

# Ultrasonic Thru-Wall Level Switch Specifications



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## Features

1. Simple calibration using push button.
2. Single Pole Double Throw relay output 8A/230 Vac
3. RS485 Communication with diagnostics and data logging.
4. 3 wire operation.
5. PVC or TEFLON materials for transducers.
6. PVC electronics enclosures.



## Applications

Any Liquid:	Water Pharmaceutical Food and beverage
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## Approvals

CE:	IEC61010-1:90+A1:92+A2:95
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## Temperature Ratings

Electronics Enclosure:	-40 to 140°F (-40 to 60°C) Continuous Operation
PVC & Standard Sanitary Nozzle:	- 40 to 140°F(-40 to 60°C)
Teflon Nozzle:	- 40 to 266°F(-40 to 130 °C)

## Operational Specifications

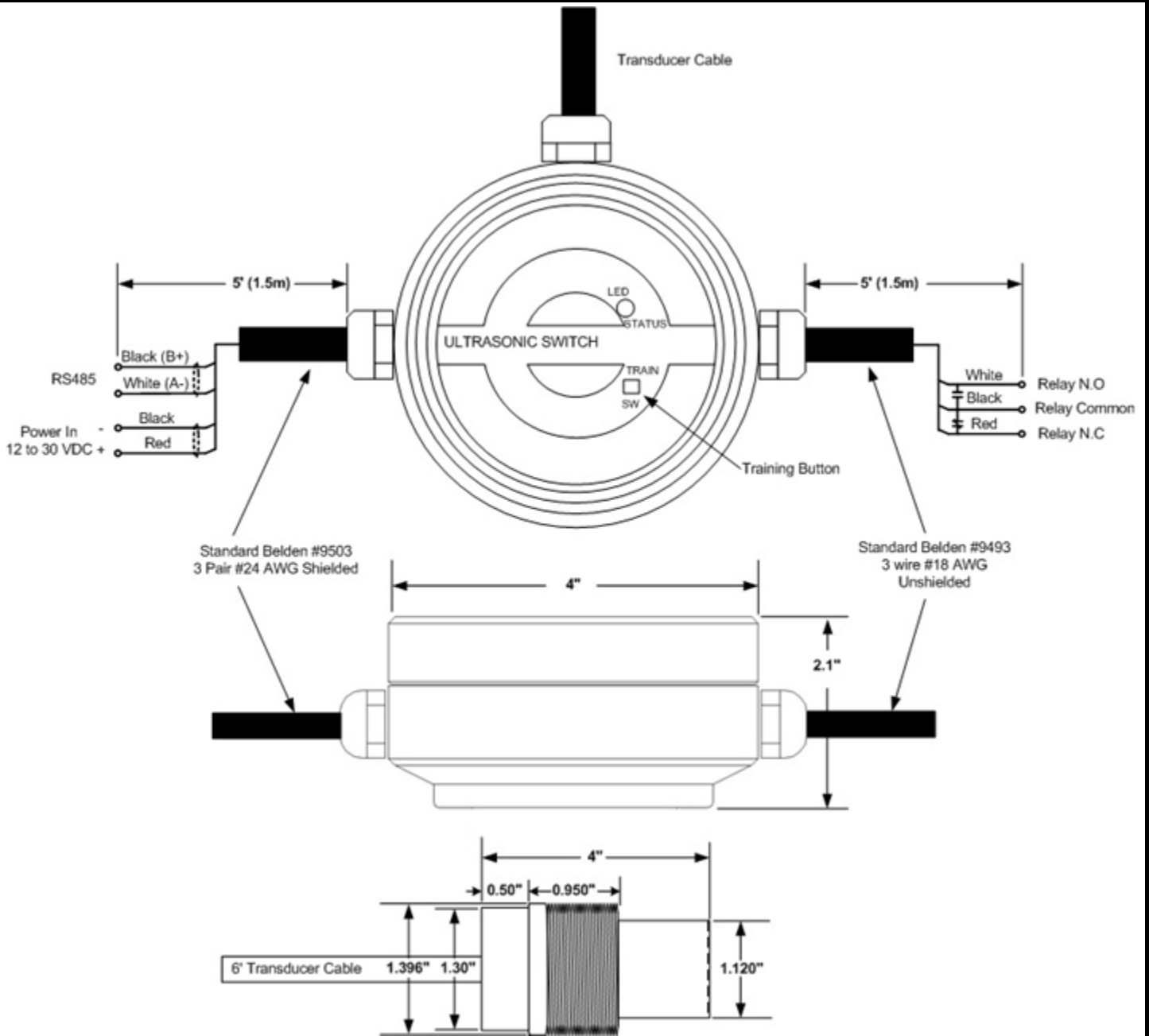
Accuracy:	+/-1 mm
Wall Thickness:	Thin Wall Mode ≤ 0.5 mm or 0.0197” Plastic or Metal Tanks Thick Wall Mode ≥ 0.5 mm or 0.0197” Metal Tanks Only
Tank Material:	Plastic or Metal
Calibration:	Push-button or programmable through RS485 port.

