

Tank Installation Guide for Massa Ultrasonic Liquid Level Sensors

PURPOSE

This guide aids in the selection of proper mounting locations on tanks for Massa Ultrasonic Liquid Level Sensors. Incorrect installation may result in inaccurate measurements.

OVERVIEW

Massa Sensors operate by transmitting a narrow beam of ultrasonic sound that reflects from the surface of the liquid in a tank and returns to the sensor, as illustrated in **Figure 1**. The distance to the liquid is computed by measuring the amount of time for the echo from the transmitted sound pulse to travel to the liquid surface and then back to the sensor.

In order to produce accurate liquid level measurements the sensor must be mounted properly to the tank to ensure that the echoes from the surface return to the sensor, and that “false echoes” are not created by objects in the path of the sound beam.

The following sections discuss some common installation problems that must be avoided.

INSTALLATION PROBLEMS

Incorrect “Empty Tank” Reports, Due to “Off Angle” Echoes That Do Not Return to the Sensor

The Massa Sensor must be mounted level to ensure that the conical sound beam is perpendicular to the liquid surface. If the axis, of the sound beam, is not perpendicular to the liquid surface the reflected echo will not return to the sensor for detection.

An unlevel sensor problem can be caused in several ways. For example, if the sensor is mounted “off angle” as shown in **Figure 2**, the echo will not be detected. A similar situation occurs if the tank is tilted so that the bottom and top are not level.

To overcome this problem, self-aligning bulk head fittings may be required for mounting the sensor.

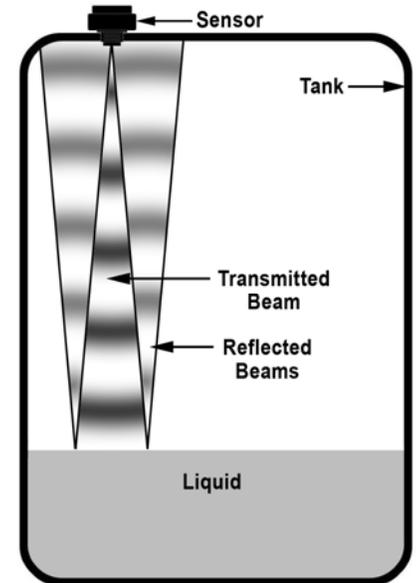


Figure 1

Illustration Showing a Sensor Mounted on a Tank Transmitting a Conical Ultrasonic Beam That Reflects From the Liquid Surface

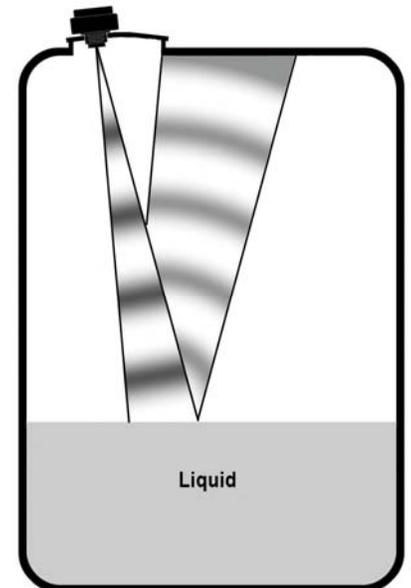


Figure 2

Illustration Showing a Sensor Mounted on a Tank “Off Angle”, So That the Reflected Echo Does Not Return

INSTALLATION PROBLEMS (Continued)

Incorrect “High Liquid Level” Reports, Due to Obstructions in the Path of the Sound Beam

The path of the ultrasonic beam must be free from any obstructions that could reflect the sound and cause a “false echo” to return to the sensor before the echo from the surface of the liquid. **Figure 3** shows some typical mounting issues that must be avoided.

If the sensor is mounted so that the sound beam hits the tank wall before the liquid surface, any reflecting surfaces on, or near, the side of the tank can produce a “false echo”. Common examples of reflecting surfaces that produce “false echoes” are recessing or protruding tank seams, or structures mounted in the tank, such as ladders.

To overcome this problem, the Massa Sensor should be mounted closer to the center of the tank, so that the sound beam does not intersect any objects or reflecting surfaces.

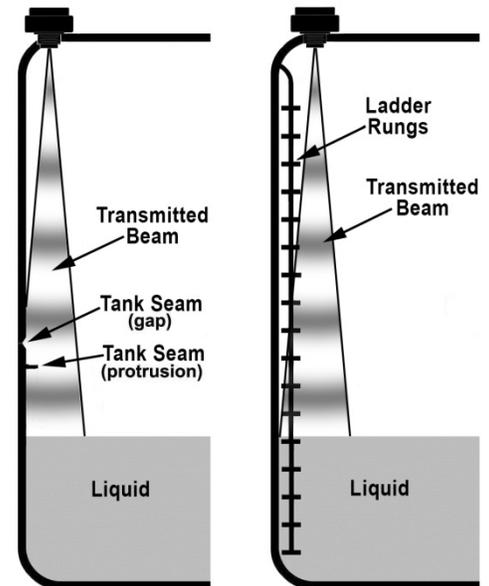


Figure 3

Illustrations Showing How Obstructions Within the Sound Beam Can Produce “False Echoes”

Incorrect “High Liquid Level” or “Empty Tank” Reports When the Tank Is Being Filled

Tanks can be filled either from the side or from the top. If the liquid entering the tank from the side intersects the sound beam, it can either disperse the sound so that no echo returns to the sensor, or reflect the sound and create a “false echo”. Fluid entering the tank from either the top or the side can severely agitate the surface of the liquid. This can cause the sound beam to be dispersed, and the weak echo produced may not return to the sensor. These two scenarios are shown in **Figure 4**.

To overcome this problem either, mount the Massa Sensor in a location so that the sound beam is not affected by incoming fluid, or disregard liquid level measurements taken when filling agitates the surface. Then wait until liquid level is high enough to produce detectable echoes.

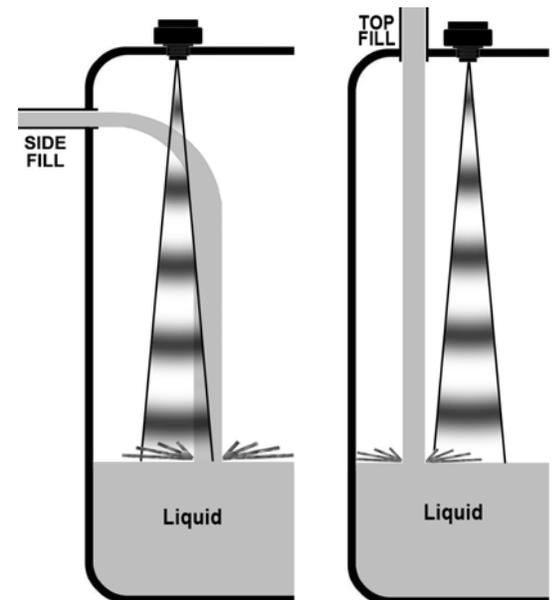


Figure 4

Illustrations Showing How Filling the Tank Can Disrupt the Sound Beam and Produce “False Echoes” or Echoes Too Weak to Be Detected

Incorrect “High Liquid Level” Reports Caused by the Sensor Being Mounted Onto a Standpipe

If a Massa Sensor is mounted onto a long standpipe that is small enough in diameter for the sound beam to hit the sides at the opening into the tank, a “false echo” can be reflected. The sensor will interpret the echo from the opening, which arrives before the echo from the liquid, as a “high liquid level”.

To overcome this problem, a larger diameter or shorter standpipe can be used, or the sensitivity of the sensor can be lowered.