LV3000 and LVCN410 Series
Continuous Level Measurement
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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.
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Introduction

LV3000 and LVCN410 Series
Continuous Level Measurement

The LV3000 Series Capacitance Level Measurement System is designed to measure and control the level in most industrial applications. The LV3000 probe works in conjunction with the LVCN410 Series of level controllers. The LV3000 is available in 316SS with optional ETFE tubing or ECTFE coatings (required for conductive or aggressive mediums). The LVCN410 controller with an integrated bar graph display gives the operator an overview of the level within the vessel. With 4…20mA output signal and up to 2 Relay switch outputs, this system provides a complete level control solution for most applications.

How it works:
A capacitor consists of the probe’s rod as one plate and the metallic wall of the vessel (or a secondary reference rod or sheath) as the other plate. As the medium rises and displaces the empty space within the vessel, the dielectric constant around the probe changes. This change is recorded and converted into either a relay switch output or a 4…20mA output signal which is proportional to the level within the vessel. By using this principle, the LV3000 + LVCN410 Series can be applied in a wide range of products such as most liquids, powders, pastes and granular mediums.

Features

➤ Used in a wide range of application/industries
➤ Accurate and reliable measurement.
➤ No moving parts - Rugged construction.
➤ Can operate at high temperatures and pressure.
➤ Functions on conductive as well as non-conductive medias.
Mounting Options
Extended Necks for Higher Temperatures

Note: Medium Temperature (up to 120°C) and High Temperature (up to 150°C)

LV3000 Standard
Aluminum Housing
LV3000 Standard
Reference Rod
LV3000 w/ cable
(also w/ Reference Cable)

Obs: Minimum Insertion Length for the LV3000 is 1/2 meter

Process Connection

<table>
<thead>
<tr>
<th>Threaded</th>
<th>Tri-Clamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; NPT</td>
<td>1 1/2&quot; FF</td>
</tr>
<tr>
<td>1&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>2 1/2&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; FF</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
</tr>
<tr>
<td>2 1/2&quot;</td>
</tr>
</tbody>
</table>

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Features

- Bargraph Level Indicator from 0 to 100%
- Output 4...20mA or (0...5 Vdc optional) with Zero and Span adjustment
- 2 Outputs Relay (Low and High) with individual set-point Adjustment
- Power Supply available in 24Vdc (LVCN411) or 85...265Vac (LVCN412)
LV3000:

The LV3000 Series works in conjunction with the LVCN410 Controller. Do not power the probe with another brand of controller.

**ALUMINUM HOUSING**

L1- LED Status: Connected
S1- Sensitivity Control
P1- Power Supply and Output Signal.

---

**Important**: Before connecting the equipment, make sure it is properly powered as shown on the ID tag.

**LV3000 & LVCN410**

[Diagram of LV3000 and LVCN410 connections]

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Wiring Diagram

LVCN410

A- Bargraph Level Indication.
B- LED Set-point Indication (Low & High).
C- Adjust Zero (low level).
D- Adjust Span (high level).
E- Adjust Set-point.

Power Supply
DC: 24Vdc ± 10% (LVCN411)
AC: 85...265Vac (LVCN412)
Mediums that are conductive will cause a short circuit between a bare stainless steel probe and the tank wall. For that reason we recommend the use of ECTFE or other types of insulating coatings on the rod's surface. (Fig. 1)

Material build-up also affects the accuracy of RF capacitive measurements, and therefore additional adjustment to the probe's sensitivity is recommended in applications where build-up is a concern. (Fig. 2)

Housings must also be compatible with the requirements for wash-down, wet, and/or dusty environments. Hazardous environments may require the housing to be certified. In addition, the active probe might need to be intrinsically safe or have an intrinsic safety barrier. (Fig. 3)

The electronic circuitry of the probe performs several functions such as rectifying and filtering the incoming power, generating the radio frequency signal, measuring the changes in current flow, analog signal generators and display meters. The circuitry is provided with potentiometer adjustments for setting sensitivity that is located in the housing of the probe. These adjustments give an added level of fine-tuning which enable the user to control the probe's sensitivity with greater accuracy. (Fig. 3)

Variation in current input (power supply) to the probe will affect the output. Therefore, a stable power supply should be available. (Fig. 4)
Mounting Notes

- When making connections between the controller and the probe use reliable cables and make sure they are grounded.
- Shielded cables prevent interference improving and protecting against false measurements.
- Do not install the controller in harsh environments and humidity.
- Respect class protection, working temperature and protect the same from rain and excessive heat.
- A stable power supply prevents damage and equipment malfunction.

