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LV3000 and LVCN410 Series Continuous Level Measurement

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Contents

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:

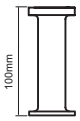
A capacitor consists of the probe's rod as one plate and the metallic wall of the vessel (or a secondary reference rod or sheath) as the other plate. As the medium rises and displaces the empty space within the vessel, the dielectric constant around the probe changes. This change is recorded and converted 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 hight temperatures and pressure.
- Functions on conductive as well as non-conductive medias.

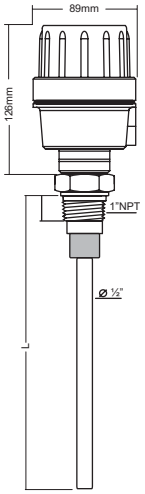
Mounting Options

Extended Necks for Higher Temperatures

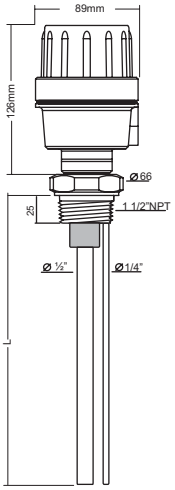


Note: Medium Temperature (up to 120°C) and High Temperature (up to 150°C)

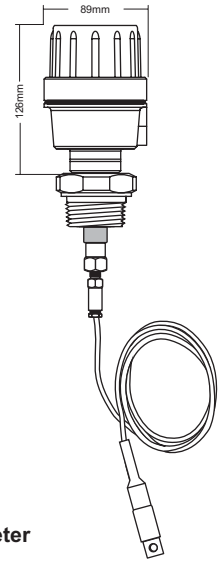
LV3000 Standard Aluminum Housing



LV3000 Standard Reference Rod



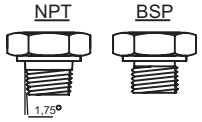
LV3000 w/ cable (also w/ Reference Cable)



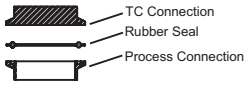
Obs: Minimum Insertion Length for the LV3000 is 1/2 meter

Process Connection

Threaded	
3/4"	NPT BSP
1"	
1 ½"	
2"	

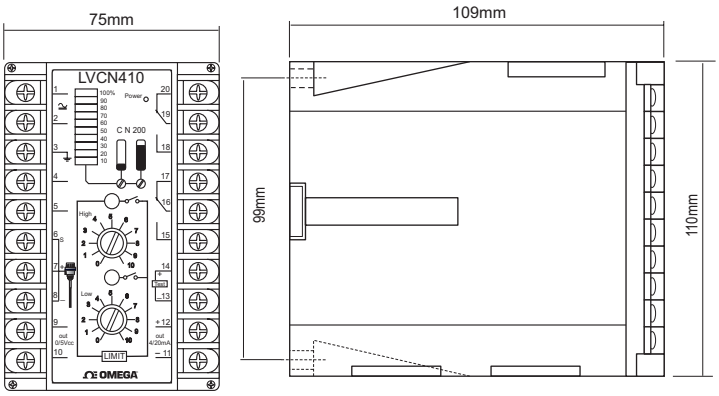


Tri-Clamp
1 ½"
2"
2 ½"
3"



Flange	ANSI 150# ANSI 300#
1"	FF
1 ½"	
2"	RF
2 ½"	

LVCN410



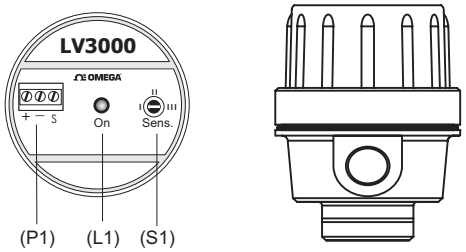
Features

- 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 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.

