

# 200C Series

## Submersible Level Sensors

### Operating Manual



Corrosion-Free  
Instrumentation Equipment

**Table of Contents**

Safety Information ..... 03

Introduction ..... 03

General Information ..... 03

Technical Specifications ..... 05

200C Series Identification ..... 06

LP100 Junction Box ..... 06

External Tank Level Display & Controller ..... 07

Sensor & Junction Box Installation ..... 08

Sensor & Junction Box Wire Connection ..... 09

Connection Diagram - Sensor + 250B Display ..... 10

Connection Diagram - Sensor + TVL Display ..... 11

Connection Diagram - Sensor + Sentinel LTE + TVL Display ..... 12

Understanding Level Measurement ..... 13

Application Details ..... 13

Getting Started ..... 14

Calculating Max Range of Sensor ..... 15

Correction Sensor Position ..... 16

Trouble Shooting ..... 17

Warranty, Returns & Limitations ..... 18



Corrosion-Free  
Instrumentation Equipment

### Safety Information



#### Warning | Caution | Danger

Indicates a potential hazard. Failure to follow all warnings may lead to equipment damage, injury, or death



#### IMPORTANT!

Indicates situations or cases which, if not avoided, could result in damage or failure of the **Products** equipment.



#### Note | Technical Notes

Highlights additional information or detailed procedure.



#### Do Not Use Tools

Use of tool(s) may damage product beyond repair and potentially void product warranty.

### Introduction

The **200C Series** Levelpro Submersible Level Transmitters are manufactured for years of trouble free service in tough industrial applications. The **200C Series** Levelpro Submersible Level Transmitter measures the height of liquid above the position of the sensing diaphragm of the transmitter located inside the tank referenced to atmospheric pressure. The transmitter consists of a ceramic piezo-resistive sensing element, encased in PVC, PVDF, PP, or 316 SS housing.

The Large Diameter flush diaphragm is non-clogging and damage resistant to floating solids.

The **200C Series** transmitter is equipped with a high tensile strength FEP (Teflon) shielded and vented cable, and contains an internal non-wetted weight and utilizes Kalrez O-ring seals. The Ventilation tube in the cable automatically compensates for changes in atmospheric pressure above the tank.

### General Information

This operating manual contains important information on proper usage of the device. Read this operating manual carefully before installing and starting up the pressure measuring device.

Adhere to the safety notes and operating instructions which are given in the operating manual. Additionally applicable regulations regarding occupational safety, accident prevention as well as national installation standards and engineering rules must be complied with!

This operating manual is part of the device, and should be kept nearest its location, always accessible to all employees.

This operating manual is copyrighted. The contents of this operating manual reflect the version available at the time of printing. It has been issued to our best knowledge. **Levelpro** is not liable for any incorrect statements and their effects.

### Limitation of Liability

By non observance of the operating manual, inappropriate use, modification or damage, no liability is assumed and warranty claims will be excluded.

### Intended Use

The **Levelpro** Level Sensors have been developed for continuous level measurement. It is the operator's responsibility to check and verify the suitability of the device for the intended application. If any doubts remain, please contact our technical department in order to ensure proper usage and compatibility. **Levelpro** is not liable for any incorrect selections and their effects!

Permissible media are liquids (no solids or frozen media), specified in the data sheet. In addition it has to be ensured, that this medium is compatible with the any wetted parts of the level sensor.

The technical data listed in the current data sheet are engaging and must be complied with. If the data sheet is not available, please order or download it from our homepage. ([www.iconprocon.com](http://www.iconprocon.com))

### Package Contents

Please verify that all listed parts are undamaged included in the delivery and check for consistency specified in your order:

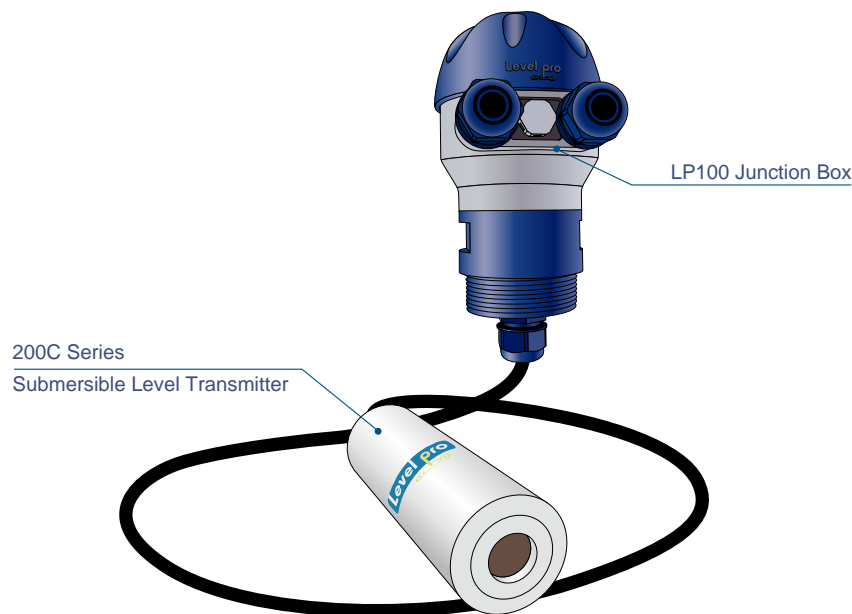
- ❑ Probe
- ❑ Mounting Instructions

### Mounting and Safety Instructions

- ⚠ **WARNING!** Install the device only when depressurized and not connected to power source!
- ⚠ **WARNING!** This device may only be installed by qualified technical personnel who has read and understood the operating manual!
- ⚠ Handle this high sensitive electronic precision measuring device with care, both in packed and unpacked condition!
- ⚠ There are no modifications / changes to be made on the device.
- ⚠ Do not throw the package / device!
- ⚠ **To avoid damaging the diaphragm, remove packaging and protective cap directly before starting assembly. The delivered protective cap has to be stored!**
- ⚠ Place the Protective Cap on the pressure port again immediately after disassembling.
- ⚠ Handle the unprotected diaphragm very carefully - it is very sensitive and may be easily damaged.
- ⚠ Do not use any force when installing the device to prevent damage of the device and the plant!
- ⚠ When placing the device into operation or after maintenance work, the probe has to be submerged slowly into the medium! A rough immersion into the medium can damage or destroy the diaphragm.
- ⚠ If there is any danger of damage by lightning or overpressure when the device is installed outdoor, we suggest putting a sufficiently sized overpressure protection device between the supply or switch cabinet and the device

### Installation Steps for Probe

- ⊙ Carefully remove the pressure measuring device from the package and dispose of the package properly.
- ⊙ Mount the device according to your demands.
- ⊙ If the probe has been delivered without mounting accessories. Please Contact Icon Process Controls ([www.iconprocon.com](http://www.iconprocon.com)) for tank connection **LP100 Junction Box**.



### Removing the Protection Cap

For the protection of the diaphragm, some of the probes have a protection device. The device must be removed before installation. If it is necessary for your application to remove the protection cap, this has to be done with utmost care. To prevent damage of the diaphragm, please follow these instructions.

