DeltaSpan
Industrial Pressure
Level Transmitter Manual
LD30 Series
22 AUG 08
Rev A

Introduction

The LD30 Series Industrial Pressure Transmitters converts a single positive pressure into a standard 4-20 mA output signal. The transmitter can be used to accurately measure compatible gases and liquids with full scale accuracy of 0.25%. Designed for industrial environments with a NEMA 4X (IP66) housing, this transmitter resists most effects of shock and vibration.

CAUTION: *Do not exceed specified supply voltage ratings. Permanent damage not covered by warranty will result. This device is not designed for 120 or 240 volt AC operation. Use only on 13 to 30 VDC.*

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About this Manual:
PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on all versions of the DeltaSpan Series Industrial Pressure Level Transmitter from Flowline; models LD30-____. Please refer to the part number located on the transmitter label to verify the exact model which you have purchased.

User's Responsibility for Safety:
Flowline manufactures a wide range of liquid level sensors and technologies. While each of these technologies are designed to operate in a wide variety of applications, it is the user's responsibility to select a technology that is appropriate for the application, install it properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.

Proper Installation and Handling:
Only properly-trained staff should install and/or repair this product. Use a proper sealant with all installations. Always check for leaks prior to system start-up.

Wiring and Electrical:
A supply voltage of 13 to 30 VDC is used to power the LD30 series transmitter. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

Temperature and Pressure:
The LD30 series is designed for use in application temperatures from -18° to 93°C (0° to 200°F), and for use at pressures up to 2 x the full span of the LD30 series.

Material Compatibility:
The Industrial pressure level transmitter, LD30 series, is made of 316 Stainless Steel (316 SS) and 316L Stainless Steel (316L SS). Make sure that the model which you have selected is chemically compatible with the application liquids.

Flammable, Explosive and Hazardous Applications:
DO NOT USE THE DELTASPAN, LD30 SERIES LEVEL TRANSMITTER IN HAZARDOUS LOCATIONS.

Make a Fail-Safe System:
Design a fail-safe system that accommodates the possibility of transmitter failure or battery power loss. In critical applications, Flowline recommends the use of redundant backup systems and alarms in addition to the primary system.

Components:
DeltaSpan is offered in six different models, based upon pressure rating and material. Depending on the model purchased, you may or may not have been shipped all the components shown below.

- DeltaSpan
  - LD30-S001 – 05 psi (11.54 ft wc / 3.52 m wc), 9' (2.7 m) Cable
  - LD30-S201 – 15 psi (34.63 ft wc / 10.56 m wc), 9' (2.7 m) Cable
  - LD30-S401 – 30 psi (69.30 ft wc / 21.12 m wc), 9' (2.7 m) Cable
  - LD30-S011 – 05 psi (11.54 ft wc / 3.52 m wc), Terminal Block in Housing
  - LD30-S211 – 15 psi (34.63 ft wc / 10.56 m wc), Terminal Block in Housing
  - LD30-S411 – 30 psi (69.30 ft wc / 21.12 m wc), Terminal Block in Housing
- Quick Start Guide

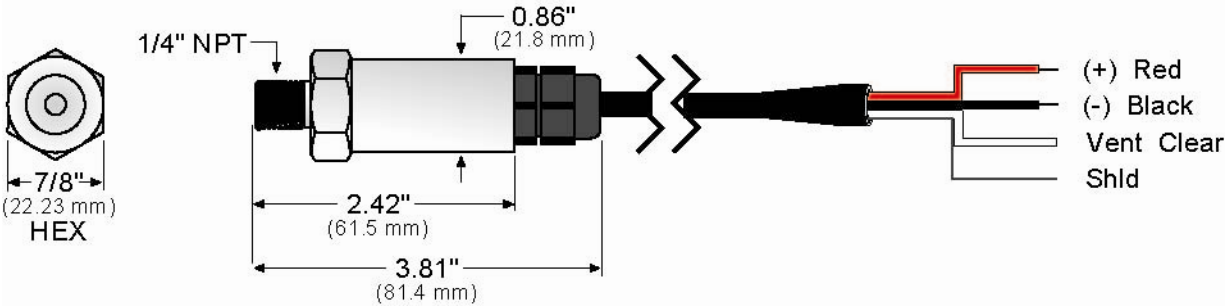
Technology
A pressure transmitter is installed near or on the bottom of the tank by way of a ¼" NPT thread. A stainless steel pressure diaphragm within the pressure transmitter is exposed on one side to the application fluid. The amount of pressure applied to the sensing surface will slightly deflect the diaphragm. The deflection of the diaphragm is measured by a built-in microprocessor that provides greater linearity correction over common thermal compensation methods. A 4-20 mA current signal proportional the height of the liquid or the pressure of the gas is generated from the microprocessor.

