Instruction Manual

ANDERSON-NEGELE

Instrument Model Number _____

Instrument Serial Number _____

"L3" Pressure and Level Transmitter

Section 1 - Introduction

1.1 Specifications

Measuring range URL [bar]	Relative	0...0.4 / -1...2 / -1...7 / -1...35
Measuring range URL [psi]	Relative	0...6 / -14.7...30 / -14.7...100 / -14.7...500
Turndown	max. 10:1	of upper range limit
		(see also measurement accuracy)
Overpressure strength	Factor	1.5 x nominal pressure of measuring element
Measurement accuracy	Turndown to 5:1	≤ 0.10 % in calibrated measuring range
	Turndown over 5:1	≤ 0.15 % in calibrated measuring range
	Repeatability	0.05 %
	Long-term stability	0.2 % URL every 2 years
Temperature effect	Process	< 0.016 % of calibrated measuring range / 5.5 °C (10 °F)
	Ambient	< 0.016 % of calibrated measuring range / 5.5 °C (10 °F)
Temperature range	Process	-18...110 °C (0...230 °F) at ambient temperature below 71 °C (160 °F)
	Ambient	-18...71 °C (0...160 °F)
	CIP/SIP Cleaning	CIP/SIP at 130 °C (266 °F) for 1 hour when ambient is below 60 °C (140 °F)*
Response time		< 0.1 seconds
Sample rate		< 0.05 seconds
Materials	Connection head	Stainless steel, AISI 304 (1.4301), Ra ≤ 0.8 µm (32 microinch)
	Metal cover	Stainless steel, AISI 304 (1.4301), Ra ≤ 0.8 µm (32 microinch)
	Plastic cover	Polycarbonate
	Threaded connector	Stainless steel, AISI 304 (1.4301), Ra ≤ 0.8 µm (32 microinch)
	Wetted parts	Stainless steel, AISI 316L, Ra ≤ 0.64 µm (25 microinch)
	Diaphragm	Stainless steel, AISI 316L, Ra ≤ 0.64 µm (25 microinch)
	Diaphragm seal/oil filling	Medical white oil / mineral oil / paraffin oil
		FDA approval number 21CFR172.878, 21CFR178.3620, 21CFR573.680
		Neobee M20 (optional)
Process connection	3-A Compliant	1-1/2" Tri-Clamp®
		2" Tri-Clamp®
		2½" Tri-Clamp®
		3" Tri-Clamp®
		AIC CPM Flush Mount
		Anderson Flush Mount Short (71060-A4, A6, A8)
		Anderson Flush Mount Long (71060-A3, A5, A7, A9)
		Rosemount/Foxboro Sanitary Spud - Short and Long
		Endress & Hauser Universal Adaptor - Short and Long
	Not 3-A Compliant	G1"
		G1" Fixed Thread
		1-1/2" NPT 2
		38mm SMS Liner (female)
		51mm SMS Liner (female)
		40mm DIN 11851 (Milk Coupling)
		50mm DIN 11851 (Milk Coupling)
		DRD—not 3-A compliant
		M38x1.5

* CIP/SIP temperature limit of 121ºC (250 °F) for fitting options 088 and 089

Electric connection	Cable gland	M16x1.5
	Plug-in connection	M12 plug, 5-pin, 1.4305
Protection class		IP 67 (with cable fitting) / NEMA 4X
		IP 69 K (with plug-in connection)
Auxiliary voltage		Hart Version: 18...35 VDC
		IO-Link Version: 18...36 VDC
Output	Current loop and IO-Link Communication versions available	analog 4...20mA, Hart 7.0, IO-Link Communications
Tightening torque	For assembly, all L3 components	27 Nm (20 ft-lbs)
Weight		approx. 780 g

1.2 Warnings

Warning! This unit accepts DC voltage only, connection to AC voltage can cause failure of the sensor and/or risk of electrocution