Panel mounting with the protection cover
C- DIN trail (35mm)
D- Screws (3,5mm)
Note: LVCN410 can be installed vertically or horizontally.
When installing the probe either directly to the tank, or utilizing a connection, the capacitance probe should be mounted on the top of the tank, never on the side or angle, so that the rod stays parallel to the tank wall.
(Fig. 1 correct Fig. 2 Incorrect)

The mounting location of the probe should stay clear away from the point where the medium enters, this will avoid false reading from the sensor while being filled.
(Fig. 1 correct Fig. 2 Incorrect)

The recommended distance of installation of the probe from the internal wall is a minimum of 500mm, and from the tip of the rod to the bottom of the tank is 100mm, this will prevent a false signal and possible build up between the wall and probe.
(Fig. 1 correct Fig. 2 Incorrect)

**Note:** For high pressure and explosion proof applications, care should be taken when tightening the connection as achieving a proper seal is very important.
In order to achieve a linear output signal, the main rod of the probe must have a parallel reference either to the tank or to a secondary reference rod or sheath. If the probe is mounted without this parallel reference within a cylindrical tank that is mounted on its side, the output signal will not be linear. Please consult one of our application engineers if you have further questions.

(Correct/Fig.2 incorrect)
The tank must be free from turbulence or vortices throughout use. If this is not possible we highly recommend a stilling well or sheath. (Fig. 1 correct, Fig. 2 incorrect)

Ensure that mounting position does not interfere with any obstructions within the vessel or tank. (Fig. 1 correct, Fig. 2 incorrect)
Installation

When installing the LV3000 with cable and reference be sure that they are well connected to the bottom of the tank and that it has no slack. (Fig. 1 correct Fig. 2 Incorrect)

The mounting location of the probe should stay clear away from the point where the medium enters, this will avoid false reading from the sensor while being filled. (Fig. 1 correct Fig. 2 Incorrect)

The recommended distance of installation of the probe from the internal wall is a minimum of 500mm, and from the tip of the pendulum to the bottom of the tank is 100mm, this will prevent a false signal and possible build up between the wall and probe. (Fig. 1 correct Fig. 2 Incorrect)

If the cable is secure to the bottom of the vessel it must be isolated and the vessel is steel it must be isolated so that it does not create a short circuit.
LVCN Controller Calibration

Adjustment 4mA

It is recommended that an multimeter be connected according to the figure(fig.4) to monitor the current value during the calibration. Prior to calibration it is recommended that both potentiometers are reset. Turn both potentiometers counter-clockwise or approximately 5 turns. (Fig. 1) The bargraph is calibrate according to the signal (4mA-0% and 20mA- 100%).

1) Drain the tank to minimum level (Zero% or 4mA).

2) Select the Sens. switch 1,2,3 located in the probe Unit LV3000. It is recommended to begin with Sens. switch 1. (Fig. 2)

3) Use the Zero potentiometer to set the current value for the actual level to 4mA or 0%. Turn the potentiometer clockwise to increase current. Turn the potentiometer counter-clockwise to decrease current. If you are unable to set the probe at 4mA, alter the Sensitivity potentiometer (Fig.2) position and try to adjust the minimum value (4mA) through the Zero Potentiometer again. (Fig.3)
Adjustment 20mA

After calibrating the minimum value (4mA or 0%), fill up the tank to maximum level (100% - level).

4) Use the Span potentiometer to set the current value for the actual level to 20mA or 100%. Turn the potentiometer clockwise to increase current. Turn the potentiometer counter-clockwise to decrease current (Fig.5).

5) If the current is lower than 20mA or 100% after fully turning the Span Potentiometer clockwise, it is necessary to increase the sensitivity by selecting the next level of the switch ( Sens.). If the current still remains lower than 20mA or 100%, continue on to the next level until achieve 20mA.

6) With the 20mA or 100% signal adjusted it is best to re-adjust the Zero. Drain the tank back down to the starting level and re-adjust (if necessary) the minimum level to 4mA or 0% one more time. After this stage, set-up is complete.
**LVCN410 Set-Point adjustment**

After completed the calibration, it is necessary to be done to adjust the set-point outputs of the case is used.

LVCN410 controller has 2 outputs Relay (SPDT), with indication LOW and HIGH. To adjust, make sure the outputs are not actuated (statement made by the LED’s), if necessary turn the potentiometers clockwise (fig.1).

1) Low Level Control.
   Fill the tank to the first point, then turn the potentiometer (Low) counter-clockwise until the LED indicator turn-on.

2) High Level Control.
   Fill the tank to the second point, then turn the potentiometer (High) counter-clockwise until the LED indication turn-on.