Specifications

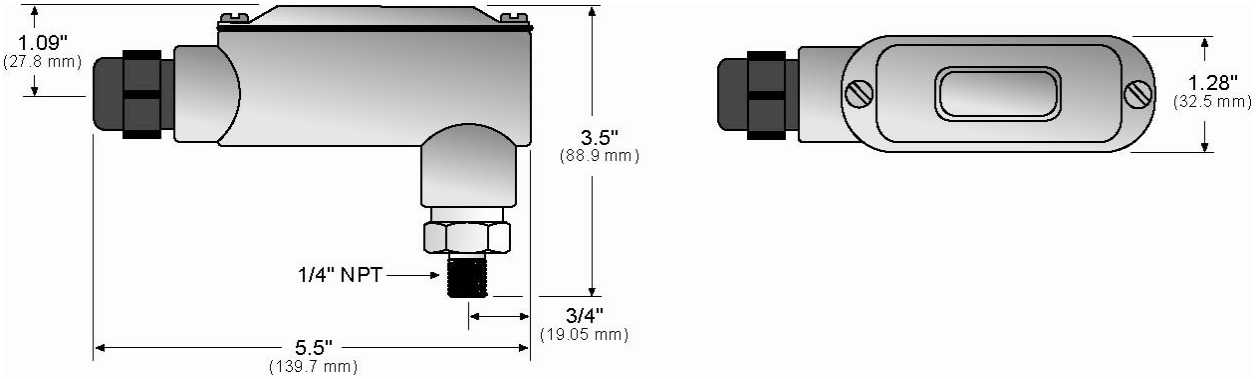
Service:	Compatible gases or liquids.
Wetted Materials:	Body: 316 SS, 316L SS
Accuracy:	±0.25% of full scale.
Temperature Limit:	0 to 200ºF (-18 to 93ºC).
Compensated Temperature Range:	0 to 175ºF (-18 to 79ºC).
Thermal Effect:	Less than ±0.02%/°F.
Pressure Limit:	-S0_1: 10 psig (maximum) / 50 psig (over pressure)
	-S2_1: 30 psig (maximum) / 150 psig (over pressure)
	-S4_1: 60 psig (maximum) / 300 psig (over pressure)
Power Requirement:	13 to 30 VDC.
Output Signal:	4 to 20 mA, 2-wire.
Response Time:	50 ms.
Max. Loop Resistance:	1300 Ohms @ 30 VDC
Current consumption:	38 mA (maximum)
Electrical Connections:	-S_01: Cable (9’ length)
	-S_11: Conduit Housing with Terminal Block
Process connection:	¼” male NPT
Enclosure rating:	NEMA 4X (IP 66)
Mounting Orientation:	Mount in any position.
Weight:	10 oz. (283 g).
Agency approval (CE):	EN 55022
	EN 55024
	EN 61000-4-2
	EN 61000-4-3
	EN 61000-4-4
	EN 61000-4-5
	EN 61000-4-6

Dimensions

Cable Version



Conduit Version



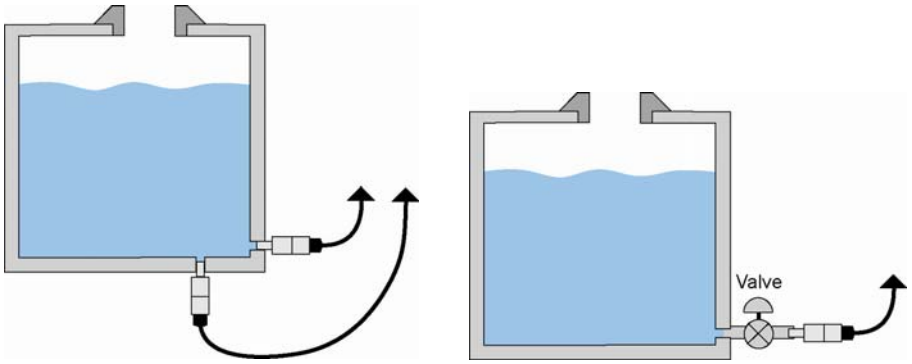
Material Compatibility:

- The LD30 series is made of 316 Stainless Steel (316 SS), 316L Stainless Steel (316L SS).
- The Cable Version (LD30-S_01) is provided with 3' (0.91 m) of cable.
- The Conduit Version (LD30-S_11) is provided with a junction box (including a terminal strip) and a ½' NPT conduit.
- The total length the signal can transmitter is based upon the following formula: RLmax = (Vsup – 13V) / 0.02A, where RLmax is the total resistance including the load and the cable length.
- Make sure that the switch is compatible with the application liquids. To determine the chemical compatibility between the sensor and its application liquids, refer to the Compass Corrosion Guide, available from Compass Publications (858-589-9636).

