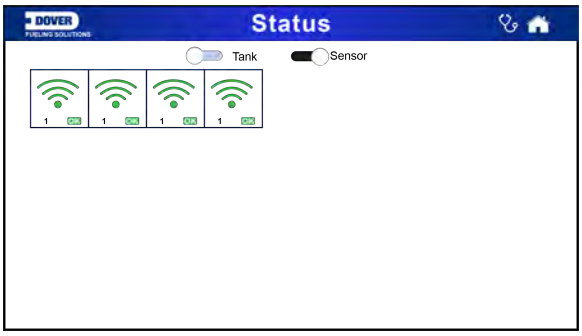
7.3 Main Menu

Push the **Home** button in the top right of the Inventory screen to go to the *Main Menu*.

7.4 Status Page



Push the **Status** icon on the *Main Menu*. The display will navigate to the "Status" screen that shows information related to the condition of the Tanks or Sensors (move the Sensor slider to the right to see the Sensor status).



The icons will show in green if there are no alarms. If a tank or sensor is in alarm, its icon will show in red.

7.5 Calendar

Push the **Calendar** icon on the *Main Menu* and the "Calendar" screen will come into view.

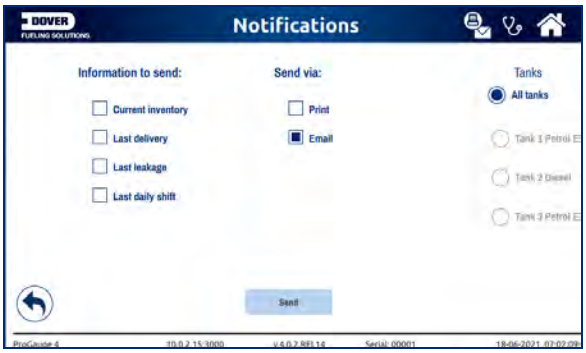
There is a group of icons along the left side of the calendar. These icons are used as filters to select what events are shown on the calendar display.

- * System Select this icon to show events related to the console.
- Tank Select this icon to show events related to tanks.
- * Sensors Select this icon to show events related to sensors.
- Select this icon to show deliveries.
- Select this icon to show alarms.
- Select this icon to show warnings.
- Select this icon to show leak tests.

Use the radio buttons along the right side of the calendar to select the applicable tanks.

Push a date box to see information for the events on that date.

7.6 Notifications



Push the **Notifications** icon on the *Main Menu* and the "Notifications" screen will come into view.

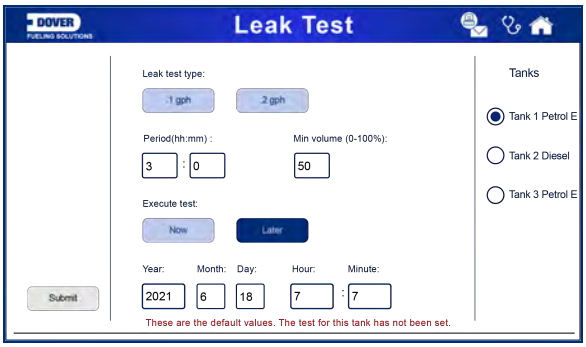
Under *Information to send*, select the applicable **type** of information to send.

Under *Send via*, select the **method** used to send the information.

Push the **SEND** button.

Select the **recipients** from the *prompt screen* that shows.

7.7 Leak Test



In this screen the user can configure the tank leak test settings.

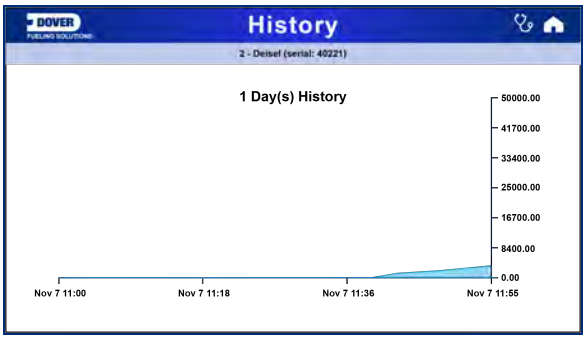
Select the **Tank** in the right panel.

Select the tank leak test **type** (0.2 gph or 0.1 gph).

Enter the time **period** and the **minimum volume** that must be in the tank for the test to start (make sure that this parameter agrees with the leak certification of the system).