Warning! Do not remove this sensor from the process while it is operating. Removal while the process is operating can contaminate the process and could cause human injury.
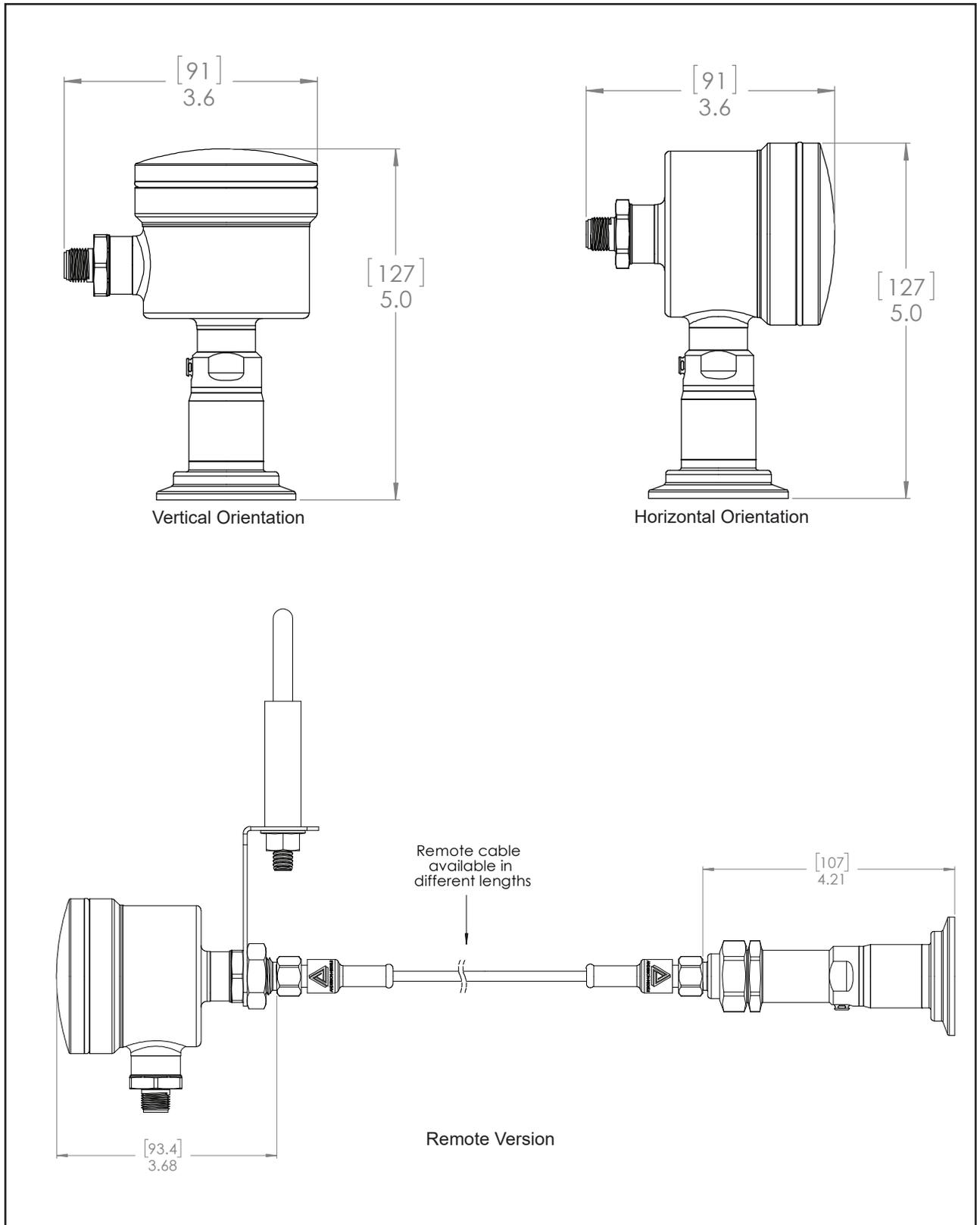
Warning! Do not subject this sensor to pressure that exceeds the specified upper range limit. Over-pressure may cause premature failure, incorrect output signal, or possible human injury.

Warning! Before removing for service or calibration, ensure that residual product has been flushed from the line and that internal pressure has returned to atmospheric pressure.

1.3 Dimensional Drawings

[91]
3.6

[127]
5.0

Vertical Orientation

[91]
3.6

[127]
5.0

Horizontal Orientation

Remote cable
available in
different lengths

[107]
4.21

[93.4]
3.68

Remote Version

Section 2 - Theory of Operation and Description

The Anderson - Negele L3 Pressure / Level transmitter may be used in applications where an output proportional to process pressure, hydrostatic head, or the volume or mass of a vessel's contents is needed for process or inventory control . This unit utilizes an internal piezoelectric transducer and an RTD temperature element to measure the pressure and temperature of the internal actuating fluid. The mV signal of the transducer and resistance of the RTD are measured and converted to a compensated pressure value by way of the signal acquisition board in the stem. This signal is digitally communicated to the head where the signal is converted to industry standard 4...20mA, IO-Link or Hart 7.0 signals. For relative sensors the back of the diaphragm is vented and the output is relative to the atmospheric conditions. In the case of the absolute sensors the measurement is relative to a theoretical perfect vacuum therefore the signal will vary with atmospheric conditions.

