FLUID ELECTRONICS
HIGH AND LOW LEVEL FLOAT SWITCH DUAL POINT ALARMS
MODEL FHLS 300 B & S

1. GENERAL DESCRIPTION

1.1. Containment Solutions provides a Fluid Electronics Dual Float High and Low Level Float Switch Sensor (FHLS 300) designed to provide a signal indicating that a liquid has reached one of two predetermined alarm points within a storage tank. The high and low level alarm points are determined at time of purchase and are not field adjustable. The sensor must be installed in a "Vertical" position within the storage tank.

1.2. The FHLS 300 sensor is Factory Mutual (FM) approved as an intrinsically safe system when used with CSI's Fluid Electronics' Control Panels.

2. FEATURES

2.1. The FHLS 300 Series High and Low Level Sensor is simple in design and operation. It consists of two floats, a float stem sized for the diameter of the tank and two dry-reed switches.

2.2. A magnet within each float actuates the reed switch that is hermetically sealed within the brass or stainless steel float stem. The switches are completely protected from exposure to liquid or vapor. Ten feet of cable extends from the top of the sensor.

2.3. The sensor may be installed up to 5000' from CSI's Fluid Electronics' Control Panel.

2.4. The High and Low Level "Alarm Points" are determined by the diameter and capacity of the storage tank. These points (reed switch positions) are set at the factory and can not be adjusted in the field. The switch is normally in the closed position.

2.5. The floats are 1.6" diameter stainless steel spheres. The "standard" float stem is constructed of ½" brass tubing - FHLS 300 B. An Optional Stainless Steel stem is available - FHLS 300 S. The length of the float stem is determined by the diameter of the tank. Movement of the float is restricted via the use of two stainless steel retainer clips that are placed directly above and below the customer specified alarm points. As little as a 3/8" movement of the float will actuate the reed switch.

2.6. The FHLS 300 Series Sensors are intended to be used in conjunction with one of the following control/alarm panels:

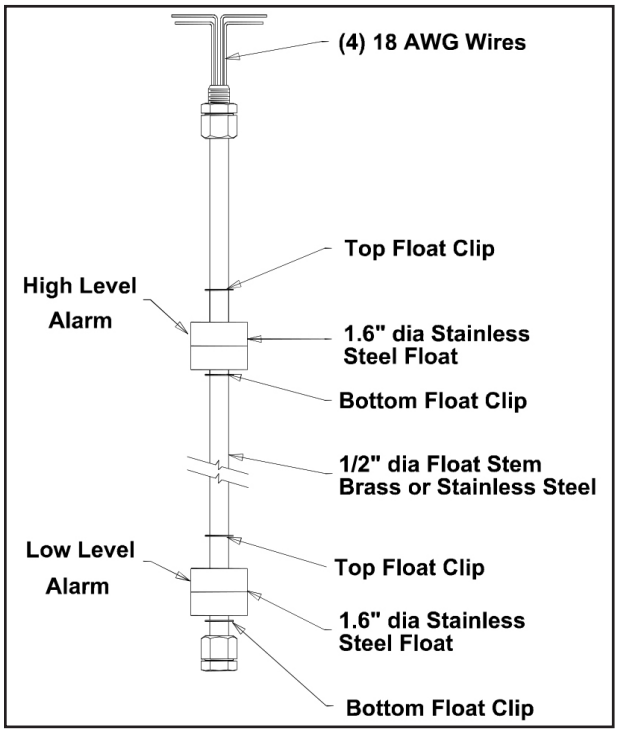
2.6.1. Fluid Electronics (CSI) - CPF 2, 3 & 4.

