

Measuring Transition Points in Liquids with Different Densities with Sensortech's Capacitive CLC and CLW Level Sensors

1 INTRODUCTION

Sensortech's capacitive CLC and CLW sensors allow for contact-free measurement of liquid level and can be easily mounted to the outside of a container or vessel. The CLC series measures continuously whereas the CLW devices detect point levels.

Further more, due to their sensitivity and teaching possibilities these sensors can be used to determine transition points between any two liquids with different densities and a sufficient difference in relative permittivity (ϵ_r).

A typical application is the detection of water accumulating at the bottom of an oil tank to prevent contamination of oil systems.

This application note provides instructions on how to teach the CLC and CLW sensors to achieve optimum results.



Fig. 1: Example of continuous oil over water detection with Sensortech's CLC sensor

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2 OIL OVER WATER DETECTION

2.1 Continuous detection of the water level in an oil tank

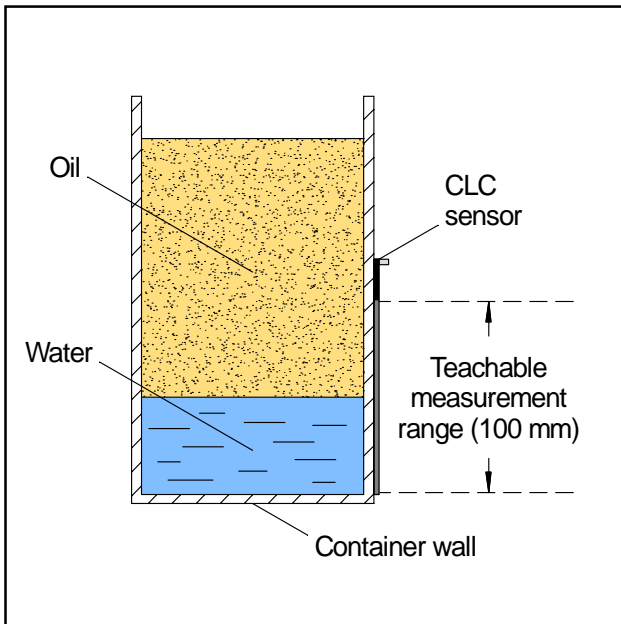


Fig. 2: Setup of continuous oil over water detection

Teach-in procedure

1. Attach the CLC sensor to the tank so that the tip of the sensor pad reaches the bottom of the container (see teachable measurement range in Fig. 2).
2. Fill the container with the liquid which has the lower ϵ_r (in this application the oil) so that at least the complete sensor pad is covered.
3. Teach the CLC sensor to LOW level
4. Fill the container with the liquid which has the higher ϵ_r (in this application the water) to the desired maximum level. For best results the complete sensor pad (100 mm) should be covered.
5. Teach the CLC sensor to HIGH level

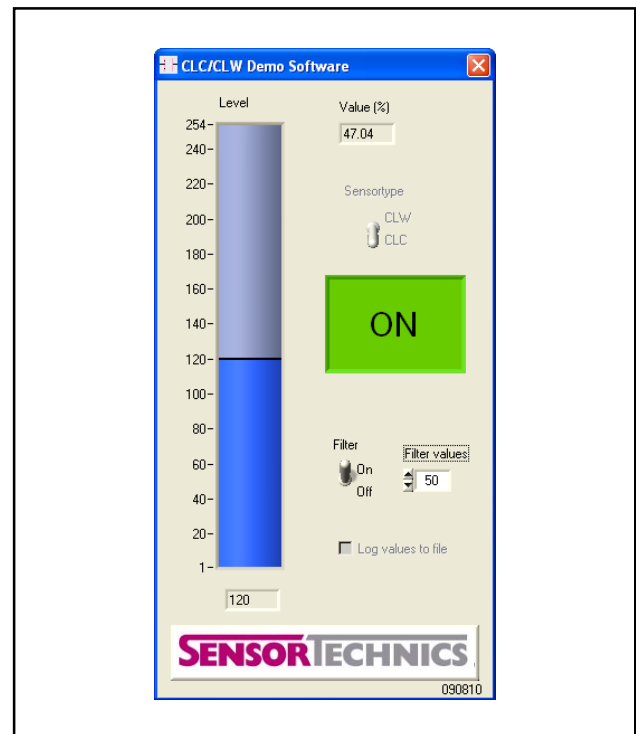


Fig. 3: Level visualisation for continuous oil over water detection (here approx. 50 mm of water from bottom of the tank). For level visualisation an RS232 adapter may be used to convert the 1-wire signal given by the CLC sensor.