With two adjusted points, confirm the points draining and filling the tank until the set-points, re-adjust if necessary.
Handling

Probes:

Seal the thread with Teflon tape before installation. (Fig. 1)

Do not turn or handle by the housing. (Fig. 2)

When tightening the sensor, use only use the 316S.S. hexagon fitting to achieve a seal, do not twist with the body of the sensor. (Fig. 3)

The probe should not be dropped or suffer any impact or fall that could damage the electronics or the coating of the probe. (Fig. 4 and 5)

Periodic visual inspection of the probe is required to check for corrosion or deposit build-up. If deposits are found, clean the sensor to ensure optimum performance.

Care should be taken when handling and installing probes with coated rods to avoid scratching them. Scratching the coating could interfere with the probe performance.

When cleaning the rod use a soft brush or any other similar object.
## Technical Specification

### LV3000 Aluminum Housing

![LV3000 Aluminum Housing](image)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application</strong></td>
<td>Continuous Level Measurement for Liquids and Solids</td>
</tr>
<tr>
<td><strong>Current Consumption</strong></td>
<td>22mA max</td>
</tr>
<tr>
<td><strong>Adjustment</strong></td>
<td>Sensibility, (1,2,3 stages)</td>
</tr>
<tr>
<td><strong>Sensitivity Range</strong></td>
<td>100 to 5500pF</td>
</tr>
<tr>
<td><strong>Frequency Oscillation</strong></td>
<td>400 kHz</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>0.5%</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>+/- 1mm</td>
</tr>
<tr>
<td><strong>Electrical Connection</strong></td>
<td>½” NPT, M12 Connector or Cable Gland</td>
</tr>
<tr>
<td><strong>Process Connection</strong></td>
<td>3/4” to 1 1/2” BSP or NPT Flange or Sanitary Connections</td>
</tr>
<tr>
<td><strong>Wetted Parts</strong></td>
<td>316 Stainless Steel, ETFE, ECTFE</td>
</tr>
<tr>
<td><strong>Enclosure Material</strong></td>
<td>Aluminum</td>
</tr>
<tr>
<td><strong>Max Pressure</strong></td>
<td>290 PSI (20 Bar)</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-10 to 80°C</td>
</tr>
<tr>
<td><strong>Class Protection</strong></td>
<td>(IP 65)</td>
</tr>
</tbody>
</table>

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# Technical Specifications

## Controller LVCN410

![Diagram of LVCN410](image)

<table>
<thead>
<tr>
<th>Application</th>
<th>Continuous Level Measurement for Liquids and Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Voltage</td>
<td>24Vdc (10%) (LVCN411) 85...264 Vac (50/60Hz) (LVCN412)</td>
</tr>
<tr>
<td>Current Consumption</td>
<td>22mA max</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Zero &amp; Span and 2 Set-Point Control</td>
</tr>
<tr>
<td>Output</td>
<td>4...20mA &amp; 2 Relay Output (SPDT 5A-250Vac)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.5%</td>
</tr>
<tr>
<td>Repeatability</td>
<td>+/- 1mm</td>
</tr>
<tr>
<td>Level Indication</td>
<td>Bargraph</td>
</tr>
<tr>
<td>Dimensions</td>
<td>L x W x H (109mm x 75mm x 110mm)</td>
</tr>
<tr>
<td>Enclosure Material</td>
<td>ABS (Thermoplastic Resistant)</td>
</tr>
<tr>
<td>Fixation</td>
<td>2 screws &amp; DIN Trail(35mm)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>32 to 140º F (0 to 60ºC)</td>
</tr>
<tr>
<td>Class Protection</td>
<td>(IP 64)</td>
</tr>
</tbody>
</table>
# Troubleshooting

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>No signal</td>
<td>No power supply</td>
<td>Verify power supply</td>
</tr>
<tr>
<td></td>
<td>Inadequate connection</td>
<td>Verify the polarity of the power supply</td>
</tr>
<tr>
<td>Signal over 22mA</td>
<td>Probable short circuit</td>
<td>Verify that the rod is coated for conductive mediums</td>
</tr>
<tr>
<td></td>
<td>Sensitivity to high</td>
<td>Adjust sensibility again</td>
</tr>
<tr>
<td>Signal Fluctuating</td>
<td>Lack of signal from reference rod</td>
<td>Verify the grounding</td>
</tr>
<tr>
<td>Signal under 20mA</td>
<td>Sensitivity to low</td>
<td>Adjust sensibility again</td>
</tr>
<tr>
<td>Lack of linearity</td>
<td>Reference is incorrect</td>
<td>Add a Reference</td>
</tr>
<tr>
<td></td>
<td>Coating on the rod is damaged</td>
<td>Sheath the rod</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Send back for repair</td>
</tr>
</tbody>
</table>

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FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:
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2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:
1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

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- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments

M-3996/0912