2.6.2. Pneumercator - LC 1000.

3. SENSOR OPERATION

3.1. The FHLS 300 High and Low Level Sensors are designed for "Vertical" installation in the top center line of tanks. Each float travels over a single reed switch as the liquid level rises and falls. The travel distance of the float is restricted by a retainer clip placed directly above and below the reed switch. Placement of the reed switches within the float stem, and consequentially placement of the retainer clips, are determined by the required high and low level alarm points. As the liquid level rises above the High Level Alarm Point, the reed switch opens and a signal is sent to the control panel, initiating an alarm condition. As the liquid level drops below the High Level Alarm Point, the reed switch closes, thus terminating the signal to the control panel and the alarm condition. As the liquid level drops below the Low Level Alarm Point, the reed switch opens and a signal is sent to the control panel, indicating an alarm condition. As the liquid level rises above the Low Level Alarm Point, the reed switch closes, thus terminating the signal to the control panel and the alarm condition. The FHLS 300 sensors are designed to operate in WET environments within petroleum storage tanks.

Figure 2-1



4. SPECIFICATIONS

Floats (2)	1.6" Dia., Stainless Steel
Float Stem	1/2" Dia. Brass - Standard Stainless Steel Optional
Retainer Clips (2)	Stainless Steel
Connector Cable	2 Conductor - 18 AWG (Each Switch) 10' Length, PVC Coated
Maximum Rating	400 Watts, 3 AMPS at 120 VAC (max)
Models	FHLS 304 - 4' Diameter Tank FHLS 306 - 6' Diameter Tank FHLS 308 - 8' Diameter Tank FHLS 310 - 10' Diameter Tank FHLS 312 - 12' Diameter Tank
Sensors (2)	Dry Reed type Switch (Hermetically Sealed)
Temperature Range	-20° F to 180° F (-29° C to 82° C)
Pressure	Full Vacuum to 150 PSI
Installation Distance	Up to 5000' from CSI's Fluid Electronics Control Panels
Approvals	FM, Intrinsically Safe for Class I, II and III, Division 1, Groups A, B, C, D, E, F & G when used with CSI's Fluid Electronics Model CPF Panels

5. INSTALLATION

5.1. The FHLS 300 sensor must be placed in a minimum 2″ NPT port, in the top centerline of the tank. If installed in a 2″ NPT opening, a reducing bushing must be used. The sensor assembly must remain in the vertical position for proper operation.

5.2. The installing contractor must supply the items listed in Table 5-1 to successfully install the sensor. The length of the sensor is designed so that when installed directly in the tank fitting, the alarm points are in the correct position in the tank. If the sensor is to be installed in a tank using a riser or manway, it is critical that the contractor remembers that the connecting conduit must be cut so that the top (threaded) part of the sensor assembly extends 1″ above the tank, into the tank fitting.

Table 5-1

No.	Description
1	4″ x 1/2″ NPT Double Tap Bushing
2	1/2″ NPT Conduit Pipe
3	1/2″ NPT Coupling
4	4″ NPT Riser Pipe
5	Explosion Proof Junction Box

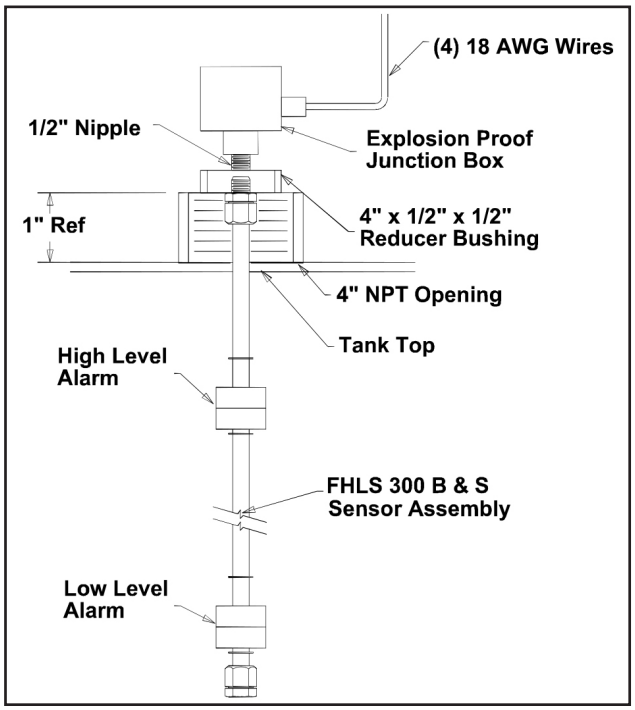
STANDARD TANK PORT MOUNTING

5.3. Standard Tank Fitting Installation (See Figure 5-1).

5.4. Attach the top (threaded) portion of the float stem to a 4″ x ½″ double tap bushing. The top of the stem must be threaded into the bottom of the bushing.