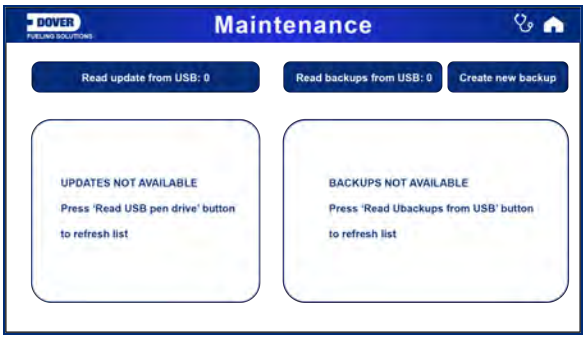
Select if the test is to start **Now** or you can configure a **start date and time** to start a test **Later**.

7.8 History



Push the **History** icon on the *Main Menu* and the History screen will come into view. The History screen shows the tank volume over a selected period.

7.9 Maintenance



Push the **Maintenance** icon on the *Main Menu* and the "Maintenance" screen will come into view. In this screen you can:

- Do software updates through the use of a USB thumb drive. The user must:
  - Get the update file “lx4_new.zip” from Dover Fueling Solutions.
  - Copy it onto a USB thumb drive.
  - Put the thumb drive into the USB port on the console.
  - Push the **Read update from USB** button.
- Restore a configuration backup from a USB thumb drive:
  - Put the USB thumb drive containing the backup to the console into the USB port of the console.
  - Push the **Read backups from USB**button.

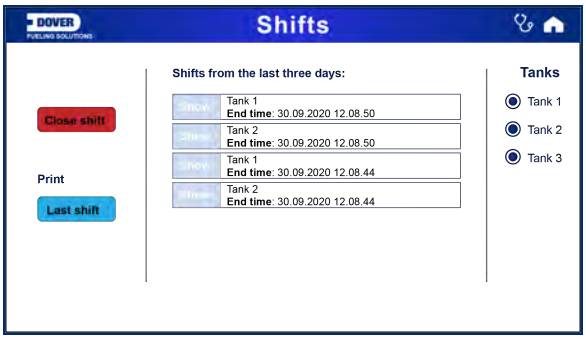
• **Create new backups** : This will make a backup of the configuration. If a USB thumb drive is put into the USB port of the console, then the backup will be stored to the thumb drive. If there is no USB thumb drive in the console, then the backup will be stored to the SD-card.

Push one of the **buttons** on the "Maintenance" screen. A 6-digit password must be entered before you can proceed.

NOTE: Note: The password is set up on the web configuration page (refer to **Passwords** in M2051-EU MagLink LX Configuration Manual.

REMINDER: Only an Admin user can set or change a password.

7.10 Shifts

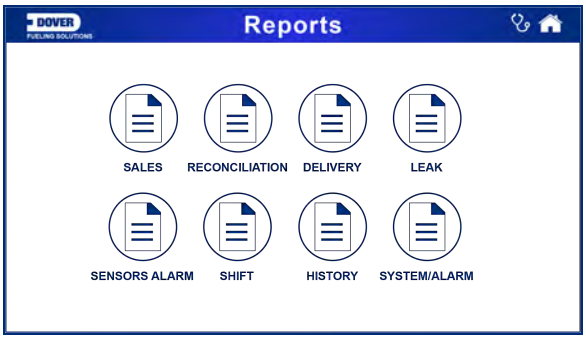


Push the **Shifts** icon on the *Main Menu* and the "Shifts" screen will come into view. The shifts from the last three days will show.

Select the **Close shift** button to manually close a shift.

Select the **Last shift** button to send the last shift information to the connected printer.

7.11 Reports

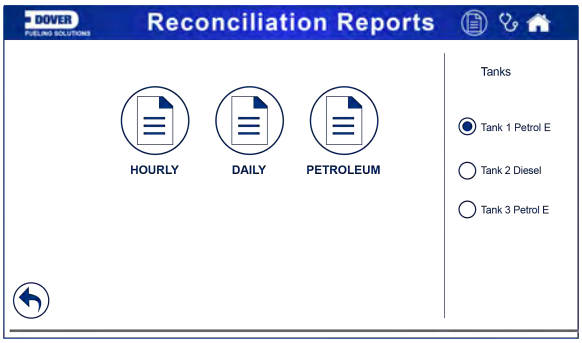


Push the **Reports** icon on the *Main Menu* and the "Reports" screen will come into view. You can make reports for the selections shown in the screen image above.

