necessary.
material and caution in the event of shipment is
examining and removing containers, re-packing
all shipment material is saved for inspection. After
The carrier will not honor damage claims unless

NOTE

Shipping Agent

Handling in transit. Immediately report any damage to the

Shipment for signs of damage. Note any evidence of rough

When you receive the equipment, inspect the container and

1-800-622-3788 or (203) 359-1660

Please call the OMEGA Customer Service Department at

equipment. If you have any questions about the shipment,

Remove the packing list and verify that you have received all

Unpacking Instructions
# Table of Contents

1. Introduction
2. TLCS-71-72 Continuous Presence Manual
3. Safety Precautions
5. Proper Installation and Handling
6. Temperature and Pressure
7. Material Compatibility
8. Table of Common Defective Components
9. Specifications
10. Dimensional Drawings
11. Table of Technical Specifications
12. Table of Technical Drawings
13. Intrinsically Safe Equipment
14. Technical Specifications
15. Electrical Signals and Test
16. Testing the Sensor
17. Signal Output
18. Supply Voltage
19. Maintenance Procedure
20. Calibration Procedure
Part Number Information:

Immediately to OMEGA

Please fill out and return the LVCN-70 Series warranty card
Warranty Card
Operations Manual

One LVCN-30 Series Continuous RF Capacitance Sensor Assembly
One LVCN-33 Continuous RF Capacitance Controller with 1100x, 1101x
One LVCN-73 Continuous RF Capacitance Controller of one
One LVCN-77 Continuous RF Capacitance Transmitter of one

The following items are included in this package:

Unpacking and Inspection:
User's Responsibility for Safety

Verify the exact model which you have purchased.

Please refer to the part number located on the sensor label to cross-reference systems from OMEGA. LVCN-71 and LVCN-72.

INSTALLING OR USING THIS PRODUCT. THIS MANUAL MUST BE READ THE ENTIRE MANUAL PRIOR TO
Temperature and Pressure

- Take from Compass Publications (699-589-9696).
- Application limits refer to the Compass Conversion Guide, available.
- Determine the chemical compatibility between the sensor and the fluid used. FEP is compatible with the application fluid. To ensure the application also known by the trade name Teflon®. Make sure the fluid is compatible with the application fluid.
- The LP-30 series sensors are made of FEP (Fluorinated Ethylene)

Material Compatibility

Always check for leaks prior to system start-up.

Proper Installation and Handling

- Never overtighten the sensor within the fitting.
- Omega strongly recommends the use of a proper sealant with
Different sensing technologies use redundant measurement and control points. Each having a
flammable or explosive application. In hazardous applications, the LVCN-70 Series sensor systems should not be used within
applications.

Flammable, Explosive and Hazardous

Wiring and Electrical

A supply voltage of 14-36 VDC is used to power the LVCN-71723.
may need to be electrically grounded. For most reliable operation, the liquid being measured
should be clean. The liquid temperature should not exceed 250°C. For reliable operation, the
liquid must be clean and free from particulate matter. The liquid temperature should not exceed
250°C. For reliable operation, the liquid must be clean and free from particulate matter.

**Warning:** Do not install the OMEGA, LVCN-70 Series sensor near any metallic objects. This may
affect the sensor's accuracy.

The capacitive probes in the sensor are designed to be used with liquids with a
dielectric value between 20 and 80.