## Mechanical Specifications

Power / Communication Cable:	5’ - Belden #9503: 3 Pair #24 AWG Supply 12 - 30 VDC 1 Pair (Red/Black) Communication RS485 1 Pair (Black/White)
Relay Cable:	5’ - Belden #9493: 3 Wire #18 AWG Unshielded Relay: SPDT 8A / 230 VAC
Conduit Entry:	1/2” NPT Hole (PVC Conduit only for PVC Housing)
Enclosure:	PVC 94V0 Ingress Protection: NEMA 6 (IP68)

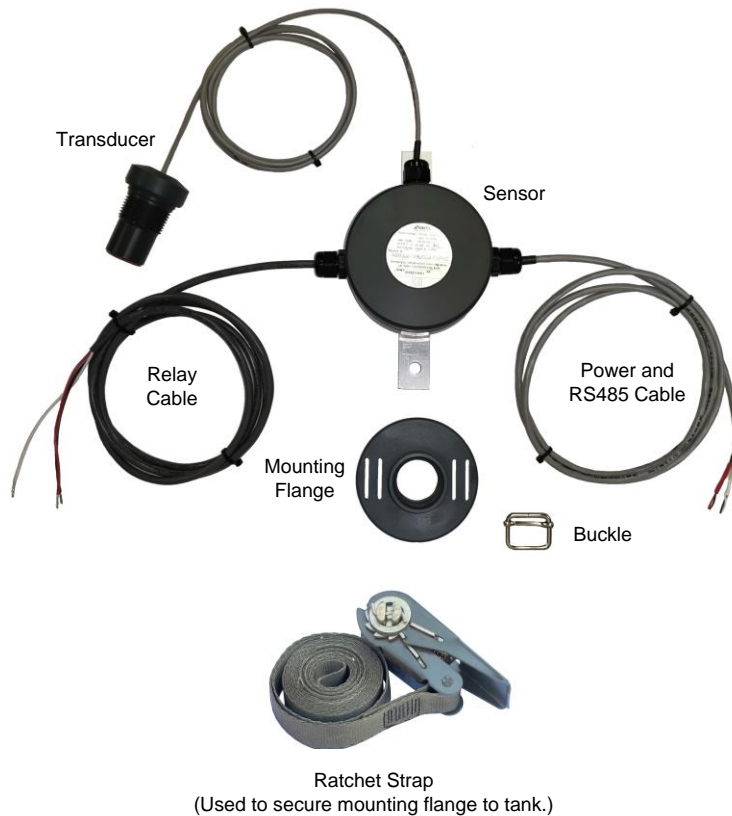
# Ultrasonic Level Switch

## Dimensions



Model #	Transducer Housing	Operating Frequency	Mounting Thread NPT
ABM300-148USC4-PVPVC-IP68	PVC	148 KHz	1"
ABM300-148USC4-PVTEF-IP68	Teflon	148 KHz	1"

# Ultrasonic Level Switch Components



As shown in the picture above the Ultrasonic Level Switch sensor system is composed of the following components:

1. Ultrasonic Sensor
2. Transducer (5 foot cable)
3. Power cable and RS485 communication cable (5 foot cable)
4. Relay cable (5 foot cable)
5. Tank mounting flange
6. 2 Buckles (used with Ratchet strap)
7. Ratchet Strap (used to strap sensor to tank)



Transducer Mounting Flange

The picture to the right shows the transducer mounting flange from the side view. The larger end of the flange is installed close to the tank. The transducer is threaded into the flange and the flange is secured to the tank using the ratchet strap and buckles.