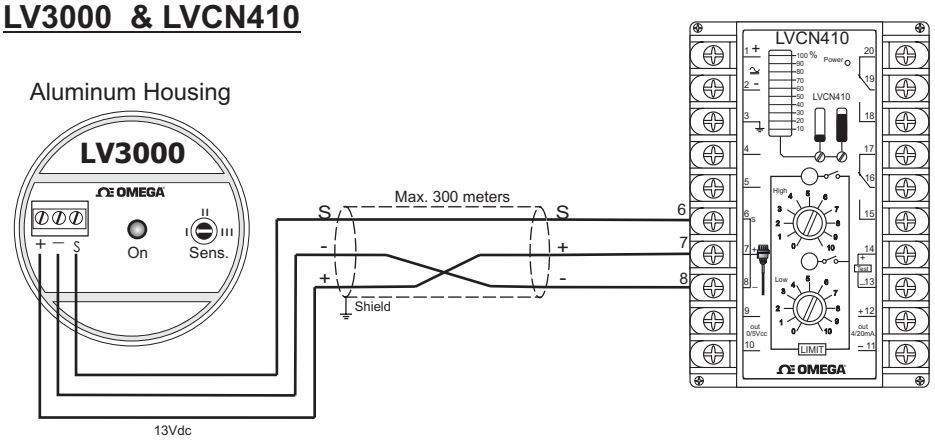
ALUMINUM HOUSING



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

Important: Before connecting the equipmente, make sure it is properly powered as show on ID tag.

LV3000 & LVCN410

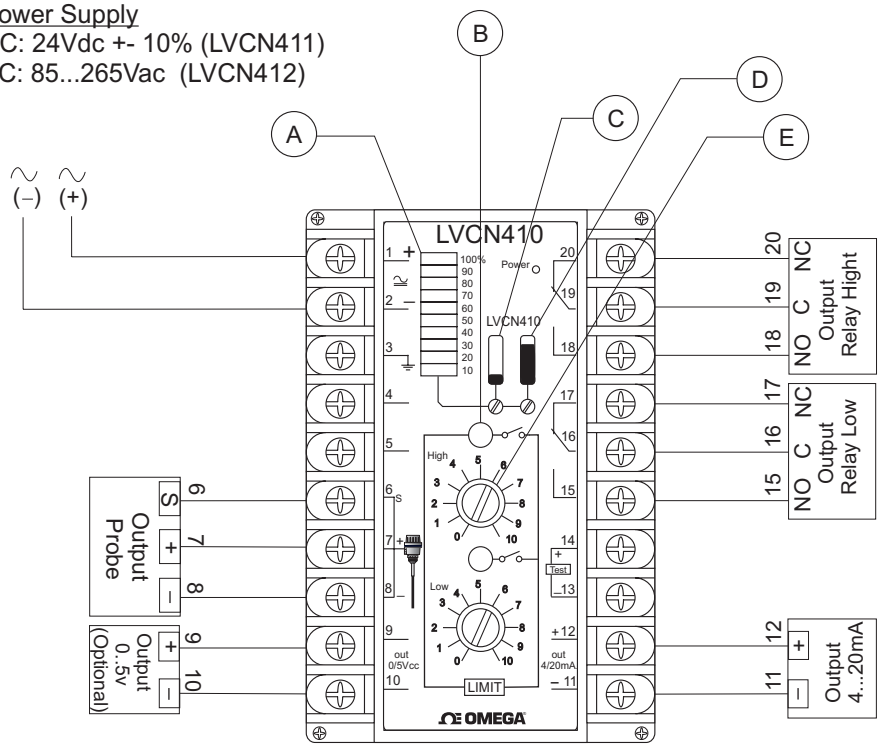


Wiring Diagram

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)

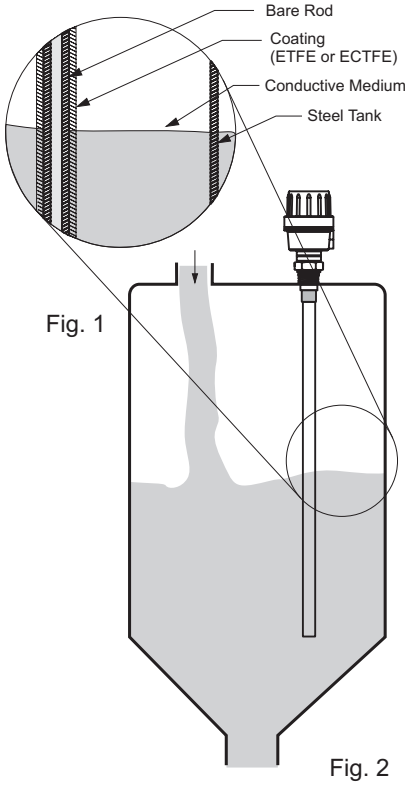


Fig. 1

Fig. 2

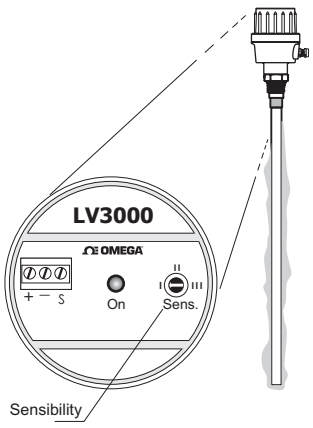


Fig. 3

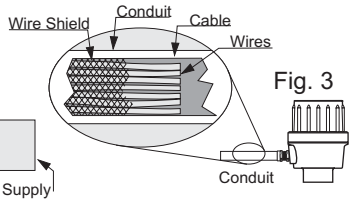
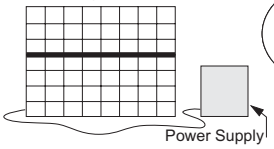