The integral display and four button interface shows the process variable, a graphical representation of the output and allows reconfiguration of the unit including the configuration of tank geometry and product density. All parameters may also be accessed through Hart communication.

The L3 Pressure / Level transmitter was designed specifically for liquid measurement applications in the food and beverage industry where accuracy in dynamic temperature environments is critical to process control. The measurement cell is integral to a welded sanitary diaphragm seal that is available in a variety of industry standard fitting styles and sizes. The process pressure deflects the metal diaphragm, transmitting the pressure to a transducer cell.

Section 3 - Installation

The physical installation is of the upmost importance with regard to sensor reliability. Transmitters must be installed in such a way that the device and cable are not subject to physical abuse. Additionally, moisture and or moist air must not be allowed to enter the sensor housing or cable.

NOTE: The installer assumes responsibility for preventing water or water-vapor from entering the sensor housing by proper installation of the cap and appropriate cable preparation. Units equipped with M12 Quick Disconnects are rated to NEMA 4X and IP69X. Cable gland equipped units are rated to NEMA 4X and IP67.

To facilitate electrical connections, your new L3 transmitter may be supplied with a 5pin M12 quick disconnect receptacle, an M16 cable gland, or a ½" NPTF threaded adaptor. If mounted horizontally, the cable connection should point downward. Also, to prevent entry of excessive moisture, it is highly recommended that conduits not be connected directly to the sensor. If conduit is to be run to the sensor, it is preferable that the watertight connector provided with each sensor not be removed from the sensor. Instead, run the flexible conduit as near to the sensor as possible and utilize a seal-tight connector at the end of the conduit. Allow a short amount of cable to run between the sensor and the flexible conduit. This isolates the sensor housing from the conduit system and any moisture it may contain. If the conduit is connected directly to the sensor, the chances are high that the sensor will eventually fail due to excessive water or water vapor entry into the housing.

NOTE: It is recommended that a sensor "Re-ZERO" be performed at time of installation. Refer to section 7.10, page XX for information on this procedure.

NOTE: It is recommended that a mA calibration be performed after installing a transmitter in a loop for the first time. Refer to section 7.9

Section 4 - Sensor Wiring

WARNING! This unit accepts DC voltage only, connection to AC voltage can cause failure of the sensor and/or risk of electrocution

For wet environments requiring IP67 or greater environmental protection Anderson – Negele strongly recommends using the available shielded molded cord-sets utilizing the 5 pin M12 eurofast quick disconnect.
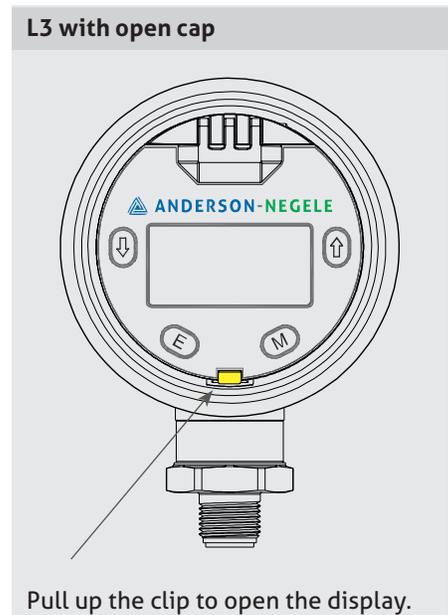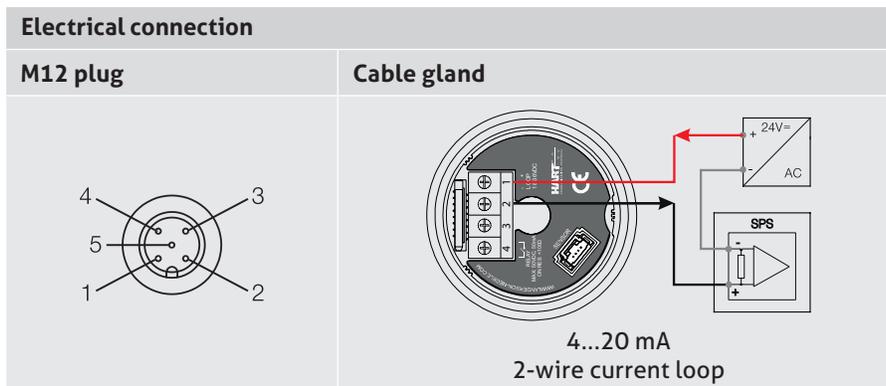
Anderson - Negele supplied cable meets all requirements for shielding and compatibility with the L3 quick disconnect receptacle. Anderson - Negele recommends a cable of 24 gauge, 4 conductor, shielded (Belden #9534) or equivalent for loop installations, when IO-Link communication is used, an IO-Link compatible cable should be used. Four conductor cable is utilized because of its roundness as well as providing connections for the normally closed relay. A round cable provides a suitable seal when used with seal-tight connectors, strain reliefs and rubber grommets. Irregular shaped cable does not allow for a watertight seal.