## **Ratchet Strap**

The ratchet strap provides a simple and reliable method to attach sensors to round tanks. The tank diameter is required when ordering.

# Ultrasonic Level Switch

## User Manual

### Basic Switch Operation

The Ultrasonic Level Switch emits a short burst of ultrasonic energy. The energy is coupled through a rubber membrane to the tank causing the tank to vibrate. The tank vibrations are detected and analysed by the Switch. Based on the vibration patterns the Switch is able to detect the presence or absence of liquid inside the tank, and directly opposite the Switch.

When the liquid inside the tank is below the switch point of the Switch, the Switch's relay will be in the energized state referred to as the Normally Open (N.O) state (connecting the relay common to the relay normally open connector).

When the liquid inside the tank is above the detection zone of the Switch, the relay will be in the non-energized state referred to as the Normally Closed (N.C) state (connecting the relay common to the relay normally close connector).

### Thin Tank and Thick Tank Modes

The Ultrasonic Level Switch has two modes of operation "thin tank" and "thick tank". Thin tank mode is ideal for plastic tanks of any thickness and metal tanks with a wall thickness of 0.5 mm or 0.016". For thicker metal tanks the thick wall mode is recommended. Please note - the liquid detection method and calibration are different for thin tank mode and thick tank mode.

### Calibrating the Switch

After your Switch has been installed a simple calibration process must be performed using the calibration button on the Switch. (Alternatively you can download the ABM Switch Gateway Software and calibrate the Switch through the RS485 serial connection.) Your Switch must be calibrated to the dynamics and characteristics of your tank when the liquid level is above and below the Switch. The liquid level requirements are different for thick walled tanks and thin walled tanks.

### Calibrating The Switch Using the Switch Button (Thin & Thick Walled Tank)

The Ultrasonic Level Switch is equipped with a calibration button that can be used to calibrate the Switch to match the tank's characteristics. To access the calibration button on the Switch please remove the Switch's lid by unscrewing it. To activate the calibration mode using the button, power must be supplied to the Switch and the button must be pressed for the time specified in the Table below. Press the button until the LED turns the desired color and then release the button.

**Table 1 – Button Timing and LED Color**

Button Timing of the Ultrasonic Level Switch.		
Seconds Pressed	LED Color	Description
< 5	Off	If the button is pressed for less than 5 seconds it is ignored and no action is taken.
> 5	Yellow	<b>Thin Tank Mode</b> - The tank liquid is below the Switch. Calibrate the Switch for "liquid below" Switch tank characteristics. (See liquid level requirements) <b>Thick Tank Mode</b> – Start Thick Wall Tank calibration.
> 10	Red	<b>Thin Tank Mode</b> - The tank liquid is above the Switch. Calibrate the Switch for "liquid above" Switch tank characteristics (See liquid level requirements) <b>Thick Tank Mode</b> – Complete Thick Wall Tank calibration.
> 15	Off	If the button is pressed for greater than 15 seconds the sensor toggles between the Thick Walled Tank algorithm and the Thin Walled Tank Algorithm.  The sensor LED indicates the sensor's mode. Thick Walled Tank Mode (flashing green LED) Thin Walled Tank mode (Solid Green LED)

Where: < means less than and > means greater than.

# Ultrasonic Level Switch

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### **Calibrating the Level Switch - Liquid Level Below the Level Switch (Thin Walled Tank)**

The sensor must be in Thin Wall mode before starting the calibration. If the LED is blinking, the sensor is in Thick Wall mode. Toggle the sensor mode by pressing and holding the sensor's button for greater than 15 seconds as per **Table 1**.

For this step the liquid level must be a minimum of 2 inches (5 centimeters) below the Switch as shown in Figure 1. With the Switch powered on, the LED should be continuously green. Press and hold the calibration button. The LED will turn off, 5 seconds later it will turn yellow. Release the button when the LED turns yellow. The LED will blink green for 10 seconds while it is calibrating. When the Switch calibration cycle is finished the LED will stop blinking and remain green.

