DeltaSpan
Waste Water Pressure
Level Transmitter Manual
LD32 Series
22 AUG 08
Rev A

Introduction

The LD32 Series Waster Water Level Transmitter is manufactured for years of trouble free service in the harshest applications. The pressure transmitter measures the height of liquid above its position in the tank referenced to atmospheric pressure. The transmitter consists of a piezoresistive sensing element, encased in 316 SS housing. Perfect for wastewater and slurry applications, the LD32 series has features to protect the unit from these demanding applications.

Superior lightning and surge protection utilizing dual arrestor technology, grounded to case, eliminating both power supply surges and lightning ground strike transients. Large diameter 316 SS diaphragm seal is non-clogging and damage resistant to floating solids.

The transmitter is equipped with a 270-pound tensile strength, shielded, vented cable. Ventilation tube in the cable automatically compensates for changes in atmospheric pressure above the tank. The vent tube has a filter attached to the end that will block particles, such as dust, dirt, and water droplets, from entering the tube.

- Excellent chemical compatibility with 316 construction and ETFE cable
- Lightning and surge protection on all models
- Maintenance free vent filter
- Large diameter, non-clogging, damage resistant, 316 SS diaphragm seal

Table of Contents

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 Waste Water Pressure Level Transmitter from Flowline; models LD32-____. 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 LD32 series transmitter. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

Temperature and Pressure:
The LD32 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 LD32 series.

Material Compatibility:
The waste water pressure level transmitter, LD32 series, is made of 316 Stainless Steel (316 SS), 316L Stainless Steel (316L SS) with a cable of Polyurethane or Ethylene Tetrafluoroethylene (ETFE). 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, LD32 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 eight 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. .

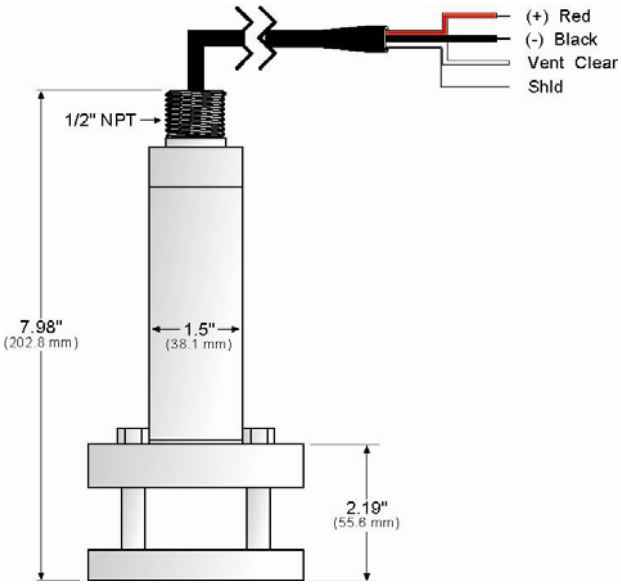
- DeltaSpan
  - LD32-S101 – 05 psi (11.54 ft wc / 3.52 m wc), 40’ (12.2 m) Polyurethane Cable
  - LD32-S111 – 10 psi (23.09 ft wc / 7.04 m wc), 40’ (12.2 m) Polyurethane Cable
  - LD32-S121 – 15 psi (34.63 ft wc / 10.56 m wc), 60’ (18.3 m) Polyurethane Cable
  - LD32-S131 – 20 psi (46.18 ft wc / 14.08 m wc), 60’ (18.3 m) Polyurethane Cable
  - LD32-S201 – 05 psi (11.54 ft wc / 3.52 m wc), 40’ (12.2 m) ETFE Cable
  - LD32-S211 – 10 psi (23.09 ft wc / 7.04 m wc), 40’ (12.2 m) ETFE Cable
  - LD32-S221 – 15 psi (34.63 ft wc / 10.56 m wc), 60’ (18.3 m) ETFE Cable
  - LD32-S231 – 20 psi (46.18 ft wc / 14.08 m wc), 60’ (18.3 m) ETFE Cable
- Quick Start Guide

Technology
A sealed pressure transmitter is placed near or on the bottom of the tank. A stainless steel pressure diaphragm within the pressure transmitter is exposed on one side to the application liquid. The other side is exposed to the reference pressure via a small ventilation tube located inside of the Polyurethane cable. A difference in pressure between liquid and reference pressures 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 is generated from the microprocessor.