If utilizing customer supplied cable, select a round cable with 22-24 AWG wire and a shield. In order for the Anderson provided seal-tight connector to seal on the cable, the O.D. of the cable must be between 3/16" and 1/4". If smaller cable is utilized, a different neoprene bushing must be used (must be customer supplied).

If an alternate seal-tight type connector is going to be used, be absolutely certain that the rubber bushing will adequately seal on the cable. Do not use a connector intended for power cable (large inside diameter) if the sensor cable is only 1/4". Be sure to use Teflon thread tape when attaching the new seal-tight connector.

4.1 Type A: L3 with 4...20 mA / IO-Link Communication

4.2 Type G: L3 with HART Communication

Electrical connection		L3 with open cap
M12 plug	**Cable gland**	

4...20 mA
2-wire current loop

Pull up the clip to open the display.

Connection M12 plug

Output / Pin	Type A (analog)	Type A (IO-Link)	Type G (analog and HART)
1: red	+ supply	+ supply	+ supply
2: black	4...20 mA current output	n. c.	- supply 4...20 mA
3: green	- supply	- supply	relay normally open
4: blue	digital output	IO-Link	relay normally open
5:	n. c.	n. c.	n. c.

Note: The IO-Link sensor has a digital output instead of the relay output as used on the Hart version. The Digital output on pin 4 is only active when powered from pins 1 and 3 and has a maximum rating of 50mA.

4.3 Direct Wiring

Direct wiring to the L3 transmitter is accomplished as follows:

1. Remove the housing cap and lift the hinged display lid by the pull tab to expose the terminals.

2. Insert the cable through the seal-tight connector, stripping back approximately 2 inches of sheathing to expose the wires.

3. Two wires will be utilized for the loop connection and two will be used for the outputs / relays. The color coding depends on the type (type A for analog and IO-Link communication, type G for HART communication) and is indicated in the table above.

    To prevent a GROUND LOOP condition, be sure the shield material and the shield ground wire do not touch the sensor housing. Use an insulator such as electrical tape or heat shrink tubing if necessary.

4. Strip the tips of the remaining wires back approximately 3/8 of an inch and twist strands (tinning is highly recommended).

5. Using Figure 2, make the proper connections to the wiring connector (located inside the housing)

Section 5 - Instrument Wiring

With the proper wiring connections made at the senor end of the loop, it is now time to make final connections at the instrument end (input card) of the loop. The L3 may feed instruments such as Anderson - Negele digital display, microprocessor based controllers, chart recorders, or customer supplied instrumentation such as a PLC.
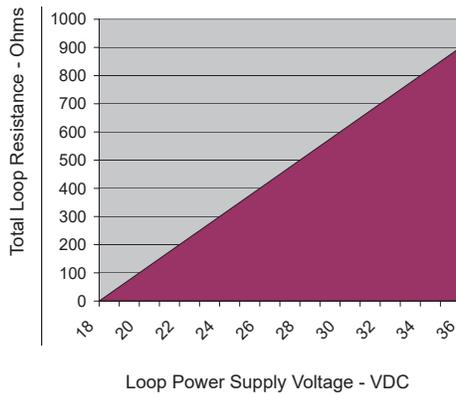
5.1 Loop Power

The Anderson L3 requires loop power for operation. Ratings are as follows:

L3 Transmitter (Hart Version): 18-35 VDC (Absolute), 24 VDC Nominal, regulated or unregulated.

L3 Transmitter (IO-Link Version): 18...36 VDC (Absolute), 24 VDC Nominal, regulated or unregulated.

As inherent resistance associated with cable length and signal receiver input may affect operation of the transmitter, Below shows some guidelines for loop power required.