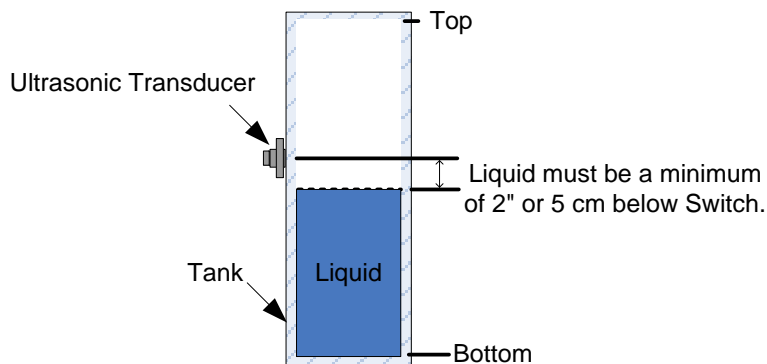


Figure 1 Calibrating the Switch when the liquid level is below the Switch. (Thin walled tank)

### **Calibrating the Level Switch - Liquid Level Above the Level Switch (Thin Walled Tank)**

For this step the liquid level must be a minimum of 2 inches (5 centimeters) above the Switch as shown in Figure 2. With the Switch powered on, the LED should be continuously green. Press and hold the calibration button. The LED will turn off, after 5 seconds the LED will turn yellow, after another 5 seconds the LED will turn red. Release the button when the LED turns red. The LED will blink green for 10 seconds while it is calibrating. When the Switch calibration cycle is finished the LED will stop blinking and remain green.

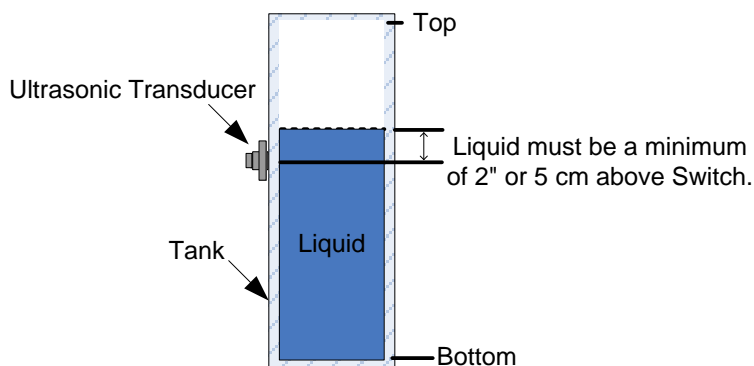


Figure 2 Calibrating the Switch when the liquid level is above the Switch. (Thin walled tank)

# Ultrasonic Level Switch

## User Manual

### **Calibrating the Level Switch - Liquid Level Below the Level Switch (Thick Walled Tank)**

For this step the tank should be empty, if that is not possible then start with the liquid a minimum of 2" or 5 cm below the sensor as shown in Figure 3. With the Switch powered on the LED should be green. Press and hold the calibrating button. The LED will turn off then 5 seconds later it will turn yellow. Release the button when the LED turns yellow.

The sensor is now in calibration mode.