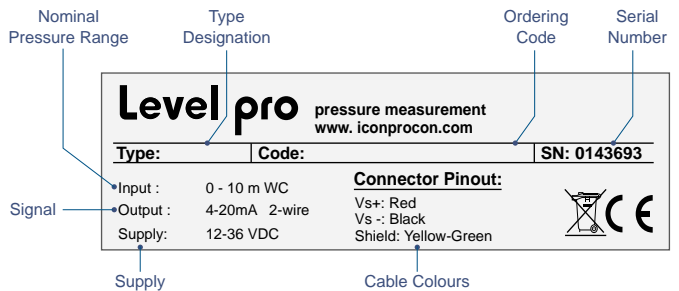
Technical Specifications

Input Pressure Range				
Level ft/H <sub>2</sub> O	14	20	34	54
Overpressure	psi	14X	14X	10X 10X
Output Signal   Supply				
Standard	4-20mA   4-20mA + Hart 2 Wire   0.5-4.5 VDC Ratiometric   0-5 VDC   RS-485 3 Wire			
Power Supply	4-20mA   24 VDC    0.5-4.5VDC Ratiometric    0.5-4.5VDC } 5VDC    RS-485 HART } 24VDC			
Performance				
Accuracy	<±.25% Std   .125% Opt			
Permissible Load	$R_{max} = [(V_s - V_{smin}) / 0.02 A] \Omega$			
Influence Effects	<b>Supply</b> : 0.05% Full Scale / 10V <b>Load</b> : 0.05% Full Scale / K $\Omega$			
Long Term Stability	<± 0.1% Full Scale Over One Year			
Response Time	<150 msec or better			
Thermal Effects   Offset and Span				
Thermal Error	<± 0.2% FSO/K in Compensated Range -20°F - 178°F			
Temperatures				
Operating Temperatures	<b>PVC</b> -32°F – 140°F   <b>PP</b> -20°F – 178°F   <b>PVDF</b> -40°F – 212°F   <b>PTFE</b> -40°F – 212°F			
Electrical Protection				
Short-Circuit Protection	Permanent			
Reverse Polarity Protection	No Damage to Sensor			
Electromagnetic Compatibility	Emission Immunity According to EN 61326			
Short-Circuit Protection	Permanent			
Electrical Connection				
Jacketed Cable	PTFE   Teflon® -40 - 200°F			
3-Wire Cable with Integrated Air Tube for Reference to Atmospheric Pressure				
Materials   Wetted				
Housing	PVC   PP   PVDF   PTFE Teflon®			
Seal	FFKM - Kalrez®			
Diaphragm	Pure Ceramic 99.9% Al <sub>2</sub> O <sub>3</sub>			
Electrical Protection				
Current Consumption	Max. 25mA			
Weight Grams	PVC 575g   PP 475g   PVDF 825g   PTFE Teflon® 875g			
Ingress Protection	IP 68			
CE-Conformity	EMC Directive: 2004   108   EC			

### 200C Series Identification

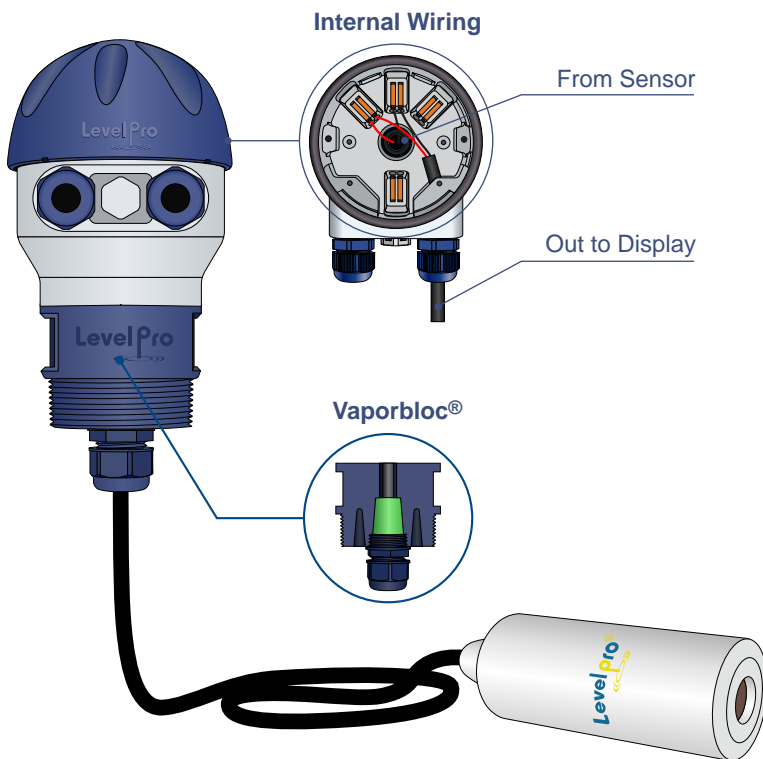


**⚠ The Solution to Tough Applications Where Ultrasonic Sensors Simply DO NOT WORK!**



The Device can be Identified by its Manufacturing Label.

### LP100 Junction Box



The **LevelPro® 200C Series** continuous submersible level transmitter and tank level **Junction box** are a perfect pair for applications where ultrasonic sensors aren't going to work.

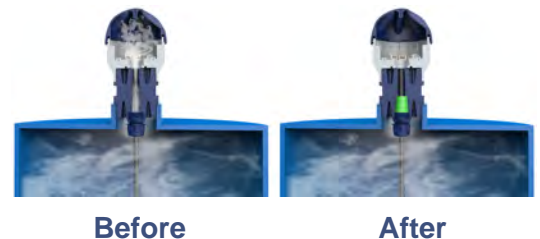
Accurately measure tank levels with this rugged combination that's simple to use and boasts superior chemical resistance along with industry exclusive features

### Features

- ✓ New **Vaporbloc®** Technology
- ✓ NEMA 4X Enclosure
- ✓ Tool Free Wiring Terminals
- ✓ All Plastic NEMA 4X Enclosure
- ✓ 2" Threaded Connection
- ✓ Excellent Chemical Resistance
- ✓ Weather Resistant
- ✓ **Gortex®** Air Breather Included
- ✓ Polypropylene Cord Grips
- ✓ Tethered Lid
- ✓ Lightweight Glass Filled Polypropylene
- ✓ Self-Draining Lid

### Vaporbloc® Technology

- ✓ Blocks out Corrosive Chemical Fumes
- ✓ Pressure Tested to 75 psi
- ✓ Protects Internal Wiring Connections
- ✓ Eliminates Corrosive Fumes Out-gassing into Environment

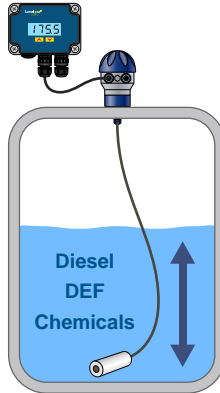


External Tank Level Display & Controller

ITC-250B Series Tank Level Display (Battery Powered)



Battery Operated



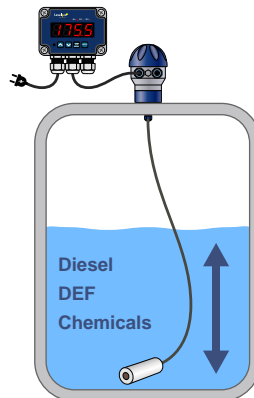
Features

- ✔ Battery Powered
- ✔ Super Bright LED Digits
- ✔ NEMA 4X Enclosure
- ✔ Security Protection
- ✔ Momentary or Adjustable Relay Timer\*
- ✔ NEMA 4X Enclosure
- ✔ LED Display
- ✔ All Plastic - Corrosion Resistant
- ✔ All Cord Grips Included
- ✔ Simple Programming

TVL Series Tank Level Display & Controller



120VAC Operated



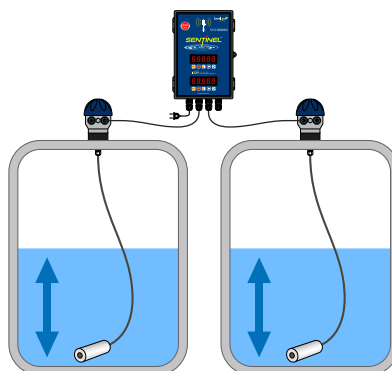
Features

- ✔ SunBright Technology for Outdoor Applications
- ✔ No Assembly Required
- ✔ 8 Levels of Brightness
- ✔ Signal Peak Value Detection | Dampens Noise
- ✔ 3 Wire Cord Grips Included | No Add Ons
- ✔ Relay Lights & Audible Alarm Function
- ✔ Completely Thermoplastic | Corrosion-Free

VU2 Series Remote Tank Level Monitoring (Dual Tank System)