Loop Power Guidelines

Loop Power Supply Voltage - VDC

Please consult the Installation/Service Manual that was provided with your receiver for specific wiring instruction. Most Anderson receiver (displays, chart recorders, etc.) are capable of supplying loop power. Typical wiring would be as follows:

Sensor Wiring
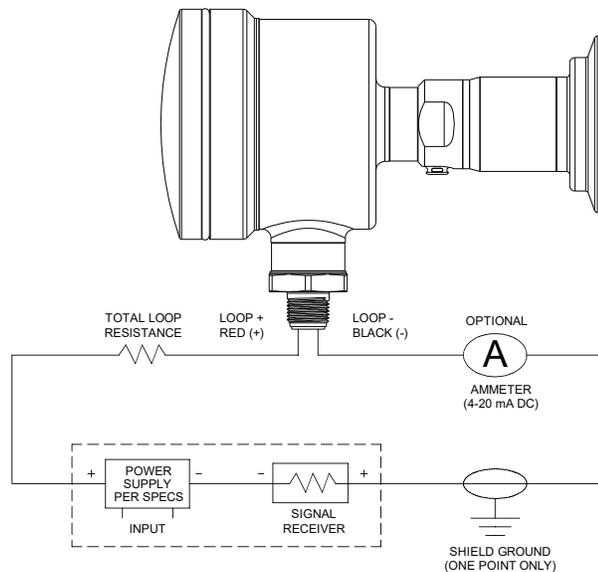
Section 6 - Modular Assembly

The L3 transmitter consists of two distinct sections, transmitter (head) and sensor (stem) which individually are comprised of one or more components. Field replacement of these components is possible to accommodate orientation reconfiguration and component replacement.

IMPORTANT: Stem and Puck compatibility for the L3 Sensor

Beginning on December 14, 2022 a change was made to the L3 puck that will limit the use of older versions of the stem with newer versions of the puck design. For stems manufactured before 12/14/2022 and having a serial number lower than 2256405, these stems can only be used with Hart capable puck assemblies. Stems manufactured after this date and with a serial number of 226405 or above may be used with both the older Hart capable pucks and the IO-Link capable pucks.

6.1 Separation of the Sensor (Stem) from the Transmitter (Head)

This proceed will require immobilizing the enclosure. If a vice is used steps should be taken to protect the surface of the enclosure

1. Remove the housing cap and lift the hinged display lid by the pull tab to expose the terminals and sensor connection

2. Gently squeeze clip connector and remove sensor ribbon from socket on transmitter

3. Unscrew stem from enclosure. Factory torque spec is 20ft-lbs.

4. Reverse to install

6.2 Replacement of the Sensor (Stem)

1. Replacement of the sensor will require separation of the sensor and transmitter. Please see section 6.1 above

2. Thread the replacement sensor into the desired transmitter opening (horizontal or vertical orientation) and tighten to 20ft-lbs.

3. Carefully insert the sensor clip connector into the socket on the transmitter

4. If a sensor of identical range is used no further action is required

5. If a new sensor range is connected please reconfigure the Range as shown in section 7.3 page XX

6. Reinstall the L3 transmitter in the process and perform a re-zero Section 7.10

6.3 Replacement of the Transmitter (Head)

1. Replacement of the sensor will require separation of the sensor and transmitter. Please see section 6.1 above

2. Thread the replacement transmitter onto the sensor using the desired transmitter opening (horizontal or vertical orientation) and tighten to 20ft-lbs.

3. Reconfigure the following transmitter parameters:
   - Dimension and Density units Section 7.2 (only if volumetric, mass, or height units are used)
   - Tank Configuration Section 7.4 (only if volumetric, mass, or height units are used)
   - Product Configuration Section 7.5 (only if volumetric, mass, or height units are used)
   - Primary Variable (PV) Units Section 7.2 if pressure units are used
   - Range Section 7.3 if pressure units are used
   - Complete Alarm configuration Section 7.6 if alarms are used
   - Complete Switch Output Configuration Section 7.7 if the switch output is used
   - Confirm the Dampening value is set correctly Section 7.8
   - Complete the mA configuration Section 7.9

4. Reinstall the L3 transmitter in the process and perform a re-zero Section 7.10

6.4 Replacement of the Electrical Receptacle

This proceed will require immobilizing the enclosure. If a vice is used steps should be taken to protect the surface of the enclosure

1. Remove the housing cap and lift the hinged display lid by the pull tab to expose the terminals and sensor connection

2. Disconnect the 4 wires from the terminal block using a Philips screwdriver

3. Unscrew the electrical connector from the transmitter housing

4. Thread the replacement receptacle into the desired transmitter opening (horizontal or vertical orientation) and tighten to 20ft-lbs.