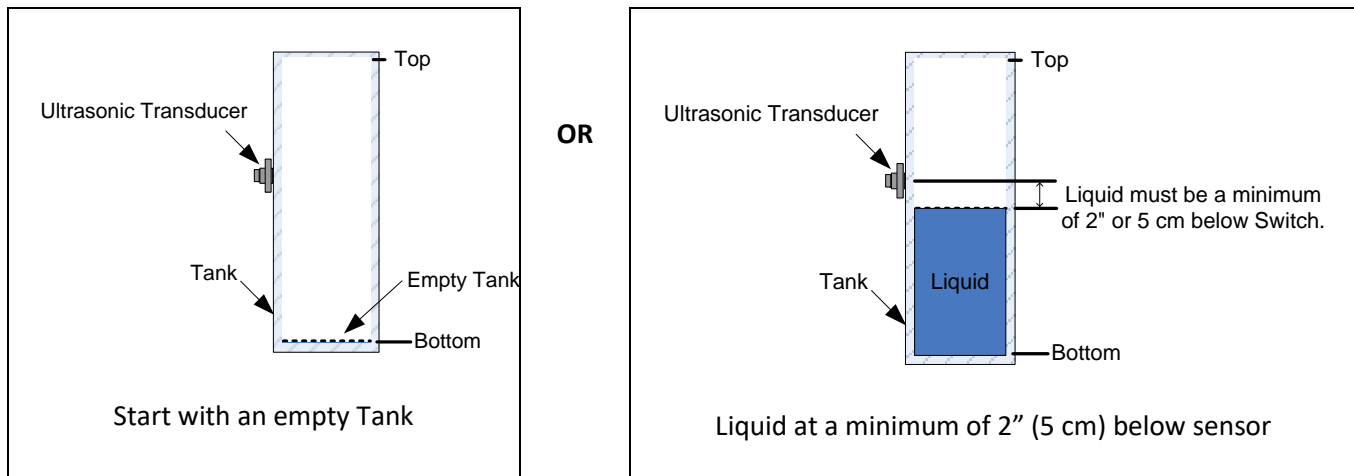


Figure 3 Before starting Thick Walled Tank calibration the tank should be empty or the liquid level should be 2" or 5 cm below the sensor.

Start filling the tank using your normal filling process. Fill the tank to the normal full level. If the tank cannot be filled completely, it must be filled to at least 2" or 5 cm above the sensor as shown in Figure 4.

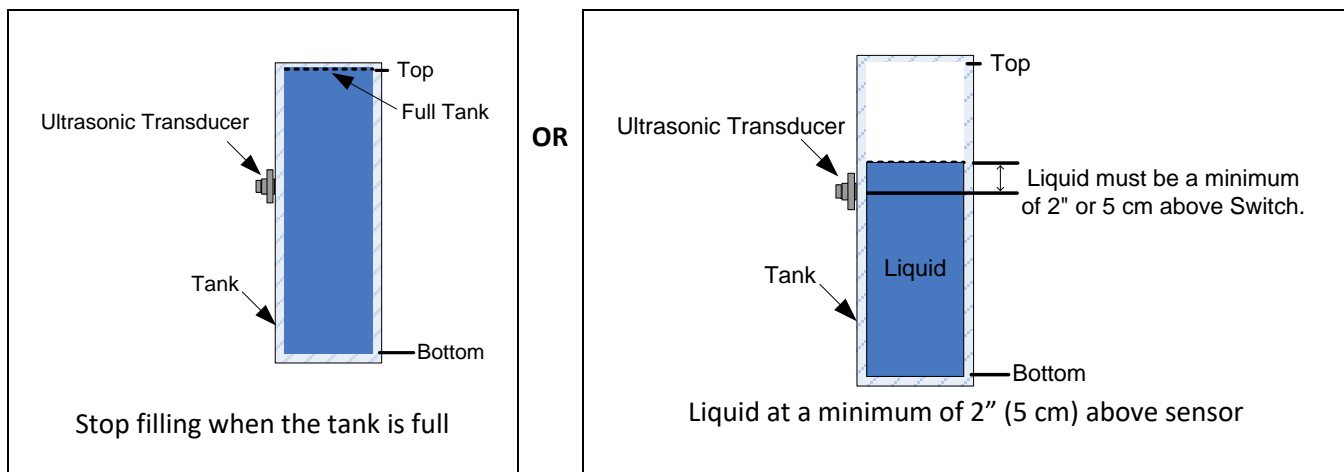


Figure 4 Fill the tank until full or at a minimum of 2" or 5 cm above the Level Switch.

With the tank is as full as possible, press and hold the calibration button. The LED will turn off then after 5 seconds the LED will turn yellow, after another 5 seconds the LED will turn red. Release the button when the LED turns red.

**Calibration is now complete.** If the LED blinks red 10 times the calibration failed. If the LED blinks green only the calibration was successful. You must test the new calibration by filling and emptying the tank. For more information about calibrating and using the Switch refer to the Ultrasonic Level Switch User Guide available from the [ABM Sensor Technology website](http://www.abmsensor.com).

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