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2.2 Point level detection of the water level in a transparent oil tank

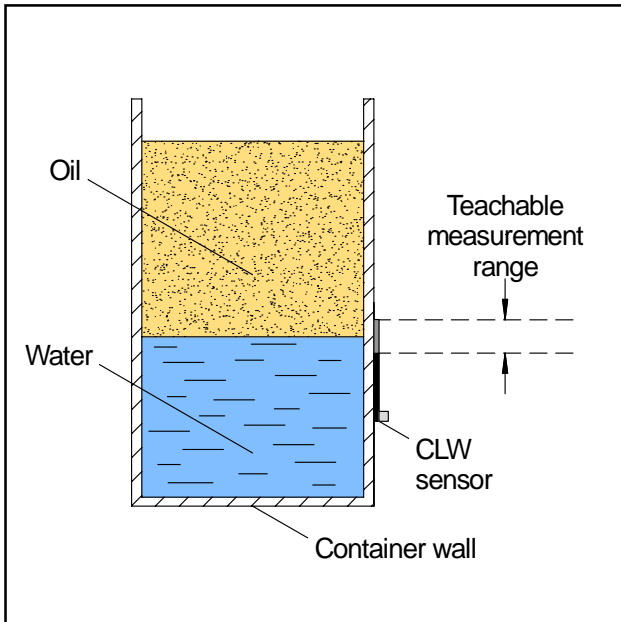


Fig. 4: Setup of point level detection of oil over water

Teach-in procedure

1. Attach the CLW sensor to the tank so that the water/oil boundary lies centred to the sensor pad (see teachable measurement range in Fig. 4). Make sure not to use the very edges of the sensor pad.
2. Teach the sensor to LOW level.
3. For minimum hysteresis teach the sensor to HIGH level at the same unchanged level of the water/oil boundary. In this configuration the hysteresis will be minimised to only a few digits (depending on the mounting and environmental conditions).

2.3 Point level detection of the water level in an opaque oil tank

Teach-in procedure

1. Attach the CLW sensor to the tank so that the sensor pad matches with the water level that must not be exceeded.
2. Completely fill the container with the liquid which has the lower ϵ_r (in this application the oil).
3. Teach the sensor to LOW level
4. Completely fill the container with the liquid which has the higher ϵ_r (in this application the water).
5. Teach the sensor to HIGH level

In this configuration the maximum hysteresis applies, i.e. the sensor switches to HIGH when the water level reaches the upper end of the sensor pad and switches back to LOW when it falls below the lower end of the pad (see Fig. 5)

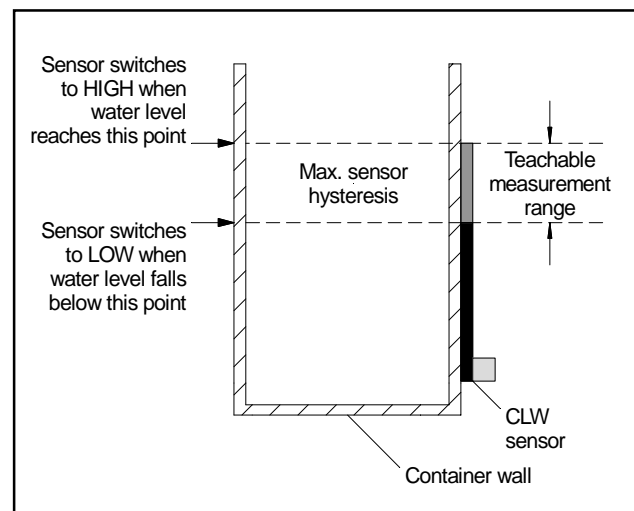


Fig. 5: Principle of point level detection of oil over water in an opaque tank