5. Reconnect the wires to the terminal block as shown in Section 4.

6. Push the hinged display lid closed and tighten the cap firmly back in place.

6.5 Changing the Orientation

1. Disassemble the transmitter by following steps 1-3 of Section 6.1 and steps 1-3 of Section 6.4

2. Swap the locations of the electrical connector and sensor in the transmitter housing and reassemble as described in steps 2-3 of Section 6.2 and Steps 4-6 of section 6.4.

CAP

HOUSING & PUCK
ASSEMBLY

M12 QUICK
DISCONNECT

STEM
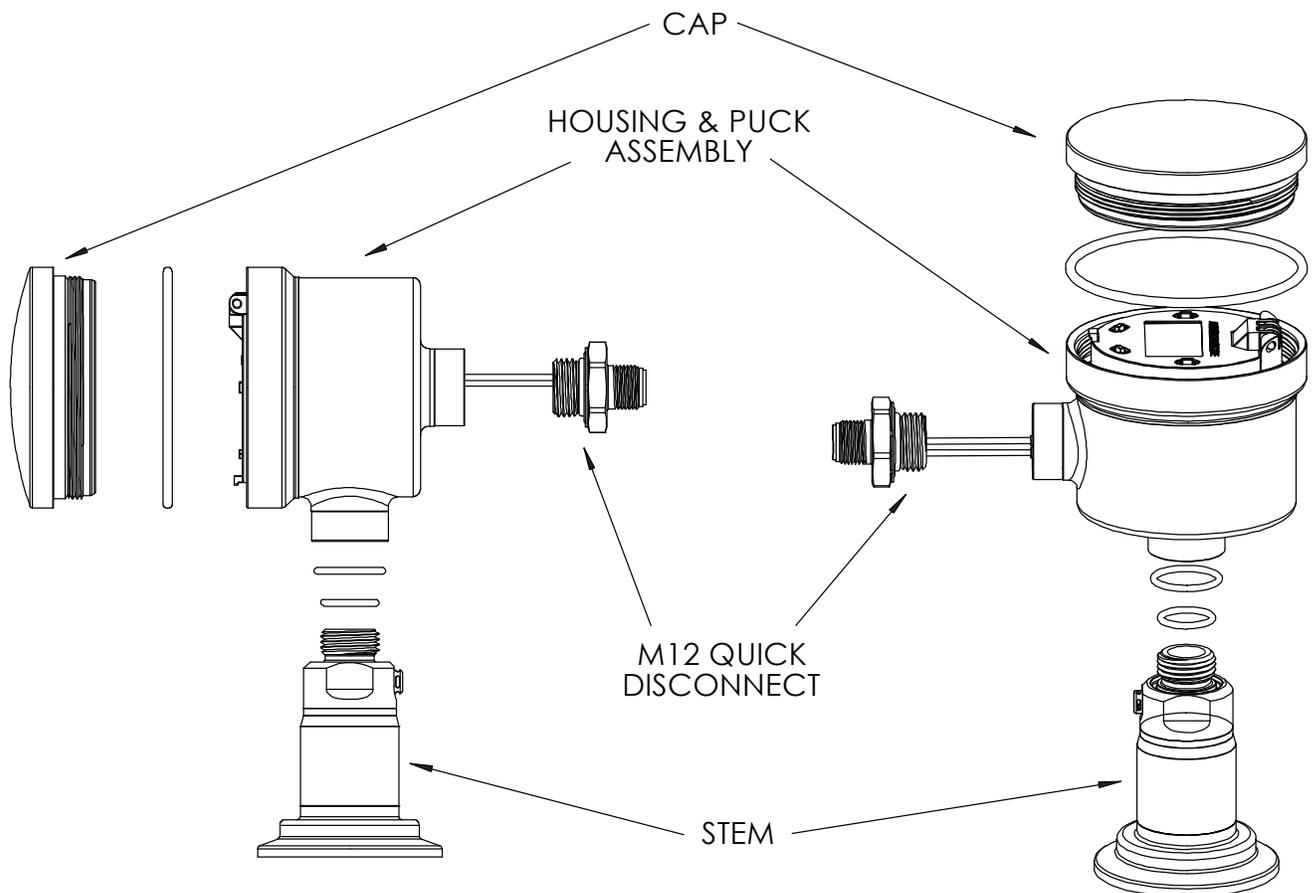
## 6.6 Installing or replacing the remote transmitter kit

The L3 series may be configured or retrofitted with remote cabling allowing the housing and display (if equipped) to be mounted up to 25 feet from the process connection. The remote cabling preserves the modular design and may be removed or added from the L3 at the user's discretion.