Fig. 4



Mounting Notes

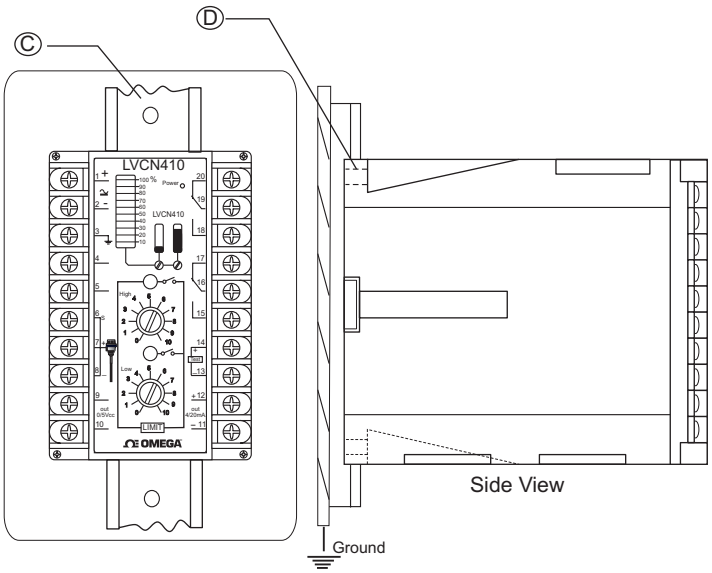
- When making connections between the controller and the probe use reliable cables and make sure they are grounded.
- Shielded cables prevent interference improving and protecting against false measurements.
- Do not install the controller in harsh environments and humidity.
- Respect class protection, 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.

Fig. 1

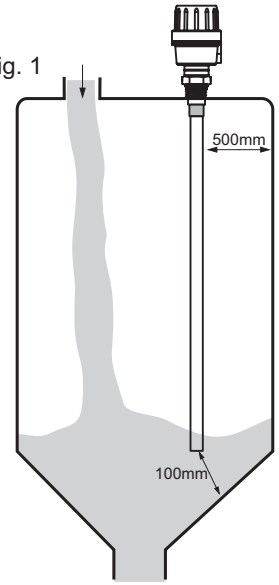
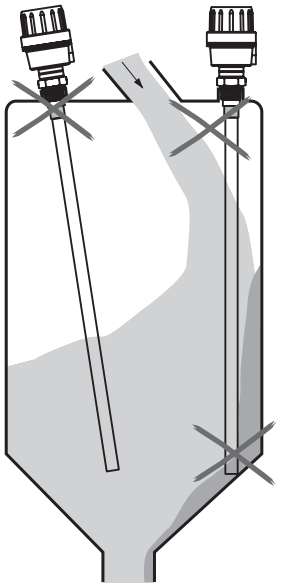


Fig. 2



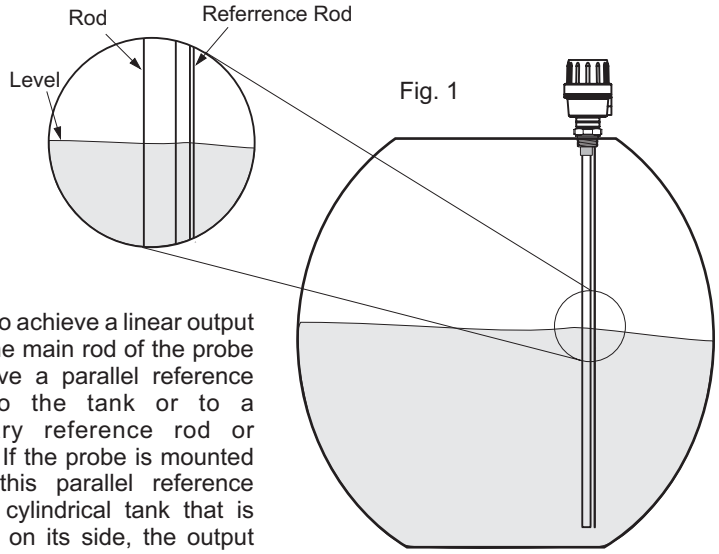


Fig. 1

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)

