



Density Measurement Option*

Installation Guide

T5 Series

Important: The density float is very fragile. Do not to damage the float’s coating; it provides electrical characteristics to avoid static discharge and prevent product absorption (which will cause incorrect readings).

Overview

T5 series consoles with magnetostrictive probes (TSP-LL2) serial # 6XXXXX can have the Density Measurement Option enabled. This feature measures and reports the density of product in a tank using the same probe by adding an additional float (called ‘density float’) that will be located around and below the product float (close to the surface of the product). The Density Measurement Option can be useful to help a site determine the quality of the product deliveries that they receive and whether or not they’ve been altered in any way.

Density is calculated based on the distance between the product float and the density float. Due to high accuracy requirements, the product float and the density float will be calibrated as a pair when they are shipped from the factory and must not be separated in the field. If either float is damaged, both will have to be replaced at the same time. Each pair of floats will be provided with a calibration constant that needs to be programmed into the ATG in addition to the probe gradient.

The float set will also include a water float, which does not affect density measurement and may or may not be installed.

All float sets will include one of each of the following:

- 3" product float
- 4" density float
- 4" water float

The density float part numbers are:

Part Number	Description
TSP-IGF4D	4" gasoline density float set
TSP-IDF4D	4" diesel density float set

Technical Specifications

Probe Part Number	Density Measurement Range
TSP-IGF4D	690-800 kg/m ³
TSP-IDF4D	790-900 kg/m ³

Density Measurement Accuracy	+/- 1.0 kg/m ³
Density Measurement Resolution	+/- 0.1 kg/m ³
Minimum Detectable Product Level	without water float – 170 mm (6.7") with water float – 270 mm (10.7")

* U.S. Patent 7,278,311
International patent pending

Installation

The selection and the installation of the probe is exactly the same as in cases of regular level measurement. The only difference is in the number and sequence of the floats. To install floats:

1. Remove the E-ring and washer from the bottom of the probe shaft.
2. Install the 3" product float on the shaft.
3. Slide the 4" density float on to the probe shaft with the cylindrical cavity facing the product float and the metal ballast facing the tip of the probe.
4. Install the water float if required.
5. Replace the washer and E-ring that you removed in Step 1.
6. Record the calibration constant marked on the bottom of the product and density floats. Make sure that both floats have the same constant. **Do not mix floats from different kits!**
7. Carefully move the floats to the bottom of the probe shaft to prevent damage. The product float should now be inside of the density float.