7.11.1 Sales Report

The sales report shows the daily tank sales for the last seven days

7.11.2 Reconciliation Report



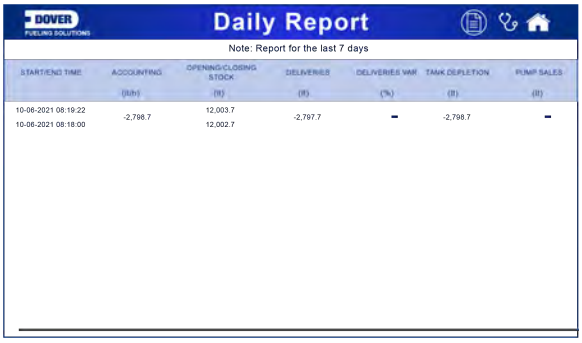
To see a **Reconciliation Report**:

- Select a **Tank** from the panel on the right of the screen.
- Select the report type (Hourly, Daily, Petroleum).

7.11.2.1 Hourly Report

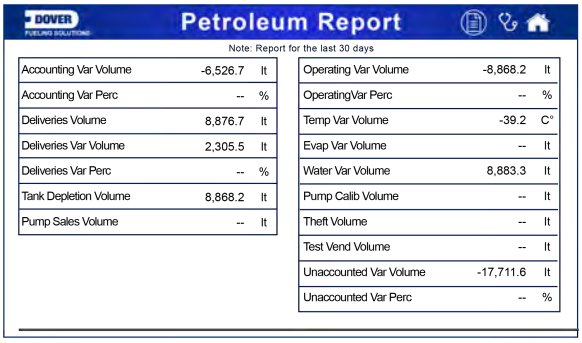
The hourly report shows the loss rate up to the hour. The sales are cumulative up to the hour. The loss/gain from evaporation is calculated on the configured evaporation factor in the ACR tank configuration.

7.11.2.2 Daily Report



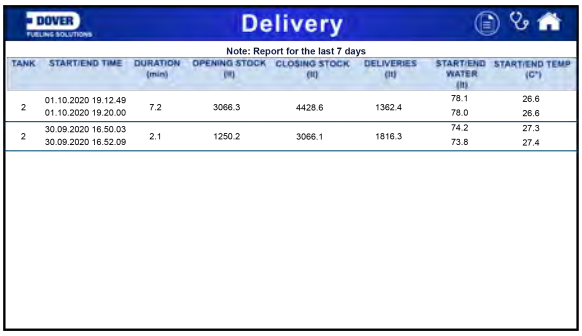
The daily report shows the variance for the day. The “DELIVERIES VAR” field will show the difference between measured delivery volume and bookstock delivery volume (if the bookstock information has been entered into the console. This feature will be available in future software releases).

7.11.2.3 Petroleum Report



The petroleum report shows data for the last 30 days. The console will calculate the variance because of pump calibration, theft volume, test vend volume (as long as the related configuration has been done in the ACR parameters).

7.11.3 Delivery Report



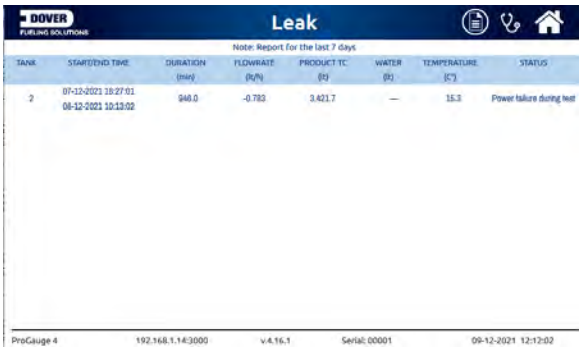
DOVER FUELING SOLUTIONS — Delivery

Note: Report for the last 7 days

TANK	START/END TIME	DURATION (min)	OPENING STOCK (lt)	CLOSING STOCK (lt)	DELIVERIES (lt)	START/END WATER (lt)	START/END TEMP (C°)
2	01.10.2020 19.12.49 01.10.2020 19.20.00	7.2	3066.3	4428.6	1362.4	78.1 78.0	26.6 26.6
2	30.09.2020 16.50.03 30.09.2020 16.52.09	2.1	1250.2	3066.1	1816.3	74.2 73.8	27.3 27.4

The delivery report shows all of the tank delivery information for the last seven days.

7.11.4 Leak Report



DOVER FUELING SOLUTIONS — Leak

Note: Report for the last 7 days

TANK	START/END TIME	DURATION (min)	FLOWRATE (lt/h)	PRODUCT TC (lt)	WATER (lt)	TEMPERATURE (C°)	STATUS
2	07-12-2021 18:27:01 08-12-2021 10:13:02	948.0	-0.783	3,421.7	—	15.3	Power failure during test

ProGauge 4 192.168.1.14:3000 v.4.16.1 Serial: 00001 09-12-2021 12:12:02

The Leak report shows all the leak test results for the last seven days.