Adding the Remote kit.

Note: all threaded connections to be torqued to 20ft-lbs

1. Separate the Sensor (stem) from enclosure as described in Section 6.1

2. Attach remote kit cabling to sensor
   • Route stem ribbon cable through stem adaptor. Screw on adaptor
   • Connect ribbon cable connector to cable kit receptacle and carefully fold excess ribbon cable into stem adaptor
   • Insert cable kit fitting into stem adaptor. Secure by threading on union nut

3. Attach remote QDR adaptor to desired enclosure opening
   • Carefully insert ribbon cable through enclosure opening
   • Screw remote QDR adaptor into place
   • Connect ribbon cable connector into sensor receptacle on puck

4. Attach pipe mount adaptor to remote QDR adaptor and secure with nut. Position as required.

5. Attach remote kit M12 plug to remote QDR adaptor

6. Reverse to un-install.

WARNING! To avoid possible ribbon cable damage, remove union nut and unplug ribbon from socket before removing stem adaptor from stem.
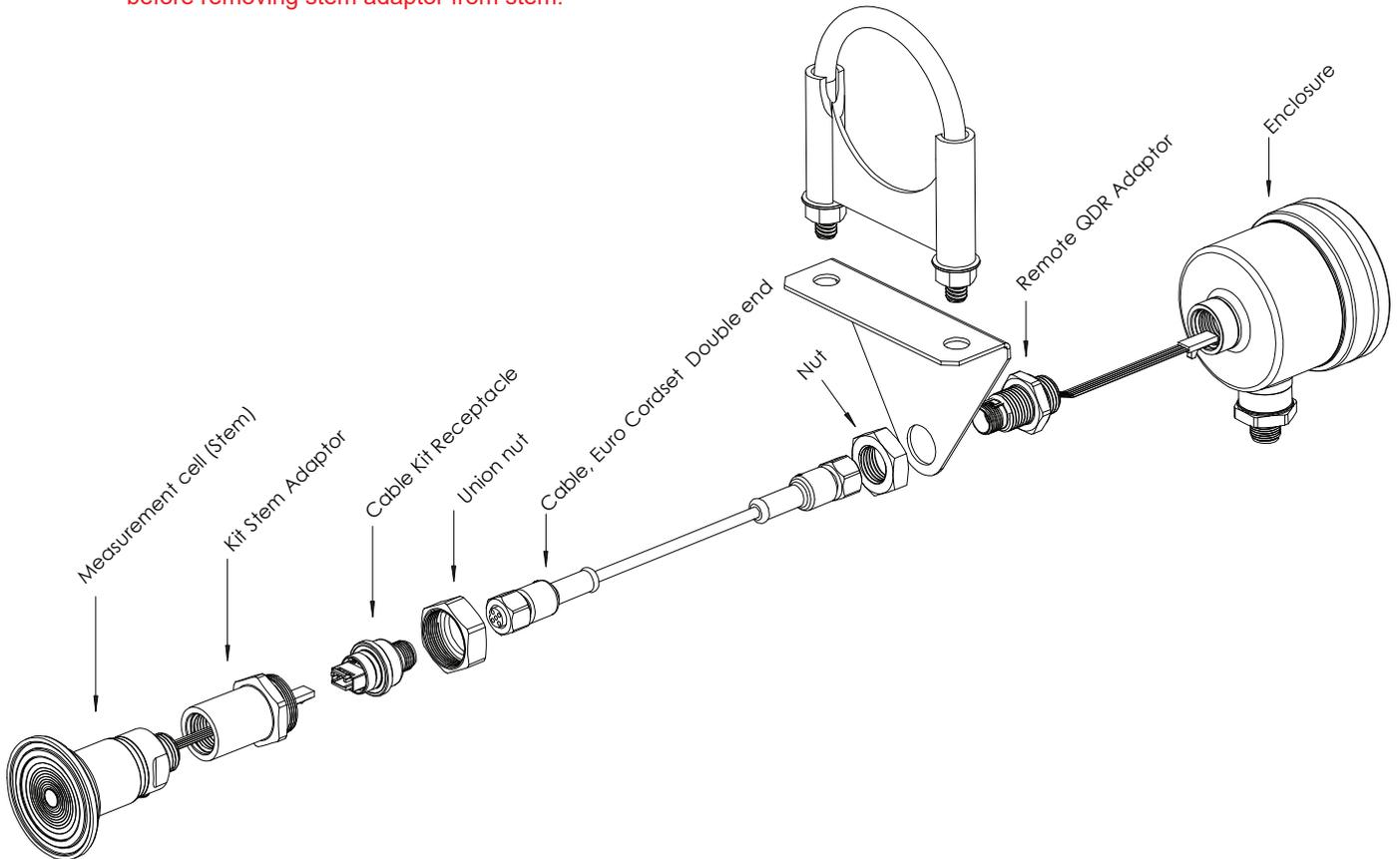
Section 7 - Configuration

The L3 transmitter may be configured via the onboard 4 button display or through Hart communication. This section will describe configuration through the onboard display.