Specifications

Service:	Compatible liquids.
Wetted Materials:	Body: 316 SS, 316L SS, and Buna-N; Cable: Polyurethane or ETFE.
Accuracy:	±0.25% of full scale.
Temperature Limit:	0 to 200ºF (-18 to 93ºC).
Compensated Temperature Range:	0 to 180ºF (-18 to 82ºC).
Thermal Effect:	Less than ±0.02%/°F.
Pressure Limit:	2X full scale.
Power Requirement:	13 to 30 VDC.
Output Signal:	Two-wire, 4 to 20 mA.
Response Time:	50 ms.
Max. Loop Resistance:	850 ohms at 30 VDC.
Electrical Connections:	Wire pigtail.
Cable Length	-_001/-_101: 40’ (12.2 m) -_201/-_301: 60’ (18.3 m)
Mounting Orientation:	Suspended in tank below level being measured. Can be placed on the bottom of the tank on its side.
Weight:	4.3 lb (2.0 kg).
Electrical Protection:	Lightning and surge protection.

Dimensions

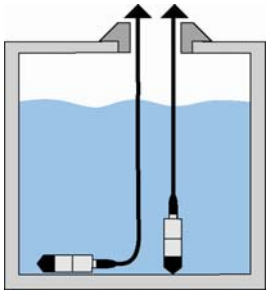


Material Compatibility:

- The LD32 series is made of 316 Stainless Steel (316 SS), 316L Stainless Steel (316L SS) with a cable of Polyurethane or Ethylene Tetrafluoroethylene (ETFE).
- 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 LD32 series will be submersed within the application fluid. The level transmitters can either rest along the bottom of the tank or be suspended at any desired level within the tank. 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.



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 LD32 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:

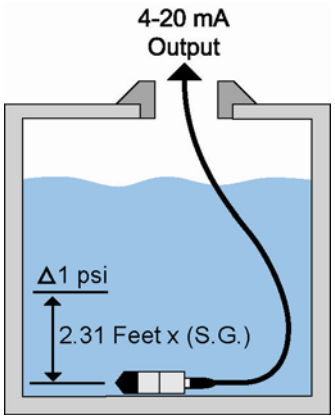
   P = 16.0 feet * (0.9) / 2.31 (feet/psi) = **6.23 psi**

   The maximum required pressure is 6.23 psi, which is above the 5 psi range for the LD32-S001. To read the full range of liquid in the tank, choose the LD32-S101.

Effects of Specific Gravity:
The LD32 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 LD32-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 LD32-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 LD32-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)

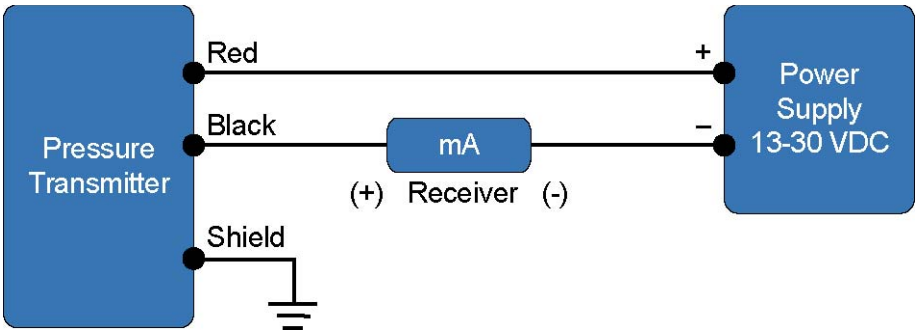
Multiply 10 psi by the new ratio to determine the maximum depth:

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.