5.5. Attach a 1/2″ pipe nipple (or longer conduit) into the top of the bushing.

Figure 5-1



MANWAY AND RISER PIPE MOUNTING

5.6. Manway Installation (See Figure 5-2).

5.7. Riser Installation (See Figure 5-3).

5.8. Determine the length of ½″ conduit required to place the top of the sensor assembly 1″ above the top of the tank Thread both ends of the conduit.

5.9. Assemble a ½″ coupling onto one end of the conduit.

5.10. Pass the sensor wire through the conduit so that the top threaded end of the float stem is attached to the coupling.

5.11. Attach the other end of the conduit into the bottom of the double tap bushing.

Figure 5-2

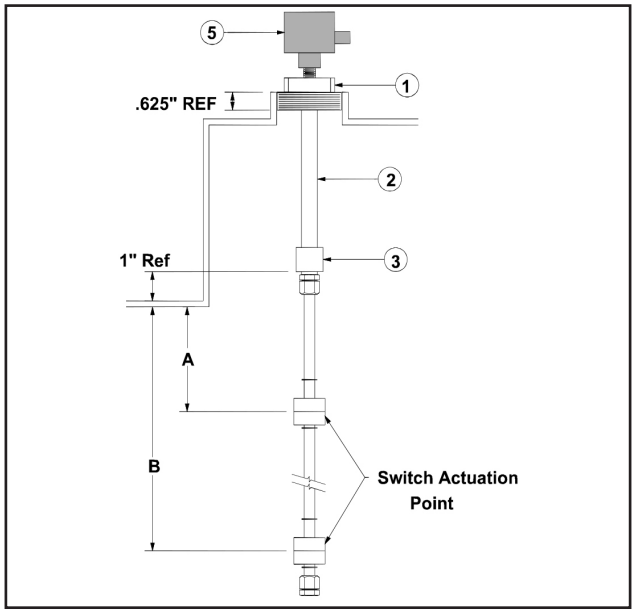
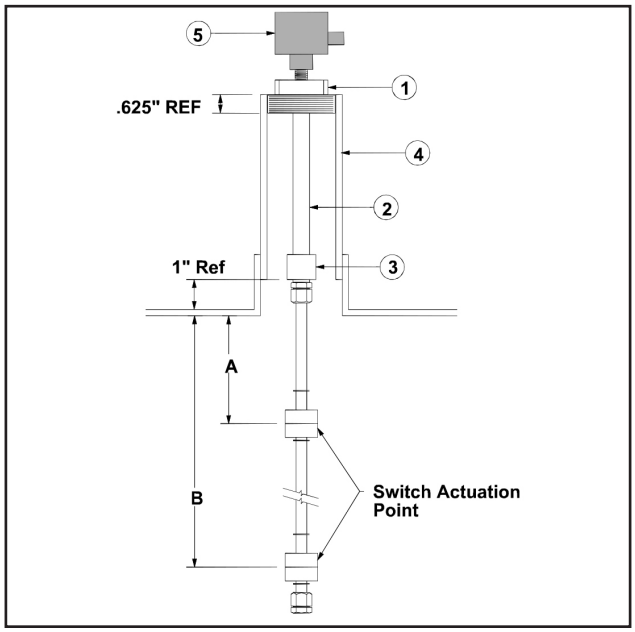


Figure 5-3



TANK PORT, MANWAY AND RISER PIPE MOUNTINGS

5.12. Standard Tank Fitting Installation (See Figure 5-1).

5.13. Attach an approved junction box to the nipple or conduit. The connector cable from the sensor must pass through the ½" opening in the bushing, into the junction box.