220VAC Operated

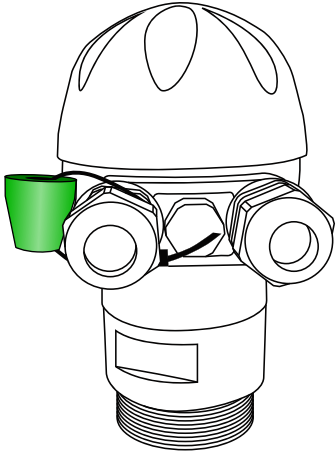


Features

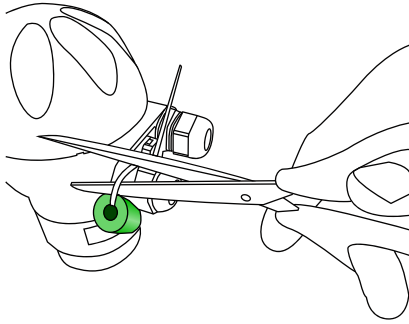
- ✔ 2x LED Display
- ✔ 120VAC Powered | No Batteries
- ✔ Remote Monitoring via Cellular Networks
- ✔ 24/7 Access to Data via Cloud Based
- ✔ Low Monthly Cost
- ✔ 5-Digit LED Display
- ✔ Access Data Via PC | Laptop | Phone
- ✔ 2-5A Relays + 4-20mA Output

Sensor & Junction Box Installation

01

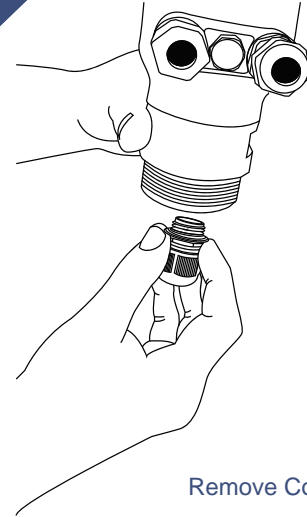


02



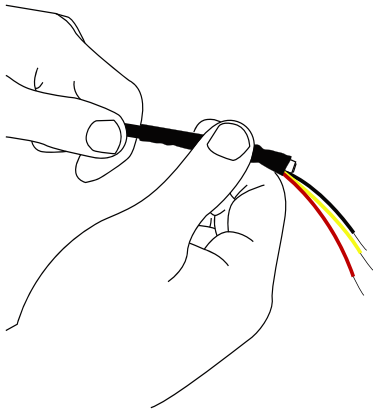
Cut Zip Tie to Retrieve VaporBloc®

03



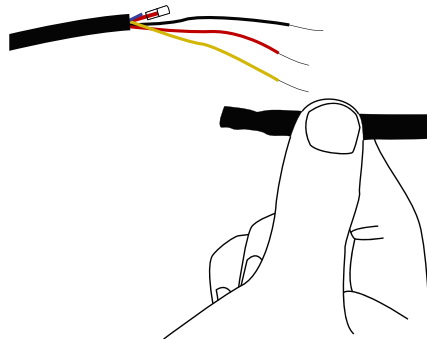
Remove Cord Grip

04



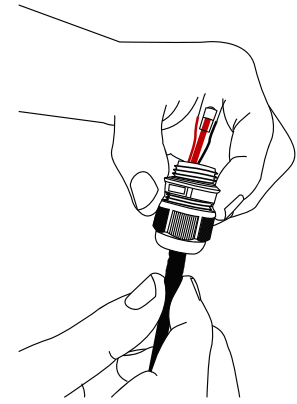
Remove Heat Shrink

05



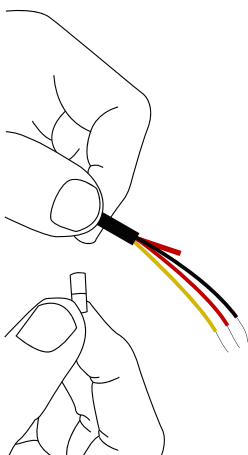
Discard Heat Shrink

06



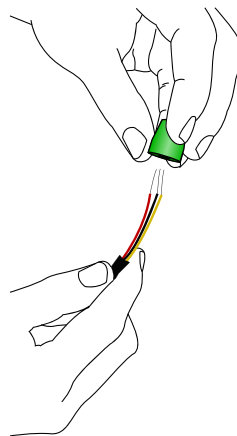
Push Wires & Breather Through Cable Gland