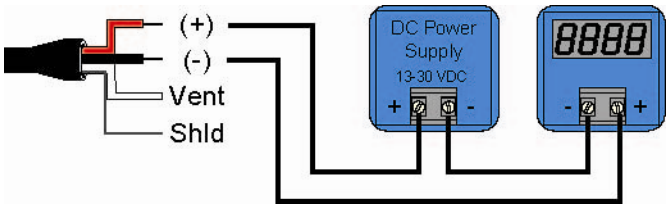


The maximum receiver load resistance (RLmax) for the DC power supply voltage (Vsup) is expressed by the formula:

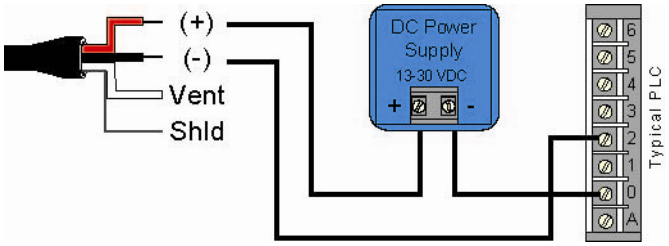
$$RLmax = (Vsup - 13V) / 0.02A$$

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

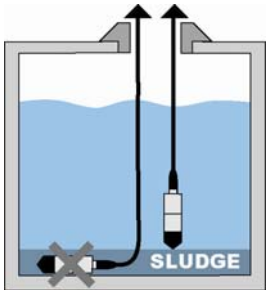


Wiring to a Typical PLC



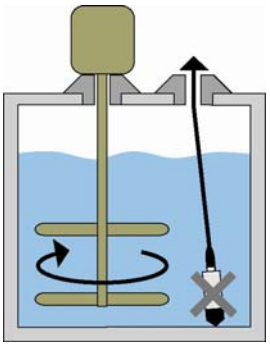
Installation

The LD32 series is designed to operate while submerged in the actual application liquid. Avoid installing the level transmitter along the bottom of the tank is materials such as sludge will build up and coat/cover the transmitter. This also includes any debris that will settle along the bottom of the tank. In these applications, it is best to suspend the transmitter above the highest level of sludge/debris that will occur.



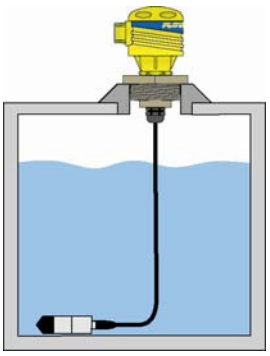
Interference

The DeltaSpan is designed to operate under the surface of the liquid in the tank. Avoid installations where other tank requirements will cause the transmitter to move or swing. For example: a mixer blade could cause the level transmitter to whip around within the tank. An alternative would be to move the transmitter to a more stable section of the tank or to install the LD32 series inside a still well/drop tube. The still well/drop pipe will minimize the effects created by the mixer.



Termination

The cable for the DeltaSpan is typically terminated at a junction box located on top of the tank. Since the vent tube is contained within the cable, the pressure within the junction box must always be the same as the reference (typically atmospheric) pressure for the liquid. The inside of the junction box must be clean, dry and free of moisture. Add the optional pressure fitting (LD90-_001) to complete the package. The LD90-_001 features a 2" NPT thread for mounting and a liquid tight connector to seal the cable interface.



Note: *Use caution when sealing the cable at the top of the tank. The ventilation tube must be open and free to allow air to flow back to the pressure diaphragm. Avoid blocking the ventilation tube by compressing the cable. Always keep the cable termination clean, dry and free of moisture and prevent liquid from entering the vent tube.*

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.