EXTRACTOR FITTING INSTALLATION

5.14. Extractor Fitting Installation (See Figure 5-4).

5.15. Extractor Fitting Sensor Installation (See Figure 5-5).

5.16. The FHLS 300 sensor may be installed in a 4" NPT opening, using the optional extractor fitting assembly. The sensor assembly must remain in the vertical position for proper operation. It is critical that the contractor remembers that the top (threaded) part of the sensor assembly extends 1" above the tank, into the tank fitting.

5.17. The extractor adapter is installed in a 4" NPT threaded tank coupling. The threaded ½" nipple of the sensor assembly screws into the 2 ½" male to ½" female threaded reducer. The threaded reducer is then screwed into the extractor fitting. The extractor fitting assembly is then installed in the extractor adapter. This installation allows the easy removal of the sensor for maintenance and observation.

Figure 5-4

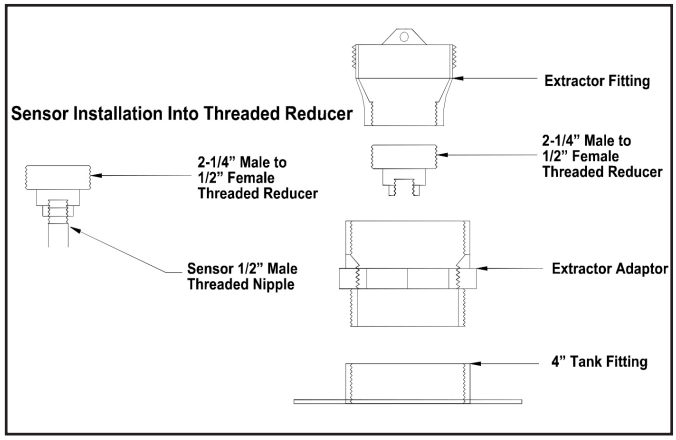
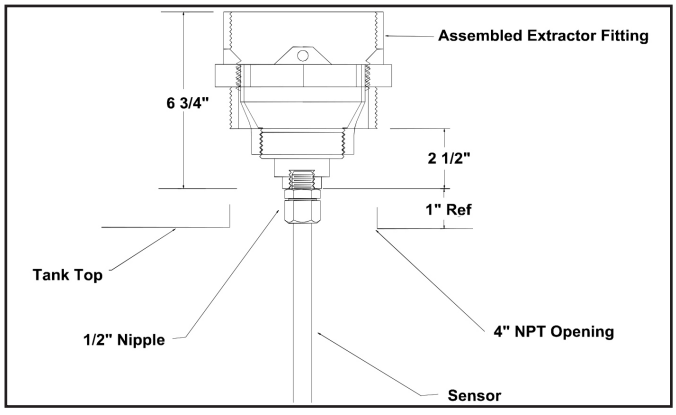


Figure 5-5



WIRING

5.18. The sensor is wired differently for various alarm panels and must be connected correctly with the alarm panel in order for the system to operate properly. See the control panel manufacturer's instructions for type of wire to be used and for the most recent wiring diagrams. All conduit and electrical junction boxes must be watertight to prevent intrusion of groundwater or rainwater from entering conduits and junction boxes. Ensure that wiring meets all local, state and national codes.