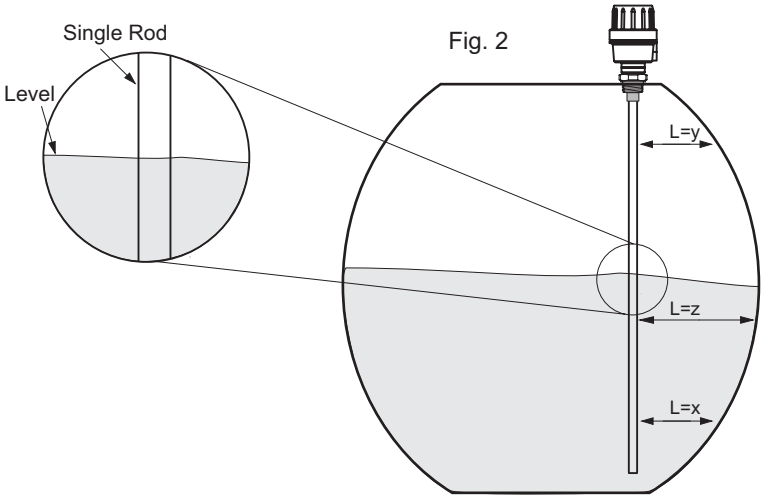


Fig. 2

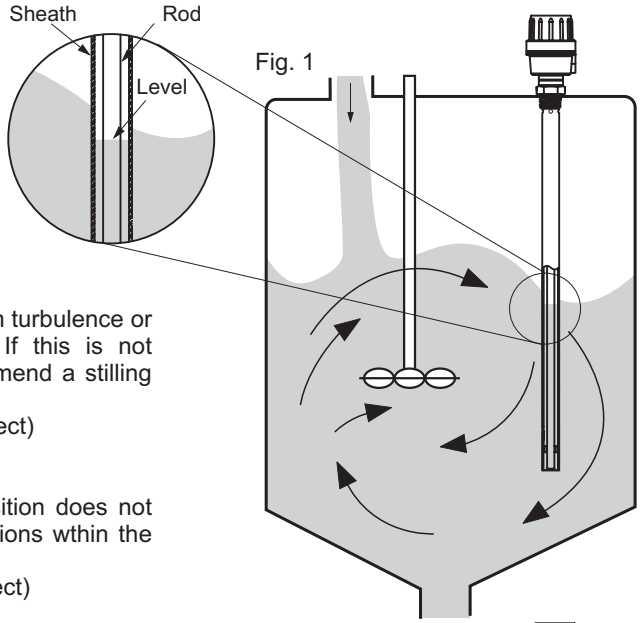


Fig. 1

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 wthin the vessel or tank.
(Fig. 1 correct, Fig. 2 incorrect)

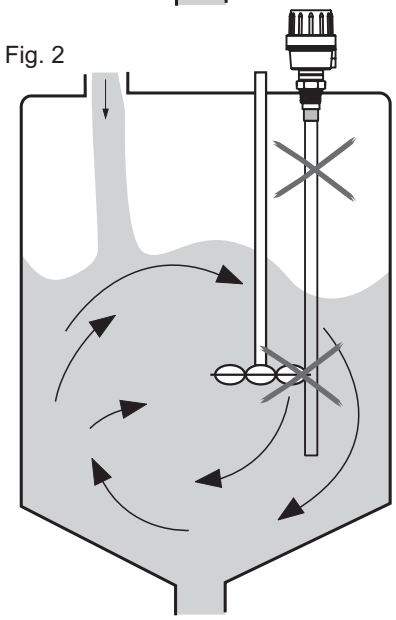


Fig. 2

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.

Fig. 1

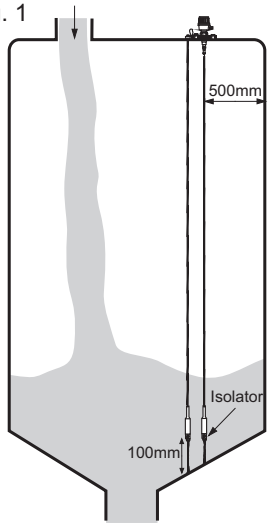
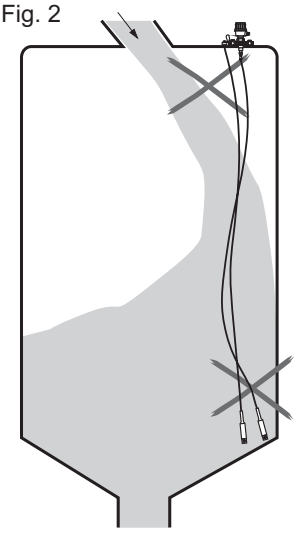