07



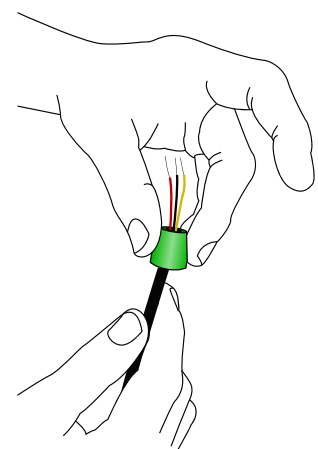
Remove Filter from Vent Tube

08



Feed Wires through VaporBloc®

09



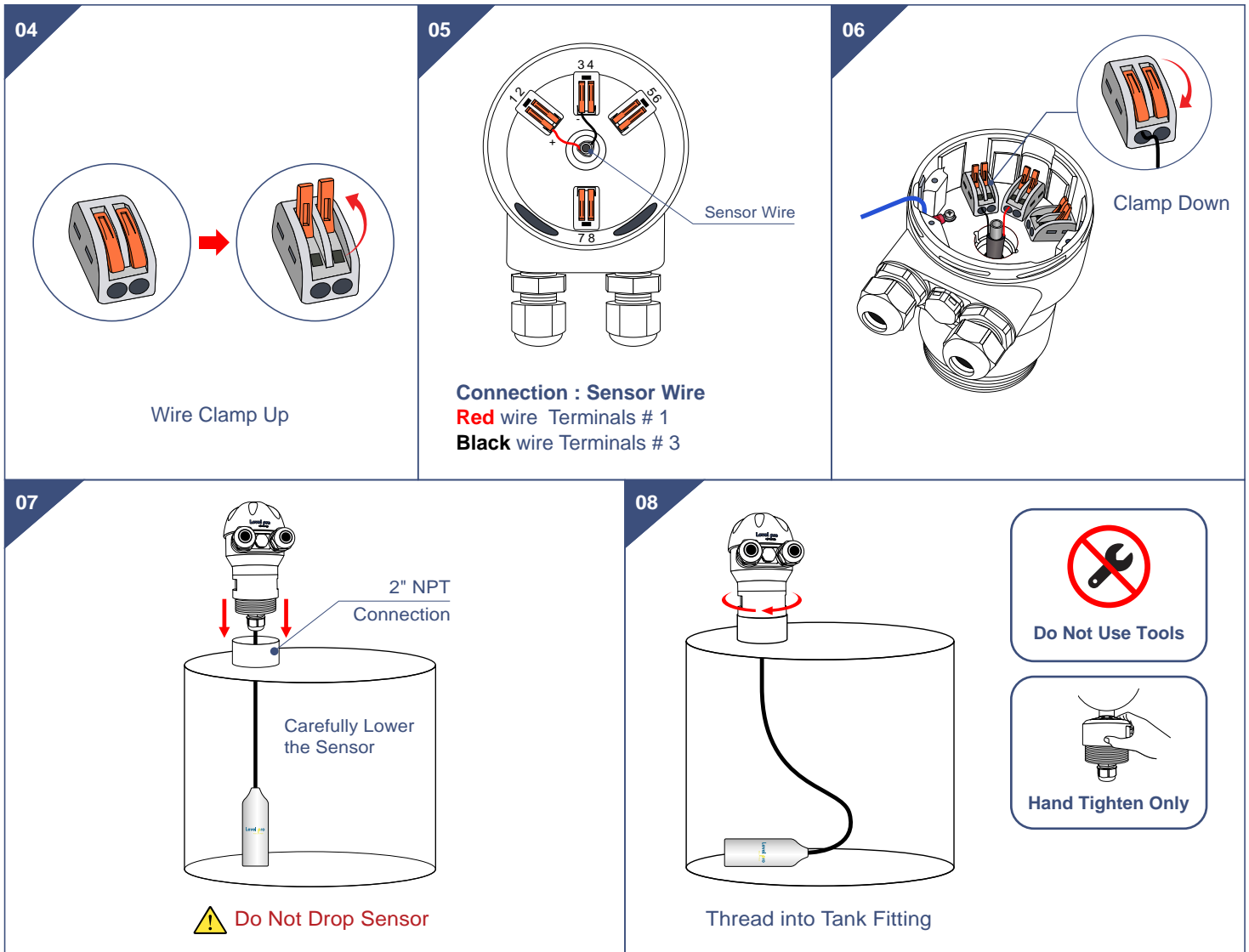
Ensure VaporBloc® is Oriented Correctly



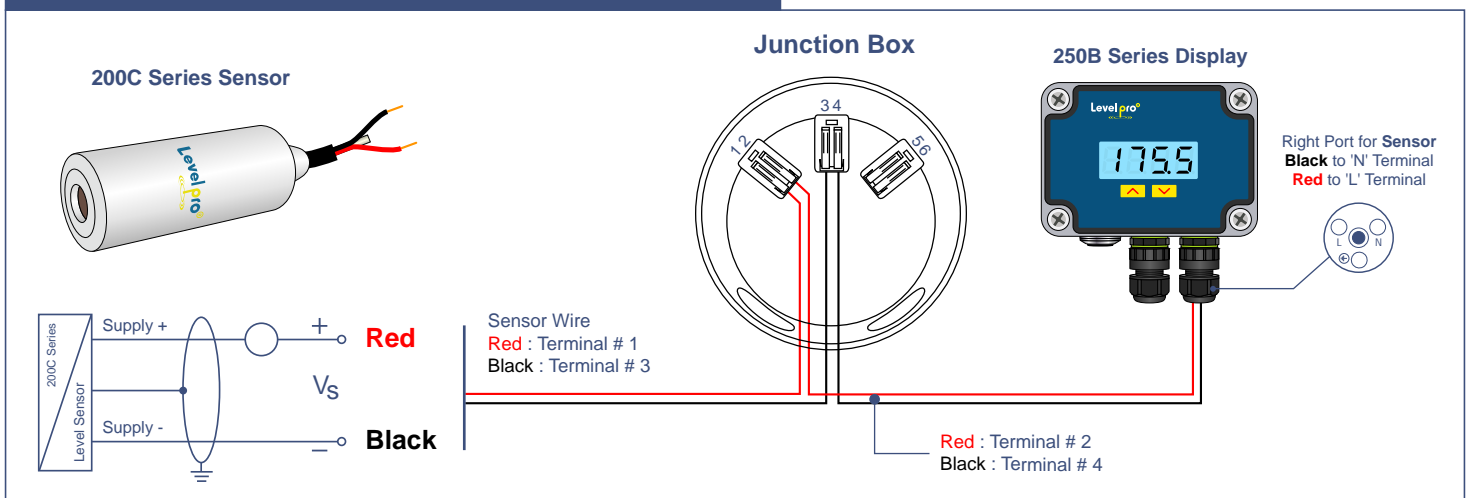
<p>10</p> <p>Ensure VaporBloc® has a Snug Fit</p>	<p>11</p> <p>Place Filter back on Vent Tube</p>	<p>12</p> <p>Insert Wire into the Junction Box</p>
<p>13</p> <p>Ensure Cable is fully Inserted</p>	<p>14</p> <p>Thread Cord Grip Into Junction Box</p>	<p>15</p> <p>VaporBloc® Installed</p>

**Sensor & Junction Box Wire Connection**

<p>01</p> <p>1/4 Turn</p> <p>Level pro</p> <p>Take Junction Box Open Lid</p>	<p>02</p> <p>Lid is Tethered</p> <p>Fuming Liquids??? Please Install VaporBloc®</p> <p>Open Lid</p>	<p>03</p> <p>Sensor Cable</p> <p>Do Not Bend Capillary Reference Tube</p> <ol style="list-style-type: none"> <li>1. Feed Sensor Red and Black Wire + Breather into Junction Box</li> <li>2. Tighten Cord Grip</li> </ol>
--	---	--