Getting Started

The LD30 series will be installed near the bottom of the vessel. The switch can be installed through the side wall or through the bottom. Please note that the physical location of the level transmitter will indicate the lowest level of measurement within the tank. For example: mounting the transmitter 1 foot from the bottom of the tank, then the lowest reading of liquid will be 1 foot from the bottom.

Note: *When installing the LD30 series, design an installation method where the unit can be removed without having to remove the fluid from the vessel. The use of valves between the transmitter and the vessel can allow transmitter removal without draining the fluid.*



Choosing the Correct Pressure Range

The DeltaSpan series are fixed range transmitters with no adjustability with respect to the 4-20 mA output. For example: at 0 psi (no liquid), the current output will be 4 mA and at maximum pressure, the current output will be 20 mA. Readings between 0 and the maximum pressure will be proportional to the 4-20 mA output. Since the density of liquid will have an influence on the range of the LD30 series, follow these simple instructions to insure the correct pressure range has been selected.

1. Determine the Specific Gravity (SG) of the liquid to be measured.
2. Determine the maximum height of liquid (H) to be measured in feet.
3. Use to following equation to determine the maximum required pressure (P):

   P = H (feet) * (SG) / 2.31 (feet/psi)
   or
   P = H (m) * (SG) / 0.704 (m/psi)

4. Compare the maximum required pressure (P) to the pressure ranges listed above.

   For example, a 16’ tall tank contains a liquid with a SG of 0.9:

   P = 16.0 feet * (0.9) / 2.31 (feet/psi) = **6.23 psi**

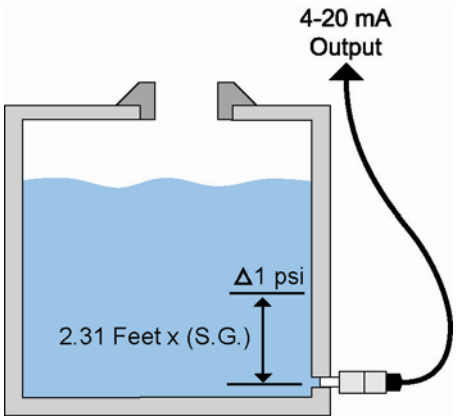
   The maximum required pressure is 6.23 psi, which is above the 5 psi range for the LD30-S001. To read the full range of liquid in the tank, choose the LD30-S101.

Effects of Specific Gravity:

The LD30 series has a fixed span with 4 mA equal to 0 psi and 20 mA equal to the maximum psi setting. Each unit is calibrated for use in liquids with a specific gravity (SG) of 1.000. Pressure transducers maybe used in liquids with a SG other than 1.000. Please note the following relationship between the pressure range and specific gravity:

1 psi = 2.31 feet @ SG = 1.000
or
1 psi = 0.704 m @ SG = 1.000

For example, the LD30-S001 has a range of 0 to 5 psi. The maximum depth the transmitter can read in water (SG = 1.000) is 5 psi x (2.31 feet / 1 psi) = 11.5 feet. For metric, the maximum depth in water is 5 psi x 0.704 m / psi) = 3.52 m.



For liquids with a different SG, simply divide 2.31 by the new SG to determine the new ratio. For example, the LD30-S001 is installed in a liquid with a SG = 0.85. The new ratio is as follows:

1 psi = 2.31 feet / (0.85) = 2.717 feet (0.828 m)

Multiply 5 psi by the new ratio to determine the maximum depth:

5 psi * (2.717 feet / 1 psi) = 13.6 feet (4.15 m)

A lower SG will increase the maximum depth for the transmitter. Another example, the LD30-S101 is installed in a liquid with a SG = 1.2. The new ratio is as follows:

1 psi = 2.31 feet / (1.2) = 1.925 feet (0.587 m)

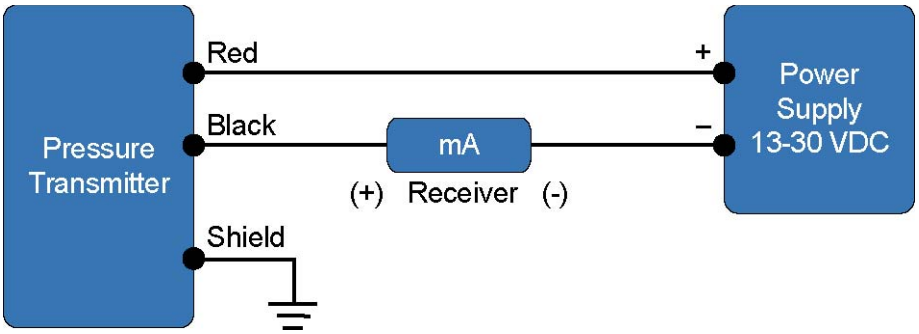
Multiply 10 psi by the new ratio to determine the maximum depth:

10 psi * (1.925 feet / 1 psi) = 19.3 feet (5.87 m)

A high SG will decrease the maximum depth for the transmitter.