5.19. Fluid Electronics CPF Panel - Dual Alarms (See Figure 5-6).

5.20. Fluid Electronics CPF Panel - Single Alarm (See Figure 5-7).

5.21. Pneumercator LC-1000 - Dual Alarms (See Figure 5-8).

Figure 5-6

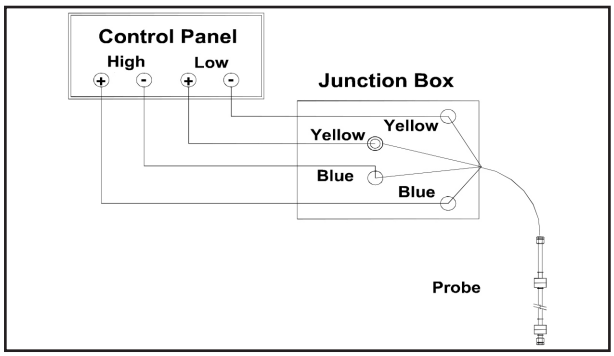


Figure 5-7

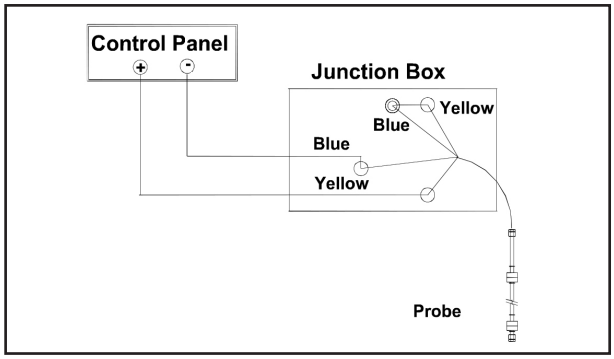
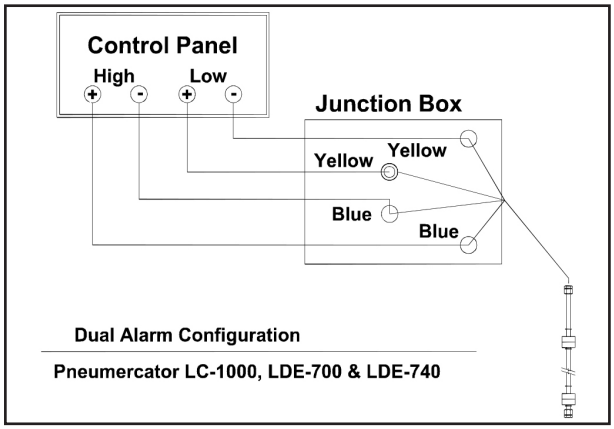


Figure 5-8



6. SENSOR TESTING AND MAINTENANCE

6.1. The sensor consists of two reed switches and two floats. To determine if the float switches are functioning properly these steps must be followed prior to installation, annually or when an alarm condition exists:

6.2. Prior to Installation

6.2.1. Connect the sensor to the Control Panel.

6.2.2. While holding the sensor assembly vertically in one hand, the High Level LED should not be illuminated, while the Low Level Alarm LED should be illuminated RED and the buzzer sounding.

6.2.3. Use your free hand to move the bottom float up against its top retainer clip. The red Low Level Alarm LED should go out and the buzzer should stop sounding.

6.2.4. When the lower float moves down, the red LED should illuminate again and the buzzer should sound.

6.2.5. The Low Level Alarm works. To test the High Level Alarm, move the Low Level Float into the up position again and keep it in place with a piece of tape.

6.2.6. Continue holding the sensor assembly vertically in one hand. Use the free hand to move the top High Level Alarm float up against the top retainer clip. The red LED should illuminate and the buzzer should sound.

6.2.7. When the float moves down, the red LED should go out and the buzzer should stop sounding.

6.2.8. Remove the tape from the bottom float and place the sensor assembly in the tank.

6.2.9. Tighten the double tap bushing into the riser pipe or tank fitting. Use petroleum compatible pipe dope to assure a watertight fit.

6.2.10. Check the alarm panel. The Low Level Alarm should be activated. Press the RESET Button, this will silence the buzzer until the fuel level in the tank is above the Low Level Alarm Point.

IMPORTANT: As the fuel level in the tank rises above the LOW Level Alarm point, the LED will go out. The system is activated and the next alarm condition could be the High Level Alarm. If the High Level Alarm activates during the filling procedure, STOP filling immediately. The fuel level has reached the high level point.

6.3. Periodic Testing

6.3.1. Remove the sensor from the tank. The control panel should be in the normal operations mode. The lower alarm indicator should be illuminated and the buzzer sounding.

6.3.2. Follow Steps in Section 6.2.2 through Section 6.2.10.