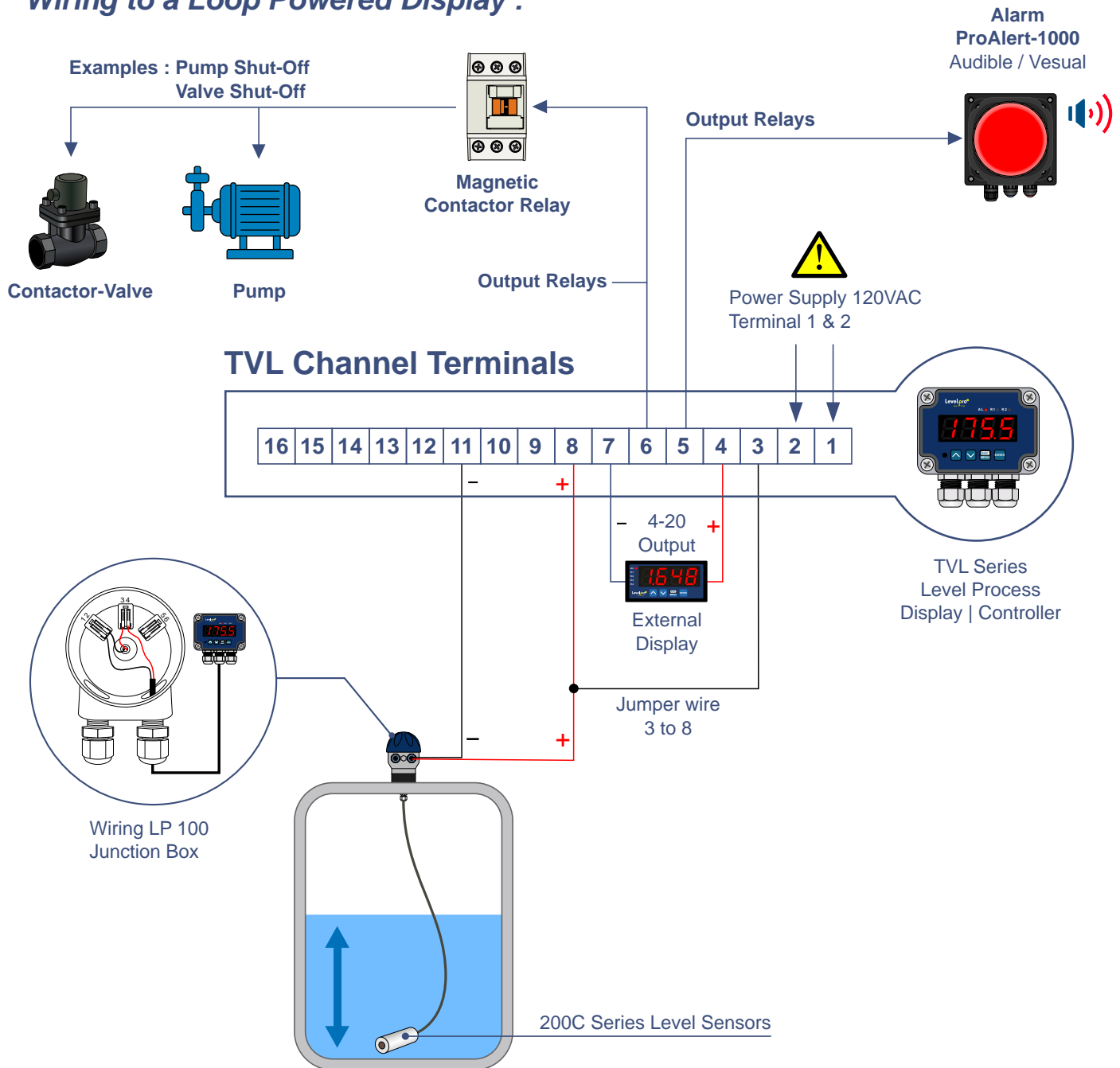


Connection Diagram - Sensor + 250B Display



Connection Diagram - Sensor + TVL Display

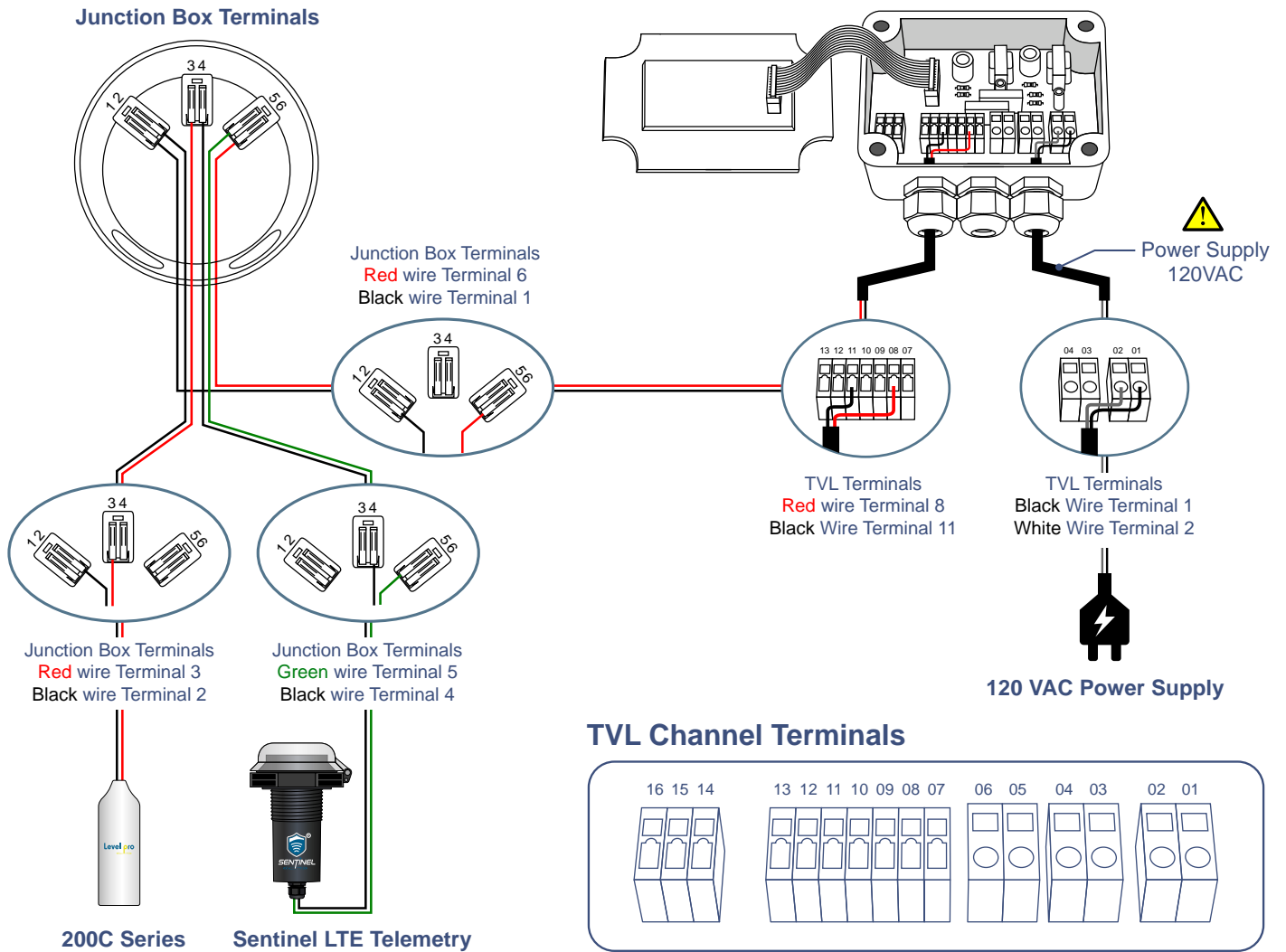
Wiring to a Loop Powered Display :



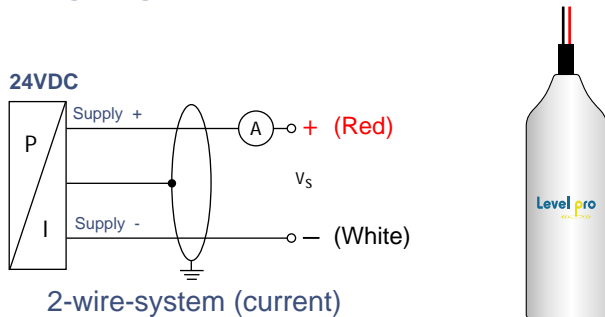
Wiring to the Levelpro Series Tank Level Controller

- ⊙ The default for the Input 1 is 4 mA and this will not change.
- ⊙ Typically, the Empty setting will be the tank is empty (example. 000.0 Gallons, 000.0 inches, 000.0 feet etc.).
- ⊙ 20mA typically reflects the Full setting will be when the tank is full (example: 500.0 Gallons, 120.0 inches, 10.0 feet, etc.)
- ⊙ **Shielded cable is recommended for control loop wiring.**
- ⊙ **Use the Red wire as the (+) and the Black wire as the (-)**

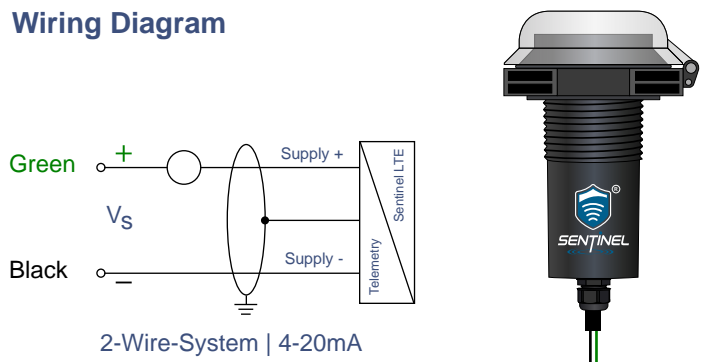
Connection Diagram - Sensor + Sentinel LTE + TVL Display



200C Series Wiring Diagram



Sentinel LTE Series Wiring Diagram

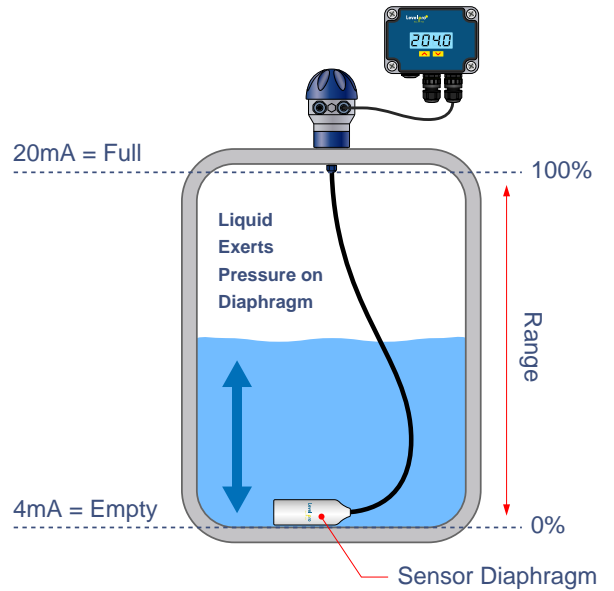


### Understanding Level Measurement

#### Submersible Sensors

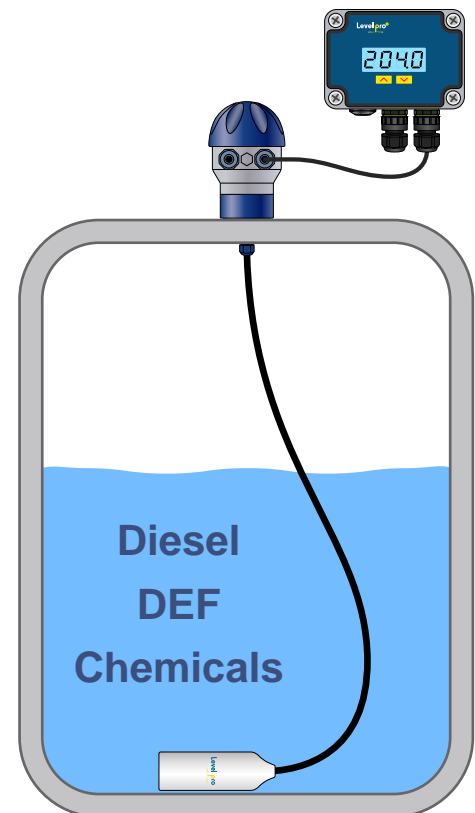
All Submersible Sensors have a Calibrated Range that is Based on H<sub>2</sub>O that has a Specific Gravity or Density = 1

- Range Value** : The Overall Measuring Distance that the Sensor has been calibrated to by the Factory - The Range will be Located on the Sensor Body
- Empty** : The Pressure being exerted on from the sensor diaphragm at Lowest Point Normally this is when the Tank is Empty within the Tank  
Empty = 4mA setting.
- Full** : The Pressure being exerted on the sensor's diaphragm at the highest point Liquid Level within the Tank  
Full = 20mA setting.