7.11.5 Sensors Alarm

Sensors alarm

Note: Report for the last 7 days

TIME	SENSOR NUMBER	SENSOR NAME	ALARM	STATUS
18-06-2021 07:44:13	1	Sump sensor	Unknown	Acknowledged
18-06-2021 07:43:50	1	Sump sensor	Unknown	Alarm
17-06-2021 19:09:23	1	Sump sensor	No Link alarm	Alarm
18-06-2021 06:43:11	1	Sump sensor	--	--
17-06-2021 19:09:23	1	Sump sensor	No Link alarm	Alarm
18-06-202106:37:53	1	Sump sensor	--	--
18-06-2021 06:36:52	1	Sump sensor	Input activated alarm	Acknowledged
18-06-2021 06:37:21	1	Sump sensor	Unknown	Acknowledged

Active sensor alarms are shown on this screen.

7.11.6 Shift Report

Shift Report

Note: Report for the last 7 days

TANK	START/END TIME	OPENING STOCK (lit)	CLOSING STOCK (lit)	DELIVERIES (lit)	DISPENSER SALES (lit)	START/END WATER (lit)
1	30.09.2020 12.08.44 30.09.2020 12.08.50	8,947.2	8,947.4	—	—	796.1 796.1
2	30.09.2020 12.08.44 30.09.2020 12.08.50	1250.2	1250.1	—	—	74.3 74.3
1	30.09.2020 09.34.06 30.09.2020 12.08.44	8,949.6	8,947.2	—	—	795.3 796.1
2	30.09.2020 09.34.05 30.09.2020 12.08.44	1250.1	1250.2	—	—	73.9 74.3

The shift report shows a full report of each shift for the last seven days. The report shows the deliveries and tank sales that occurred during the shift.

7.11.7 History

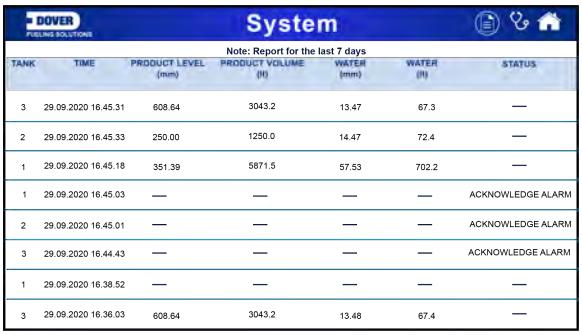
History

Note: Report for the last 7 days

TANK	TIME	PRODUCT LEVEL (mm)	PRODUCT VOLUME (lit)	PRODUCT TC (lit)	WATER (lit)	TEMPERATURE (C°)	DENSITY (lit)
1	01.10.2020 15.41.32	313.07	5072.0	5010.3	1317.3	28.9	760
2	01.10.2020 15.41.30	249.97	1249.8	1232.7	71.5	27.299999	760
1	01.10.2020 15.40.32	313.06	5071.8	5010.1	1317.3	28.9	760
2	01.10.2020 15.40.30	249.97	1249.8	1232.7	71.5	27.299999	760
1	01.10.2020 15.39.32	307.99	4968.1	4907.2	1268.4	28.9	760
2	01.10.2020 15.39.30	249.97	1249.8	1232.7	71.5	27.299999	760
1	01.10.2020 15.38.31	305.04	4908.1	4848.0	1255.2	28.9	760
2	01.10.2020 15.38.29	249.97	1249.8	1232.7	71.5	27.299999	760

The History report shows the inventory data of each tank. The console stores the inventory of every tank, for every minute.