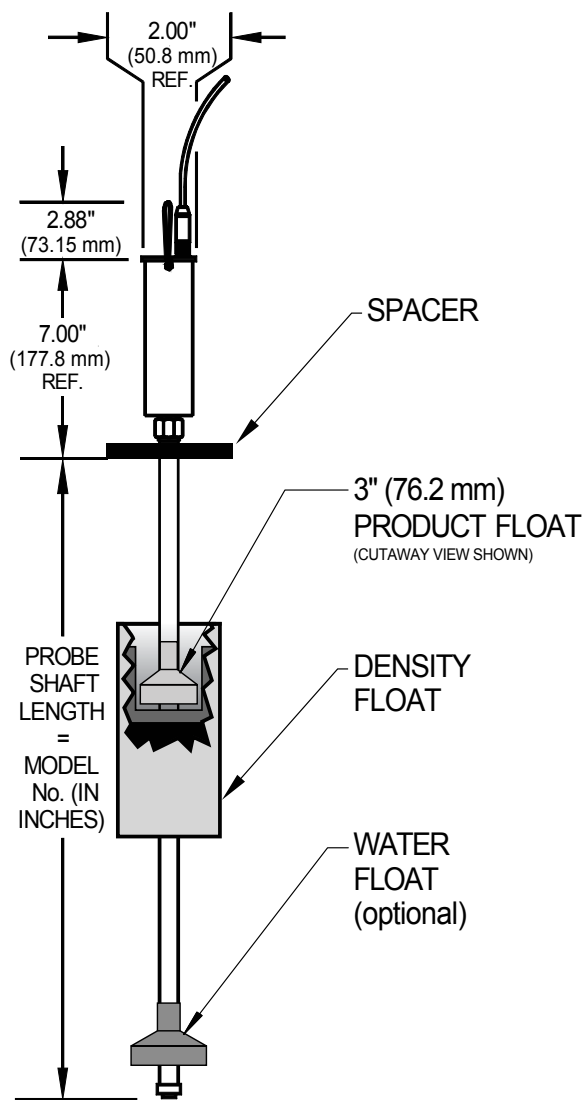


Figure 1

Setup

Setup can be performed using either a local user interface (LCD on the console) or a web interface (remotely connecting with Tank Sentinel Anyware). In both of these cases, the sequence is the same. Refer to Chapter 6 - Level Probe Installation in the *Automatic Tank Gauge/Leak Detection System Installation Guide* (p/n 000-1050) for complete probe setup information.

1. Under **FMS > Tanks > Tank N > Probe** select Float Type as *Gas Density* or *Diesel Density*. See Figure 2.
2. Enter the Density Calibration constant. This value can be obtained directly from the float that is being installed; refer to the Density Calibration field in Figure 4.
3. Under **FMS > Tank > Tank N > Limits**, two new parameters should appear: “High Density Limit” and “Low Density Limit”. These limits will be set to the default range limit, this limit can only be decreased to narrow the expected density. The ATG will generate an alarm when the density measurement is outside of this range. See Figure 5.

Float Type			
4 in gas	4 in diesel	3 in gas	
3 in diesel	2 in gas	2 in diesel	
Stainless	Propane	Gas Density	
Diesel Density			

Figure 2

[Setup (Modified)] / Fuel Management System / Tanks / Tank 1 / Probe		
Channel	Probe 1	
Type	Special 1	
Ratio	1 to 1 tip to head	
Float Type	Gas Density	
Water Float	Yes	

Figure 3

[Setup (Modified)] / Fuel Management System / Tanks / Tank 1 / Probe		
Density Calibration	200,010,000	
Gradient	9.01710	
Product Offset	.00	
Water Offset	-2.99	

Figure 4

[Setup (Modified)] / Fuel Management System / Tanks / Tank 1 / Limits		
High Density Limit	790.0	
Low Density Limit	690.0	

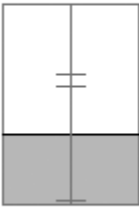
Figure 5

Web Interface

Fuel Management System		
	Ullage Percent	95 %
	Delivery Delay	1 min
	Correction Temperature	60.00 °F
	High Product Limit	Level
Static Tank Testing »		
Tanks		
	Number of Tanks	10
Tank 1		
	Name	Tank1 MagVFC 2
	Type	Special 1
	Manifolded	No
	Product #	1
	Delivery Threshold	10.0 gal
	Theft Threshold	5.0 gal
Probe		
	Channel	PRBLAB1
	Type	Standard 53
	Ratio	1 to 1 tip to head
	Float Type	Diesel Density
	Water Float	Yes
	Density Calibration	259709131
	Gradient	9.16228 µs/in
	Product Offset	0.00 in
	Water Offset	0.00 in
Generator Mode		
	Enable	No
SCALD »		
Limits		
	High High Product Level Limit	28.20 in
	High Product Level Limit	26.00 in
	High Water Level Limit	2.00 in
	Low Product Volume Limit	0.0 gal
	Low Low Product Volume Limit	0.0 gal
	High Density Limit	890.0 kg/m³
	Low Density Limit	790.0 kg/m³

Display

Density is calculated each time product volume is calculated.
Density is displayed in kg/m³ or g/cm³.

Tank1 MagVFC 2		Inventory	
Solvent 150 	Gross	153 gal	
		15.93 in	
	Net	152 gal	
	Ullage	247 gal	
	Water	11 gal	
		1.07 in	
	Temp.	67.64 °F	
Density	0.7914 g/cm ³		

Reports

The Inventory Report will display a column with density metrics.