### Application Details

- ☑ Chemical \_\_\_\_\_
- ☑ Concentration \_\_\_\_\_
- ☑ Specific Gravity \_\_\_\_\_
- ☑ Temperature \_\_\_\_\_
- ☑ Solids : Yes  No
- ☑ Out-gassing or Vapors : Yes  No
- ☑ Tank Dimensions W x H inches :  
W = \_\_\_\_\_ H = \_\_\_\_\_
- ☑ Vertical :  Horizontal :
- ☑ Flat Bottom :  Conical Bottom :



### Getting Started

- Submersible Pressure Sensors are designed to be completely submerged within the liquid. The transmitters can 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.

**ex :** Positioning the transmitter 12" from the bottom of the tank, then the lowest reading of liquid will be 12" from the bottom.

When the Liquid To Be Measured is Not H<sub>2</sub>O the New Range of the Sensor Needs to be Determined.

To Achieve this Simply Divide the Range of the Sensor Body by the Specific Gravity of the Liquid

$$\text{SENSOR RANGE} / \text{S.G} = \text{NEW RANGE}$$

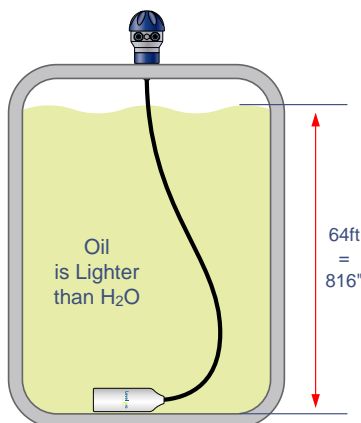
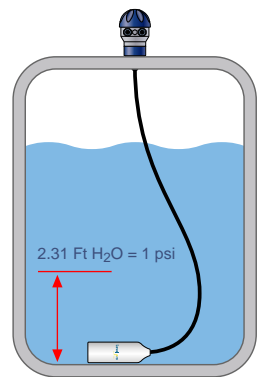
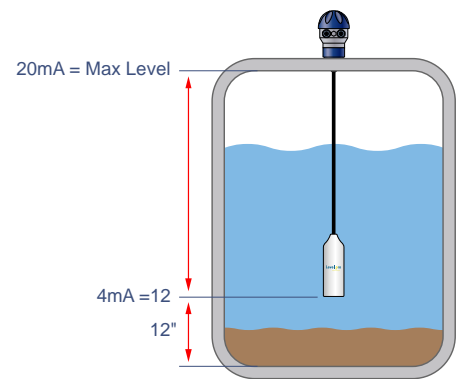
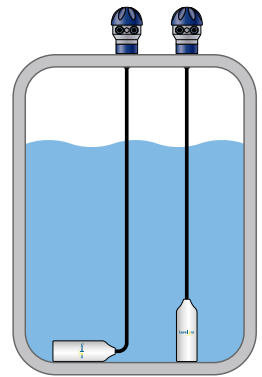
### The Importance of the Liquids S.G (Specified Gravity)

The S.G of a Liquid has a Direct Effect on the Sensors Output when Measuring the Height of the Liquid

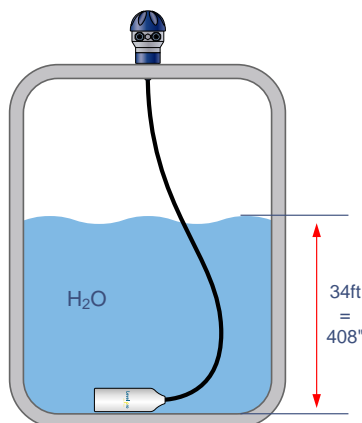
- Liquids with a S.G < 1.0 are **Lighter** than H<sub>2</sub>O i.e. Oil
- Liquids with a S.G > 1.0 are **Heavier** than H<sub>2</sub>O i.e. Sulfuric Acid
- H<sub>2</sub>O has a SG = 1.0

- S.G < 1.0 Requires **More Liquid** to Equal the Same Pressure or Height as with H<sub>2</sub>O.
- S.G > 1.0 Requires **Less Liquid** to Equal the Same Pressure or Height as with H<sub>2</sub>O.

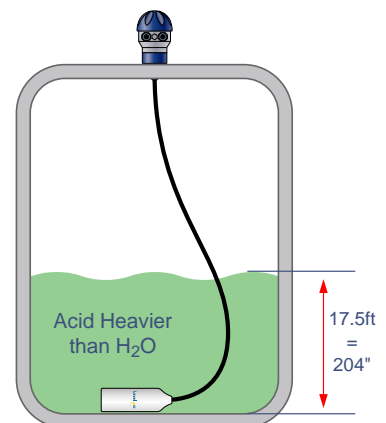
Here are some examples of how the submersible sensor range changes when submersed into liquids with different Specific Gravities



Specific Gravity = 0.5  
Tank # 1



Specific Gravity = 1  
Tank # 2



Specific Gravity = 2  
Tank # 3

# Continuous Submersible Level Transmitter

## Calculating Max Range of Sensor

Lets assume a the calibrated range of the submersible sensor is 34" or 408. The range is always referenced H<sub>2</sub>O which has a specific gravity S.G or (Density) equal to 1

Calibrated Range/S.G = Liquid Level Measurement Range  $34/1 = 34'$  or  $408/1 = \text{Liquid Level Range} = 408''$

### Example 1

The liquid in Tank # 1 has a S.G = 0.5 which is **Lighter** than that of H<sub>2</sub>O

To determine the New Range of the sensor simply divide the H<sub>2</sub>O Range (34') by the S.G of the liquid that is going to be in the tank.  $S.G = 0.5$   
 $34/.5 = 64$  feet or 816 inches

Since the oil is a lighter fluid than H<sub>2</sub>O the new measuring range of the sensor has increased and is now 64' or 816"