The sensor's operation may vary based on the dielectric properties of the
liquid. The output, which indicates the level of the liquid in the tank,
is affected by the capacitance value. The sensor's output changes
based on the capacitance value. The capacitance value is determined by the
length of the sensor, the sensor's dielectric properties, and the
liquid's dielectric constant. When the liquid changes, the capacitance value
changes. These changes in capacitance are measured by the sensor and
are displayed on the instrument. When the liquid changes, the capacitance value
changes. These changes in capacitance are measured by the sensor and
are displayed on the instrument. When the liquid changes, the capacitance value
changes. These changes in capacitance are measured by the sensor and
are displayed on the instrument. When the liquid changes, the capacitance value
changes. These changes in capacitance are measured by the sensor and
are displayed on the instrument.
**Table of Common Dielectric Constants**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Dielectric Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueous acid</td>
<td>78</td>
</tr>
<tr>
<td>Benzene</td>
<td>2.4</td>
</tr>
<tr>
<td>Benzonitrile</td>
<td>2.4</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>2.2</td>
</tr>
<tr>
<td>Dichloroethane</td>
<td>2.2</td>
</tr>
<tr>
<td>Ether</td>
<td>2.2</td>
</tr>
<tr>
<td>Ether alcohol</td>
<td>2.2</td>
</tr>
<tr>
<td>Ethylene</td>
<td>2.2</td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>2.1</td>
</tr>
<tr>
<td>Ethyleneglycol</td>
<td>2.0</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>2.0</td>
</tr>
<tr>
<td>Hydrocarbons</td>
<td>2.0</td>
</tr>
<tr>
<td>Hydroquinone</td>
<td>2.0</td>
</tr>
<tr>
<td>Hydrazine</td>
<td>1.0</td>
</tr>
<tr>
<td>Iodine</td>
<td>1.0</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>1.0</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>1.0</td>
</tr>
<tr>
<td>Nitromethane</td>
<td>0.6</td>
</tr>
<tr>
<td>Perchloric acid</td>
<td>0.0</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**NOTE:** Liquids with a dielectric constant less than 2.0 will not be detected by the LVCN-70 series sensor systems as they are generally non-polar.
<table>
<thead>
<tr>
<th>Substance</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water, 10°C</td>
<td>48 ppm</td>
</tr>
<tr>
<td>Water, 20°C</td>
<td>30 ppm</td>
</tr>
<tr>
<td>Vapour alcohol</td>
<td>6.8%</td>
</tr>
<tr>
<td>Vapour dichloroethane</td>
<td>0.3%</td>
</tr>
<tr>
<td>Chloroform</td>
<td>3.7%</td>
</tr>
<tr>
<td>Formaldehyde acid</td>
<td>1.5%</td>
</tr>
<tr>
<td>Formaldehyde neutral</td>
<td>7.2%</td>
</tr>
<tr>
<td>Vegetable Oils</td>
<td>2.5%</td>
</tr>
<tr>
<td>Olive Oils</td>
<td>2.5%</td>
</tr>
<tr>
<td>Mineral Oils</td>
<td>2.4%</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>2.5%</td>
</tr>
<tr>
<td>Nitrobenzene</td>
<td>2.4%</td>
</tr>
<tr>
<td>N-Methylformamide</td>
<td>2.4%</td>
</tr>
<tr>
<td>Metacrylate</td>
<td>2.9%</td>
</tr>
<tr>
<td>Methacrylate</td>
<td>2.3%</td>
</tr>
<tr>
<td>Melamine</td>
<td>2.5%</td>
</tr>
<tr>
<td>Melamine formaldehyde</td>
<td>2.4%</td>
</tr>
<tr>
<td>Potassium nitrate</td>
<td>5.0%</td>
</tr>
<tr>
<td>Potassium</td>
<td>1.9%</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>2.5%</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>2.5%</td>
</tr>
<tr>
<td>OB</td>
<td>2.7%</td>
</tr>
<tr>
<td>QE</td>
<td>2.7%</td>
</tr>
<tr>
<td>OB5</td>
<td>2.4%</td>
</tr>
<tr>
<td>OB8</td>
<td>2.4%</td>
</tr>
<tr>
<td>OB18</td>
<td>2.4%</td>
</tr>
<tr>
<td>OB25</td>
<td>2.4%</td>
</tr>
<tr>
<td>OB50</td>
<td>2.4%</td>
</tr>
</tbody>
</table>
Specifications

Dimensions:
- Loop resistance:
- Max. pressure rating:
- Max. lamp rating:
- Supply voltage:
- Signal output:
- Direct current range:
- Dead band hysteresis:
- Max. sensor length:
- Sensitivity:
- Capacitance range:

Available in different lengths:
- Sensor diameter: 0.625" x 0.28" x 4/4" NPT
- Electronic housing:

See drawing on page 11.

600 ohms @ 24 VDC

See chart on page 12.

1.667 psi pressure above 250°C
- 150 psi @ 25°C, derated 70°C at 160°F

Application: 14 to 36 volts dc
110-220 VAC (100-127V AC, 750 VA max) 20 to 80 @ 1 NHz
- 0.5°C
- 0°C to 600°F

Modem materials:

120V
1. Insert a crescent wrench to tighten the sensor and hand tighten it to a maximum of 80 inch-pounds. Carefully turn the sensor until the edge of the sensor's body is aligned with the hand tight.