Tank Sentinel AnyWare - Tank Status - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail New Tab

Address http://.../tank_status.html

Madison Engineering Lab - Administrator access level | gal | in | °F | kg/m³ | x

Franklin Fueling Systems Tank Status

Home System FMS VRM SCM Setup Preferences

Status Alarms Control Compliance Reports

Tanks Lines Sensors Pumps

TANKS

Image	Manifold ID	Tank ID	Name	Product	Alarms	Level	Gross Volume	Net Volume	Ullage	Water Level	Temperature	Density
		1	Tank1 MagVFC 2	Solvent 150		16.02	153.8	153.0	245.6	1.07	67.51	791.8

```

Madison Engineering Lab
3760 Marsh Road
Madison, WI 53718
1(800)838-1000
1(800)828-1000
USA
03/07/2007 14:49:32

Inventory Report
Last Available

Volume: gal
Length: in
Temperature: F
Density: g/cm³

TANKS

Tank1 MagVFC 2
Solvent 150
Maximum Capacity
432.00
Gross
152.70
Net
151.89
Level
15.92
Temperature
67.67
Density
0.7916
Ullage
246.69
Water Volume
11.01
Water Level
1.07
    
```

Print out from ATG console with Density status

Madison Engineering Lab
3760 Marsh Road
Madison, WI 53718
1 (800) 838-1000
1 (800) 828-1000
USA

Wednesday, March 07, 2007 14:58:50

Inventory Report

Last Available

	Volume:	Length:	Temperature:	Density:
units	gal	in	°F	g/cm³
	152.70	15.92	67.67	0.7921

TANKS

Tank1 MagVFC 2
Solvent 150
Max Capacity 432.00

Gross	Net	Level	Temperature	Density	Ullage	Water Vol	Water Level
152.72	151.89	15.92	67.67	0.7921	246.67	11.01	1.07

Print out from HP USB printer with Density Status


Field Calibration Procedure

Over time a float's weight can change due to sediment deposits, which can lead to systematically inaccurate readings. These inaccuracies can be minimized with the help of periodic system calibration.

Calibration can be conducted using comparison readings from the ATG and comparing it to the density obtained using a reference densitometer. In order to do this, it is necessary to take a product sample from the level near the density float. Before taking a sample record the ATG density reading 'Measured Density' and the temperature of the product. Measuring density of the sample with a reference densitometer you will obtain 'Actual Density' and 'Actual Temperature'. Set the same temperature for the Actual and Measured.

- If the readings are equal, Calibration is not necessary.
- If the difference between the Measured Density and the Actual Density is more than 5 kg/m³, the floats should be removed, cleaned, inspected and retested.
- If the difference between readings is more than 10 kg/m³ after the floats have been cleaned, they should be replaced.

Both measurements should be entered into the system, pressing the "Calibrate" button will recalculate density calibration constant and make all necessary corrections.

Madison Office - Administrator access level		xml en es ru zh_CN zh_TW	
 Franklin Fueling Systems		Density Probe Calibration	
Home System FMS VRM SCM Setup Preferences		Calibrate	
Status Alarms Control Compliance Reports		03/07/2007 14:20:39	
Tanks Sensors Pumps Probe			
<input type="checkbox"/>	Tank Name	Parameter	Value
<input type="checkbox"/>	Tank &1	Measured Density	681.0
		Actual Density	681.0

Important: If measured density and real density differ greatly, the probe needs to be extracted and inspected. Make sure that there is no debris on top of the floats. Clean if necessary.

INCON[®]



Franklin Fueling Systems

www.franklinfueling.com

3760 Marsh Road • Madison, WI 53718, U.S.A.

Tel: +1 608 838 8786 • Fax: +1 608 838 6433

Tel: USA & Canada 1 800 225 9787 • Tel: México 001 800 738 7610

Franklin Fueling Systems GmbH

Rudolf-Diesel-Strasse 20 • 54516 Wittlich, GERMANY

Tel: +49-6571-105-380 • Fax: +49-6571-105-510