Fig. 2



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)

Fig.1

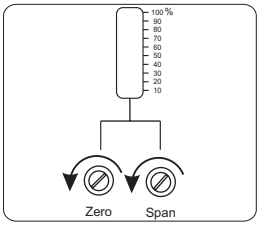


Fig.2

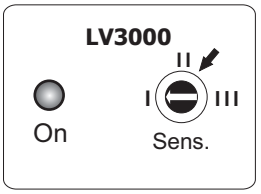


Fig.3

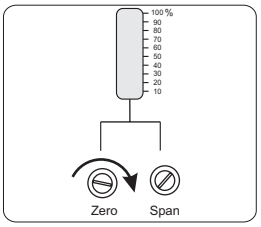
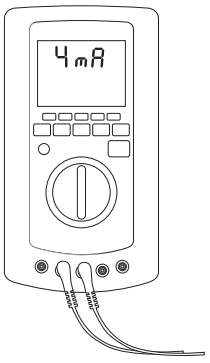


Fig.4



Adjustment 20mA

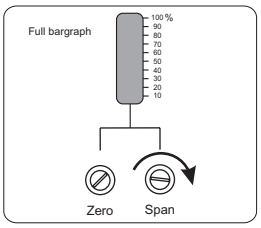
After calibrating the minimum value (4mA or 0%), fill up the tank to maximum level (100% - level).

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.

Fig.5



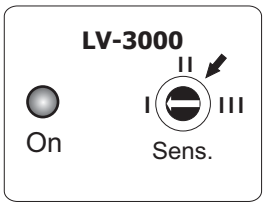
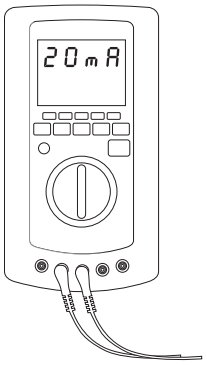


Fig.4



LVCN410 Set-Point adjustment

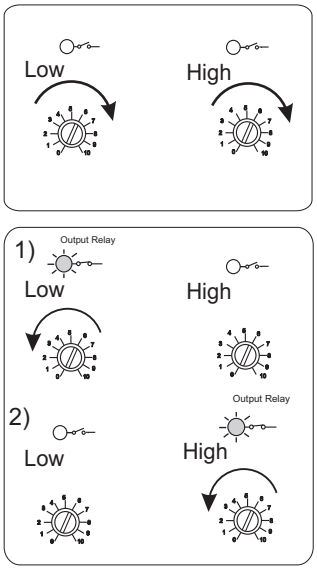
After completed the calibration, it is necessary to be done to adjust the set-point outputs of the case is used.

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.

Fig.1

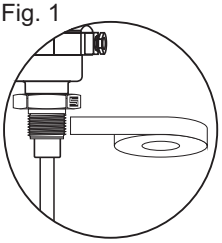


Handling

Probes:

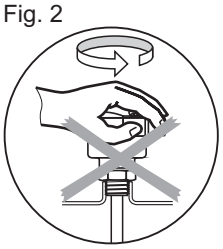
Seal the thread with Teflon tape before installation. (Fig. 1)

Fig. 1



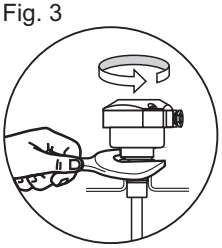
Do not turn or handle by the housing. (Fig. 2)

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)

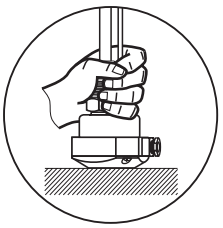
Fig. 3



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.

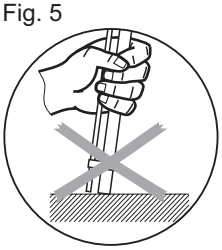
Fig. 4



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.

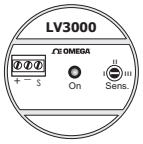
When cleaning the rod use a soft brush or any other similar object.

Fig. 5



LV3000 Aluminum Housing

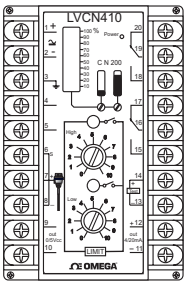
Aluminum Housing



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

Technical Especifications

Controller LVCN410



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

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

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.
If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/ DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.
The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
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 theproduct, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.
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