2. Secure the sensor into the coupling by tightening the threads of the sensor.

3. Connect the sensor to the tank's sensor system.

4. Place the LVCN-70 Series sensor into the tank and secure it with the appropriate components.
Mounting Diagram for the LVCN-717273

LVM-30 side mount bracket
2" NPT tank adapter

Torque: Be careful not to overtighten the sensor within the coupling. Always check for leaks prior to system start-up.
3. **Connection and Termination:** To ensure the protection of the sensor’s power and signal wires, use proper conduit and cable. Ensure that all connections are secure and tight. Use a well-insulated 22 gauge twin pair shielded wire.

   Cable length may be extended up to a maximum of 1000 feet. Insulate termination, remove and/or insulate the excess, if required between the LVCN-72/23 sensor system and its point of termination. Allow enough slack to ensure the easy connection of cable.

2. **Required Cable Length:** Determine the length of cable.

   **Disconnected:** Sensor, controller and/or power supply is completely disconnected.

   **Power:** Before installation, make sure that all power is off. The supply voltage to the LVCN-72 Series sensor systems should never exceed a maximum of 36 VDC.

   **Supply Voltage:**

   36V

   Supply voltage should be performed in accordance with all applicable national, electrical wiring and use of the LVCN-72 Series sensor systems.

---

**General**

**Electrical Signal and Test**
Testing the Sensor

1. Power Supply: Apply power to sensor by connecting power to the power supply.

2. Immersing the Sensor: OMEGA recommends calibration

3. Test: When the sensor contacts liquid between low and high levels of liquid, use a multimeter in series with the sensor.

4. To ensure that the correct signals are being produced by the LV-CA-70 Series sensor systems:

   - Connect the sensor to the appropriate terminals of the LV-CA-70 Series sensor system.
   - Apply power to the sensor.
   - Use a multimeter to measure the signal output.

   - If the signal output is within the specified range, the sensor is functioning correctly.

Signal Outputs:

- 4 to 20 mA Signal Output
- 110-220 VAC
- 110 VAC
- 220 VAC
- 0-5 VDC
- 0-10 VDC
- 4-20 mA Transmitter
- 0-10 mA Transmitter
- 0-5 V Transmitter
- 0-10 V Transmitter
I. Determine Capacitance of Probe

There are four basic steps in the calibration of the OMEGA LCEN-70 Series Continuous Capacitance Sensors:

- Calibrate
- [ ]
<table>
<thead>
<tr>
<th>PF vs. Dip Switch Settings Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>100PF</td>
</tr>
<tr>
<td>10H</td>
</tr>
<tr>
<td>7H</td>
</tr>
<tr>
<td>4H</td>
</tr>
<tr>
<td>1.5H</td>
</tr>
</tbody>
</table>
2. Determine "Invert" switch position

3. Adjust "Zero" and "Span" potentiometers

The controller (see the diagram on Page 26)

4. Repeat step 3 until the output current scale values are correct.

The current is 20 mA.

measure the current at the "Span" potentiometer to set
the measurement point. Adjust the "Span" potentiometer to set
the "Span" within the high level in the peak or the measurement
point. Adjust the "Span" potentiometer to set the current output to 4 mA.

a. Offset: When the fluid level in the tank is as desired
b. Offset: With the fluid level in the tank at its desired
the following manner: "Invert" switch in "position
are not correct, adjust the "offset" and "Span" potentiometers to
the sensor to reach the 4 or 20 mA output signal. If the current values
observe the point at which the inverter fails, this level causes

61
Location of "invert", switches and "offset", "span" adjustments.
Cleaning Procedure

1. Power: Make sure that all power to the sensor, controller and/or power supply is completely disconnected.

2. Cleaning the Sensor: Using a soft bristled brush and mild cleaning solution, carefully wash the LVCN-70 Sensor. Do not use abrasive or solvent based cleaners, and never use harsh abrasives such as steel wool or sandpaper, which might damage the surface of the sensor. Do not use incompatible detergents.

3. Sensor Installation: Follow the appropriate steps of installation as outlined in the installation section of this manual.

4. Application: Application depends on the specific characteristics of the maintenance schedule, based on the specific characteristics of the environment. It is the responsibility of the user to determine the appropriate cleaning and scaling procedures and clean the sensor. If the LVCN-70 Series sensor resists the effects of process General Maintenance...
Diagram of PCB with sensor connector and probe capacitance.