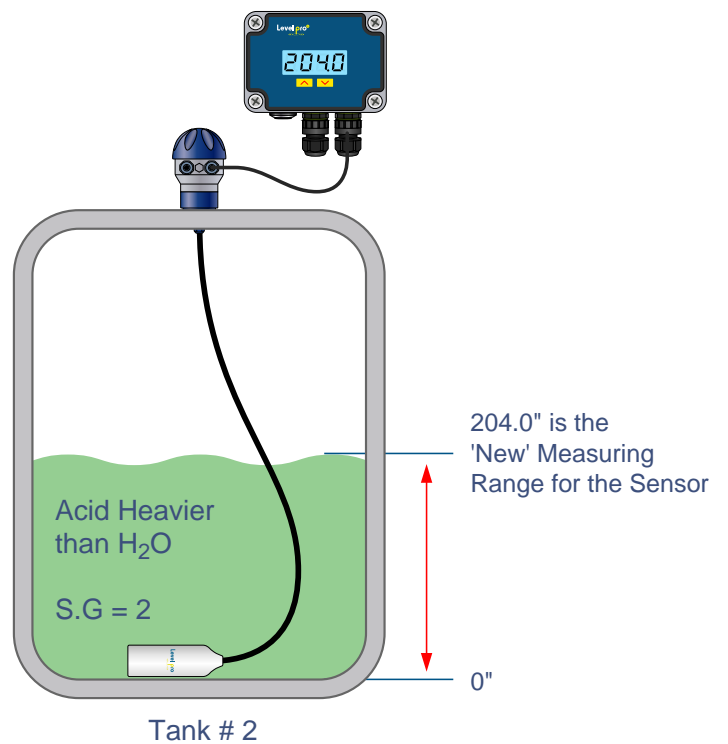
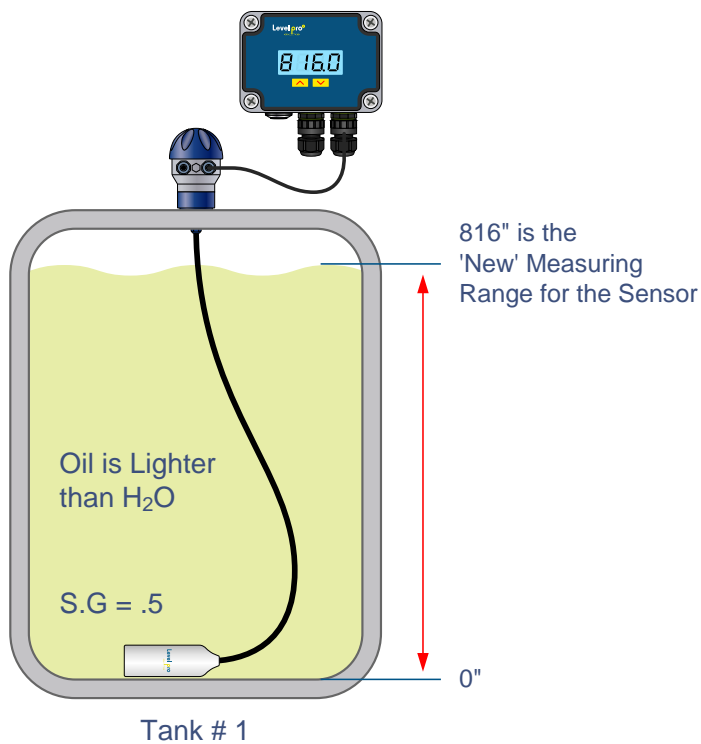
### Example 2

The liquid in Tank # 2 has a S.G. = 2 which is **2X Heavier** than H<sub>2</sub>O

The 34' sensor is now going to be installed into a tank to measure a liquid with a S.G = 2

Range / S.G = New Range of the Sensor

$34/2 = 17.5$  feet or 204"



Oil S.G = 0.5	Sensor Signal	Display Reading
Tank 1   Empty	4.0mA	0"
Tank 1   Full	20.0mA	816"

Acid S.G = 2.0	Sensor Signal	Display Reading
Tank 2   Empty	4.0mA	0"
Tank 2   Full	20.0mA	204"

### Correction Sensor Position

The **Submersible Level Sensor** is designed to operate while submerged in the actual application liquid. Avoid installing the level transmitter along the bottom of the tank if 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. See Fig A.

- ⊗ **Location** : Select a location where the temperature of the transmitter will be within the specification of the sensor.



Installations where other tank requirements will cause the transmitter to move or swing.

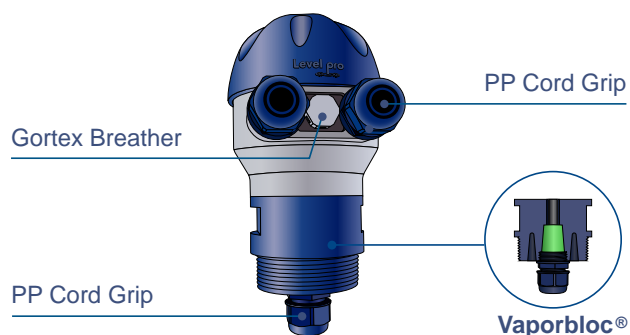
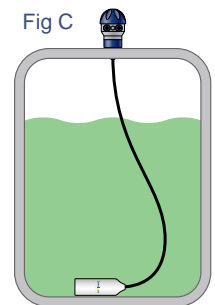
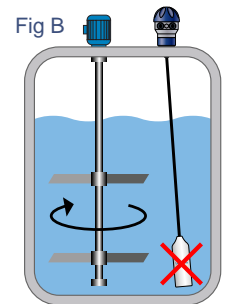
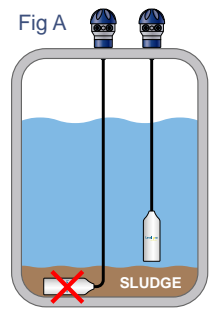
A mixer blade could cause the level transmitter to whip around within the tank. An alternative would be to move the transmitter to a more stable section of the tank or to install the Transmitter inside a still well/drop tube. This will minimize the effects created by the mixer.

- ⊗ **Position** : The transmitter is not position sensitive.
- ⊗ **Mounting** : The transmitter can be mounted via several methods. It can be suspended from the cable, it can be placed resting on the bottom of the tank in either horizontal or vertical orientation, or it can be attached to a pipe or hardwired using the **LP100** conduit box on the top of the housing.

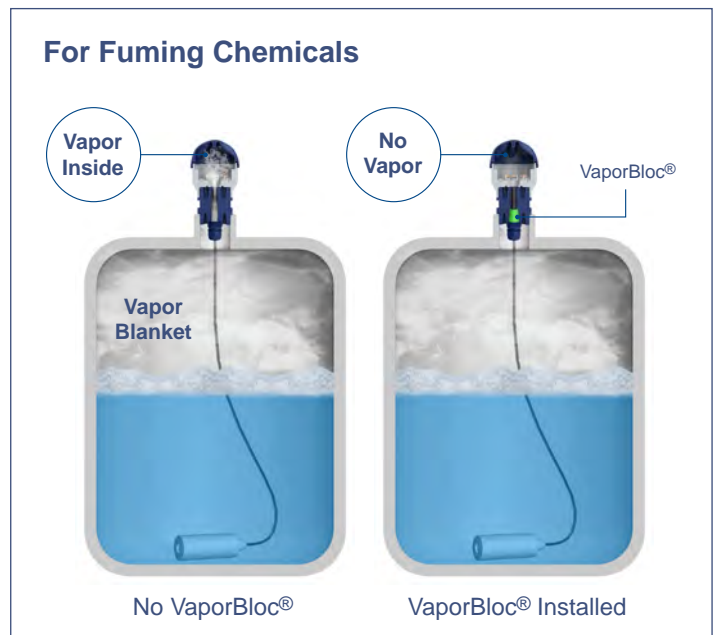
- ⊗ **Avoid** : installations where other tank requirements will cause the transmitter to move or swing.  
**Ex:** A mixer blade could cause the level transmitter to whip around within the tank. An alternative would be to move the transmitter to a more stable section of the tank or to install the Transmitter inside a still well/drop tube. This will minimize the effects created by the mixer.

**Termination:** The cable for the transmitter is terminated at a LP100 junction box located on top of the tank. Since the vent tube is contained within the cable, the pressure within the junction box. A Gortex® Breather to ensure accurate atmospheric pressure inside the junction which is necessary as a reference to the pressure acting on the sensor at the bottom of the tank.

The inside of the function box must be clean, dry and free of moisture.



- ⊗ **Note:** Use caution when connecting the cable within the junction box. A ventilation/reference tube is located within the cable. The purpose of this tube is to provide a comparison between current atmospheric pressure and the pressure that is being exerted on the sensing diaphragm within the tank.
- ⊗ The reference tube must be open and free to allow air to flow back to the pressure diaphragm.
- ⊗ Avoid blocking or bending the ventilation tube by compressing the cable.

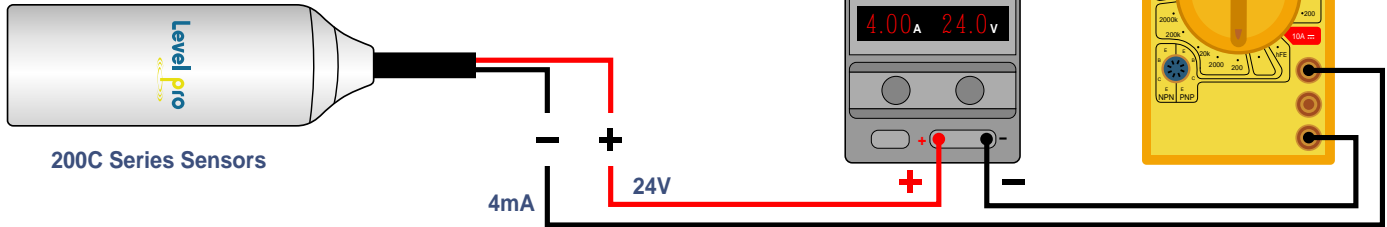




### Trouble Shooting

#### Trouble Shooting the Sensor

1. First, verify that the sensor is wired correctly.
2. Next, check if the power supply is providing the required power.



If transmitter is not functioning properly, isolate the transmitter from the system and wire as shown below. Be sure to remove the sensor from the classified area when performing this test. Multi Meter should read 4 mA with the transmitter out of liquid.