7.11.8 System/Alarms



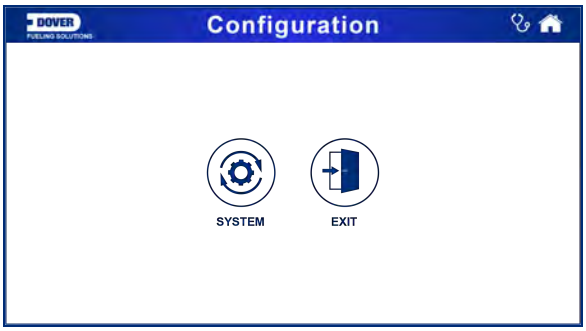
System

Note: Report for the last 7 days

TANK	TIME	PRODUCT LEVEL (mm)	PRODUCT VOLUME (lit)	WATER (mm)	WATER (lit)	STATUS
3	29.09.2020 16.45.31	608.64	3043.2	13.47	67.3	—
2	29.09.2020 16.45.33	250.00	1250.0	14.47	72.4	—
1	29.09.2020 16.45.18	351.39	5871.5	57.53	702.2	—
1	29.09.2020 16.45.03	—	—	—	—	ACKNOWLEDGE ALARM
2	29.09.2020 16.45.01	—	—	—	—	ACKNOWLEDGE ALARM
3	29.09.2020 16.44.43	—	—	—	—	ACKNOWLEDGE ALARM
1	29.09.2020 16.38.52	—	—	—	—	—
3	29.09.2020 16.36.03	608.64	3043.2	13.48	67.4	—

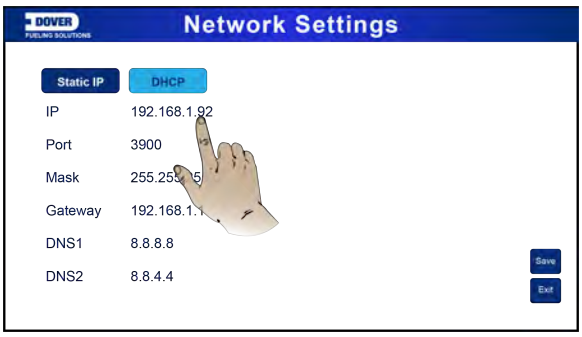
The System/Alarms report shows the alarms for the last seven days.

7.12 Configuration



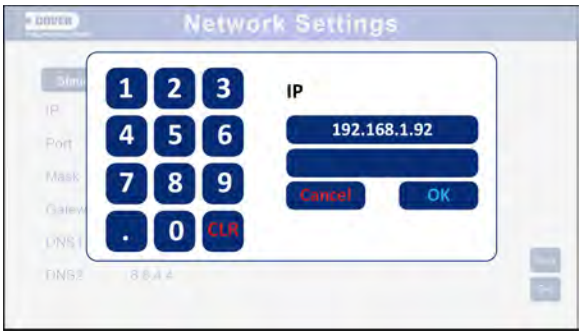
Push the **Configuration** icon on the *Main Menu*, enter your **Password** at the prompt and the "Configuration" screen will come into view.

7.12.1 System Configuration



Push the **System** icon on the *Configuration Menu* and the "Network Settings" screen will come into view.

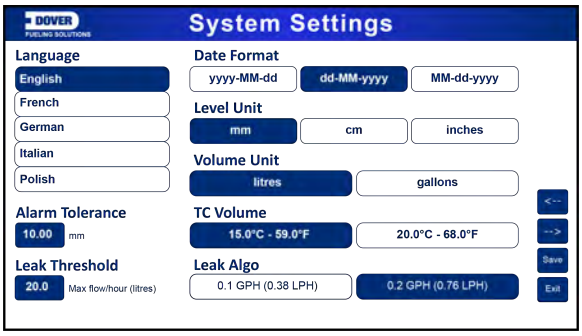
- Select a **parameter** to change. A keypad will come into view.



- Enter the new **value**.
- Click **OK** to save the value.

When you have completed all necessary changes, Click **Save**.

7.12.2 System Settings



Push the **Tank** icon on the *Configuration Menu* and the "System Settings" screen will come into view.

You can make changes to Tank configuration parameters in this screen (see the image above)

When you have completed all necessary changes, Click **Save**.

Push the **Exit** button to navigate from this screen to go back to the *Configuration menu*.

Section 8 Technical Support

When you ask for technical support from DFS, it is recommended that you give direct access to the console over the internet through ports 3000 and 22. As an alternative, the console can be connected to a site computer and technical support can get access through a third-party program (such as TeamViewer). If technical support cannot get access to the console in one of these two methods, the user must supply technical support with the log files and the database backup of the console.

Refer to the "Utility" section of the M2051 LX4 Configuration manual for for information on log files and the database backup in the console.

Revisions - M2052-EU

Revision #	ECO	Effective	Software Version	Key Changes
0	1785	8/19/2020		Initial Release
1	1836	12/3/2020		Adds Settings and Shifts
2	1891	4/7/2021		Corrected typo under GUI > Configuration. Add LX Plus characteristics, new address for Start Italiana
3	1944	8/10/2021		New screens for Inventory Detail, Leak Test, Reports, Reconciliation, Sensor Alarms, System Settings, Leak Test added to Main Menu, New Technical Support procedure.
4	1998	TBD		density value note under "Inventory." Screen updates.

NOTE: It is possible that older software versions might not support all features

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