- Probe Wiring
- Connector
- Probe Wiring
- Switches
- Sensing Dip
- Capacitance
- Housing
- Controller
- Cover

Maintenance
Probe Modification/Assembly Procedure

A. Disassembly

1. Turn off all power to the sensor.
2. Remove the probe assembly from the link.
3. Make sure power has been turned off.
4. Open the top of the controller housing and remove the wings for the power and
controller housing and remove the wires for the power and
controller housing.
5. Gently remove the PCB assembly by sliding it up and out
place. Remove the label.

4. Remove the small Phillips screw which holds the label in

3. Remove the PCB by sliding it up and out

2. Before pulling it out completely, disconnect

1. Leave the connector pins.

*down along the connector pins.*
4. Recalibrate dp switches for the new length.

5. Mount layers and the polyimide core on the sensor.

6. Using a sharp saw, carefully cut through the two copper
   layers of the conical process.

7. Fold down the wires so they will not be damaged during
   the cutting process.

8. Fold down the wires so that they will not be damaged during
   the cutting process.

9. Using a sharp knife, carefully remove the copper layers.

10. Using a sharp knife, carefully remove the polyimide core.

B. Modifying the probe length:

1. Measure the length from the connector to the
   assembly of the tip of the probe and over the wires and
   connector.

2. Remove the locking pin. Then slide the trimmer
   cutter to any clear of the following steps.

3. Slide the outer trimmers and the Polyimide core.

4. Loosen the lock trimmer and slide it off of the probe end.

5. Loosen the lock trimmer, remove the outer trimmers and
   the connector.

6. Sliding the trimmers out completely, insert the housing
   and the trimmers into the probe.

7. Slide the trimmers into the housing and the connector.

8. Slide the locking pin back in place.

Maintenance:
7. Place the housing flange over the wires and slide the housing, "washers" and the crimp terminal assembly.

6. Slide the back flange on the sensor until it rests against the bottom of the crimp terminal assembly.

5. Slide the "washers" up the sensor until they are resting behind the housing.

4. Place the wires through the bottom of the controller housing.

3. Place locking pin in.

2. Slide the nut over the crimp terminal, then the other washer, then the crimp terminal.

1. Slide the nut and the last nut over the crimp terminal, then the probe.

C. Assembling the Probe.

SLIDE OFF THE BOTTOM END OF THE PROBE.

PLACE 26 MAKE SURE THE TANK FITTING DOES NOT POINT TOWARDS THE PROBE (SEE DRAWING) OR THE TANK FITTING.

AND CONNECT WITH THE 3/4" NPT THREADS. SLIDE OVER FIRST C. ASSEMBLING THE PROBE.
1. Calibrate system. See calibration section of this manual.
2. Install sensor in sink. See installation section of this manual.
3. Replace cover on top of housing.
4. Replace wires for power and outputs.
5. Tighten screws.
6. Place label over PCB and replace small Phillips screw.
7. Present set-up.
8. Tighten the tank fitting and the housing fitting together by
9. Make sure the assembly is securely tightened.
10. Connect the connector to the PCB. See diagram on page 14.
11. Slide PCB into place above rails in housing walls. If the
   longing of the sensor has been changed considerably, the
   calibration section of this manual now lo verify the
   capacitance switch settings may need to be changed. Check
   
THE CRIMP TERMINAL ASSSEMBLY!

holding either end and turn the other. DO NOT TWIST
Sensor Connector and Probe Assembly Parts For:

- Tank Adapter Fitting
- TFE Washer
- Rubber Grommet
- Rubber Grommet
- TFE Washer
- Locking Pin
- Crimp Assembly
- Housing Fitting
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Environmental Monitoring and Control</th>
<th>Flow/Level</th>
<th>Pressure/Strain Force</th>
<th>Temperature Data Acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbine</td>
<td>Turbine Flowmeter, Flowmeters</td>
<td>Turbine Flowmeter, Flowmeters</td>
<td>Turbine Flowmeter, Flowmeters</td>
<td>Turbine Flowmeter, Flowmeters</td>
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<tr>
<td>Flow</td>
<td>Flowmeters, Flowmeters</td>
<td>Flowmeters, Flowmeters</td>
<td>Flowmeters, Flowmeters</td>
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<td>Heaters, Temperature Equipment</td>
<td>Heaters, Temperature Equipment</td>
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<tr>
<td>Temperature</td>
<td>Temperature Equipment</td>
<td>Temperature Equipment</td>
<td>Temperature Equipment</td>
<td>Temperature Equipment</td>
</tr>
</tbody>
</table>

**Process Measurement and Control**

**OEMEAG** Your source for