#### Display Not Turning On

- ✓ Check Wiring
- ✓ Check Battery Status

#### Invalid Data Transfer

- ✓ Check Wiring
- ✓ Check Battery Status

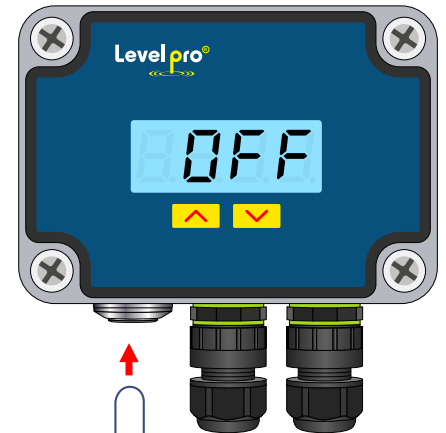
#### Display Indicates LL

- ✓ Check Wiring
- ✓ Check Battery Status

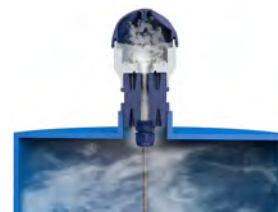
#### Incorrect Display Reading

- ✓ The reference or capillary tube is fitted with a **Gortex®** Filter - this must remain attached in order to prevent moisture, particulate or insects from entering. Do Not Remove.
- ✓ Avoid blocking or bending the ventilation tube.
- ✓ The **LP100** Installation Junction Box is fitted with a **Gortex®** Breather to allow for air to pass but not water. Please Ensure this Not Blocked

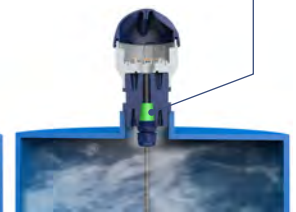
**Measuring Liquids that Fume, Form Vapor Blankets or Out-Gas - Ensure Vaporbloc® has Been Installed**



**Vaporbloc® Technology**



Fumes Entering JB



Ensure Vaporbloc is Installed

### Warranty, Returns & Limitations

## Warranty

**Icon Process Controls** warrants to the original purchaser of its products that such products will be free from defects in materials and workmanship under normal use and service in accordance with instructions furnished by **Icon Process Controls** for a period of one year from the date of sale of such products. **Icon Process Controls** obligation under this warranty is solely and exclusively limited to the repair or replacement, at Icon's option, of the products or components, which Icon examination determines to its satisfaction to be defective in material or workmanship within the warranty period. **Icon Process Controls** must be notified within thirty (30) days pursuant to the instructions below of any claims of lack of conformity under this warranty. Any product repaired under this warranty will be warranted only for the remainder of the original warranty period. Any product provided as a replacement under this warranty will be warranted for the full 1 year from the data of sale.

## Returns

Products cannot be returned to **Icon Process Controls** without Icon's prior authorization. To return a product that is thought to be defective please submit a customer return (MRA) request form and follow the instructions therein. All warranty and non-warranty product returns to **Icon Process Controls** must be shipped prepaid and insured. Icon will not be responsible for any products lost or damaged in shipment.

## Limitations

**This warranty does not apply to products which:**

- 1) Are beyond the warranty period or are products for which the original purchaser does not follow the warranty procedures outlined above;
- 2) Have been subjected to electrical, mechanical or chemical damage due to improper, accidental or negligent use;
- 3) Have been modified or altered;
- 4) Anyone other than service personnel authorized by Icon have attempted to repair;
- 5) have been involved in accidents or natural disasters;
- 6) Are damaged during return shipment to **Icon Process Controls**.

**Icon Process Controls reserves the right to unilaterally waive this warranty and dispose of any product returned to Icon where :**

- 1) There is evidence of a potentially hazardous material present with the product;
- 2) The product has remained unclaimed at **Levelpro** for more than 30 days after **Icon Process Controls** has dutifully requested disposition.

This warranty contains the sole express warranty made by Levelpro in connection with its products. ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED. The remedies of repair or replacement as stated above are the exclusive remedies for the breach of this warranty. IN NO EVENT SHALL LEVELPRO BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND INCLUDING PERSONAL OR REAL PROPERTY OF OR INJURY TO ANY PERSON. THIS WARRANTY CONSTITUTES THE FINAL, COMPLETE AND EXCLUSIVE STATEMENT OF WARRANTY TERMS AND NO PERSON IS AUTHORIZED TO MAKE ANY OTHER WARRANTIES OR REPRESENTATIONS ON BEHALF OF **Icon Process Controls**.

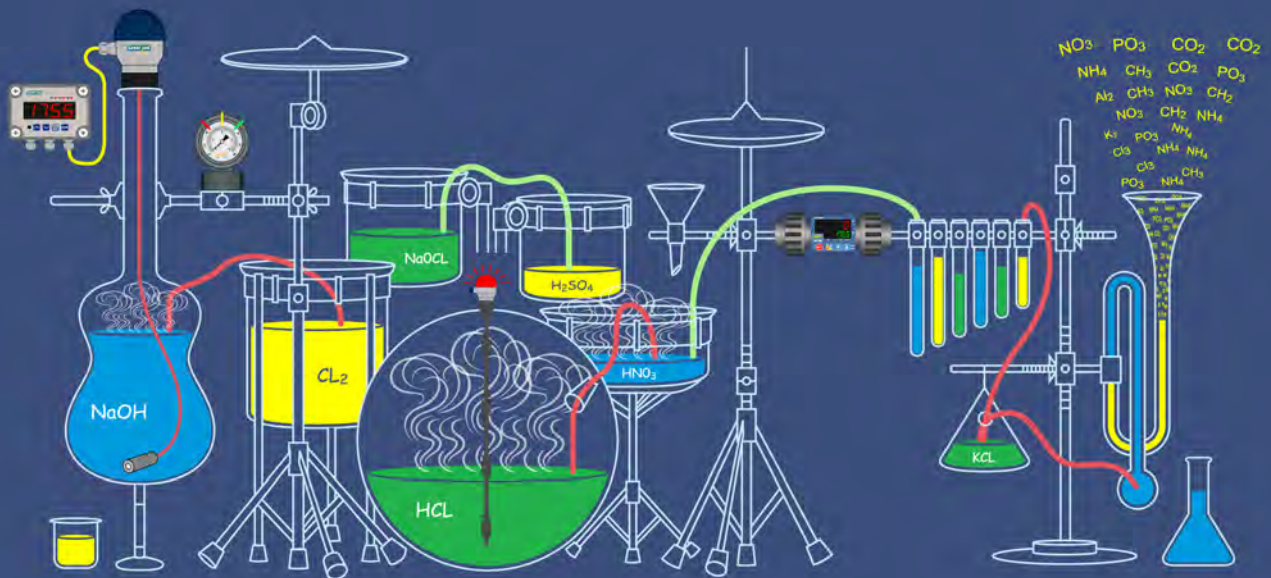
If any portion of this warranty is held to be invalid or unenforceable for any reason, such finding will not invalidate any other provision of this warranty

For additional product documentation and technical support visit [www.iconprocon.com](http://www.iconprocon.com) | e-mail: [sales@iconprocon.com](mailto:sales@iconprocon.com) [support@iconprocon.com](mailto:support@iconprocon.com) | Ph: 905.469.9283



Corrosion-Free  
Instrumentation Equipment

# CORROSION



We Measure & Control  
All Kinds of Corrosive Liquid S#\*o%

*Industry's Most Extensive Line of  
Corrosion-Free Instrumentation Equipment*



Corrosion-Free  
Instrumentation Equipment