Electrical Installation

An external power supply delivering 13-30 VDC with minimum current capability of 40 mA DC (per transmitter) is required to power the control loop. See figure below for connection of the power supply, transmitter and receiver.

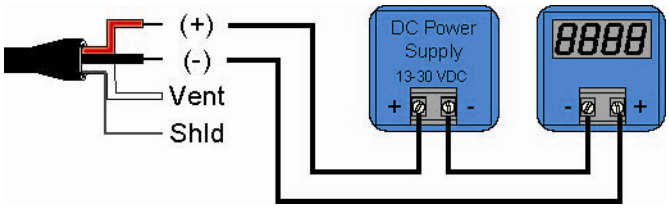


The maximum receiver load resistance (RLmax) for the DC power supply voltage (Vsup) is expressed by the formula:

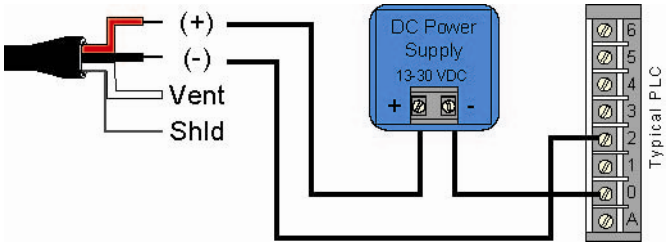
$$RLmax = (Vsup - 13V) / 0.02A$$

Shielded cable is recommended for control loop wiring. Use the Red wire as the (+) and the Black wire as the (-).

Wiring to a Loop Powered Display

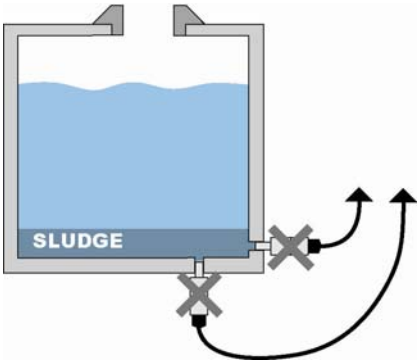


Wiring to a Typical PLC



Installation

The LD30 series is designed to operate with only the installation thread being exposed to the fluid. Avoid installing the level transmitter along the bottom of the tank as materials such as sludge will build up and coat/cover the port.



1. **Location:** Select a location where the temperature of the transmitter will be between 0 and 175°F (-18 to 79°C). Distance from the receiver is limited only by total loop resistance. The tubing or piping supplying pressure to the unit can be practically any length required but long lengths will increase response time slightly.
2. **Position:** The transmitter is not position sensitive. However all standard models are originally calibrated with the unit in a position with the pressure connection downward. Although they can be used at other angles, for best accuracy it is recommended that units be installed in the position calibrated at the factory.
3. **Pressure Connection:** Use a small amount of plumber's tape or other suitable sealants to prevent leaks. Be sure the pressure passage inside the port is not blocked.
4. **Electrical Connections:** Wire Length - The maximum length of wire connecting the transmitter and receiver is a function of wire size and receiver resistance. Wiring should not contribute more than 10% of the receiver resistance to total loop resistance. For extremely long runs (over 1000 feet), choose receivers with higher resistance to minimize the size and cost of connecting leads. Where wiring length is under 100 feet, wire as small as 22 AWG can be used.

Maintenance

Maintenance should consist of inspection to see that the transmitter is free from debris and not coated with any substance, which would prevent liquid from freely entering and leaving the transmitter. If this occurs, the transmitter should be cleaned.

Cleaning procedure:

1. *Power:* Make sure that all power to the transmitter, controller and/or power supply is completely disconnected.
2. *Transmitter removal:* If necessary, make sure that the tank is drained well below the switch prior to removal. Carefully, remove the transmitter from the installation.
3. *Cleaning the switch:* Using a soft bristle brush and mild detergent, carefully wash the switch. Do not use harsh abrasives such as steel wool or sandpaper, which might damage the surface of the sensor. Do not use incompatible solvents, which may damage the sensor's stainless steel body. Take particular care to remove any scaling from the body and that there is no debris inside the inlet.
4. *Transmitter installation:* Follow the appropriate steps of installation as outlined in the Installation section of this manual.

Testing the installation:
Verify proper wiring, power supply and loop resistance. If transmitter is not functioning properly, isolate the transmitter from the system and wire as shown below. Multimeter should read 4 mA with the transmitter out of liquid.