Configuration menus are shown graphically in this manual along with the resulting actions from pressing any of the buttons.

Users should only change one parameter at a time when utilizing IO-Link communication.

7.1 - Home screen navigation
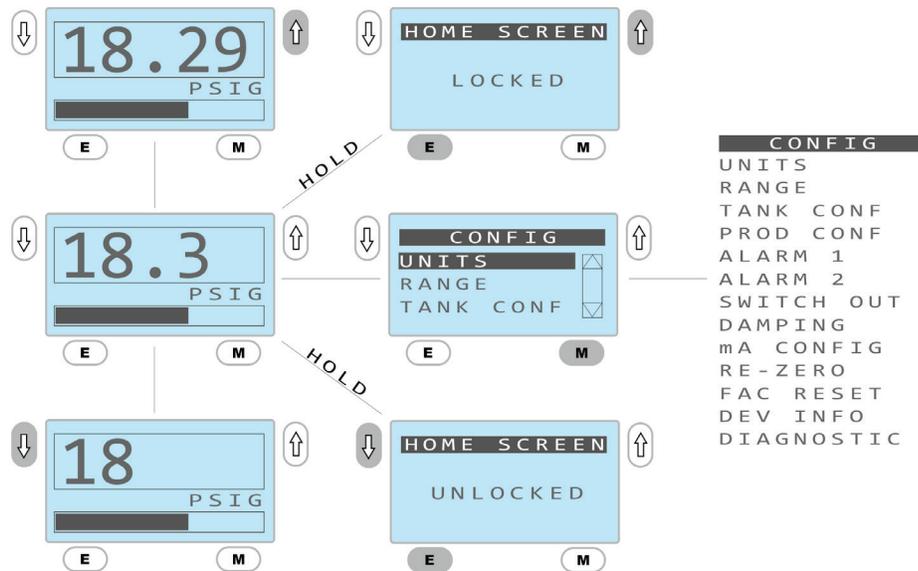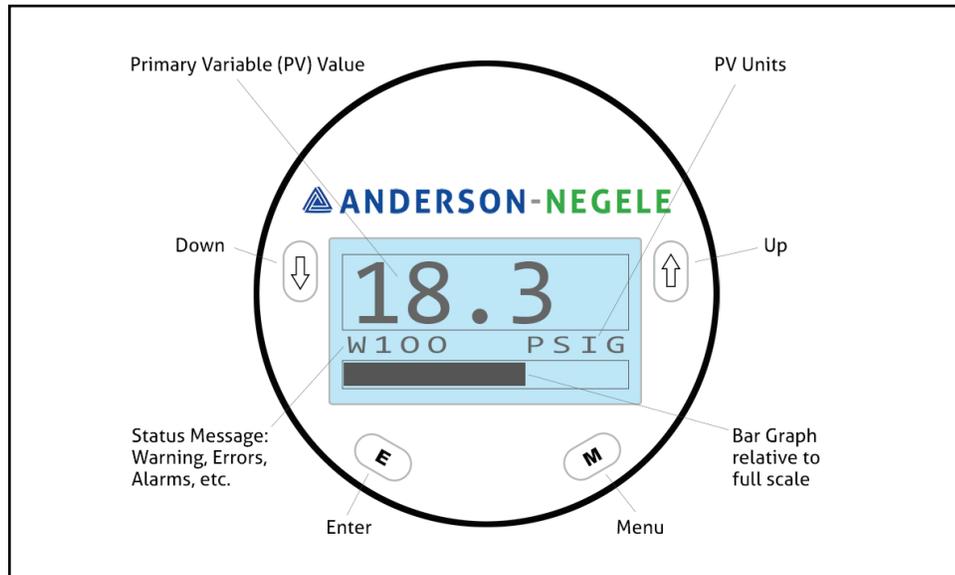
If a status message is present the following additional actions may be taken:
Pressing "E" will temporarily display an explanation of the numerical status message
Pressing and holding the down arrow will clear the warning message.

The general navigation scheme of the device is shown below:
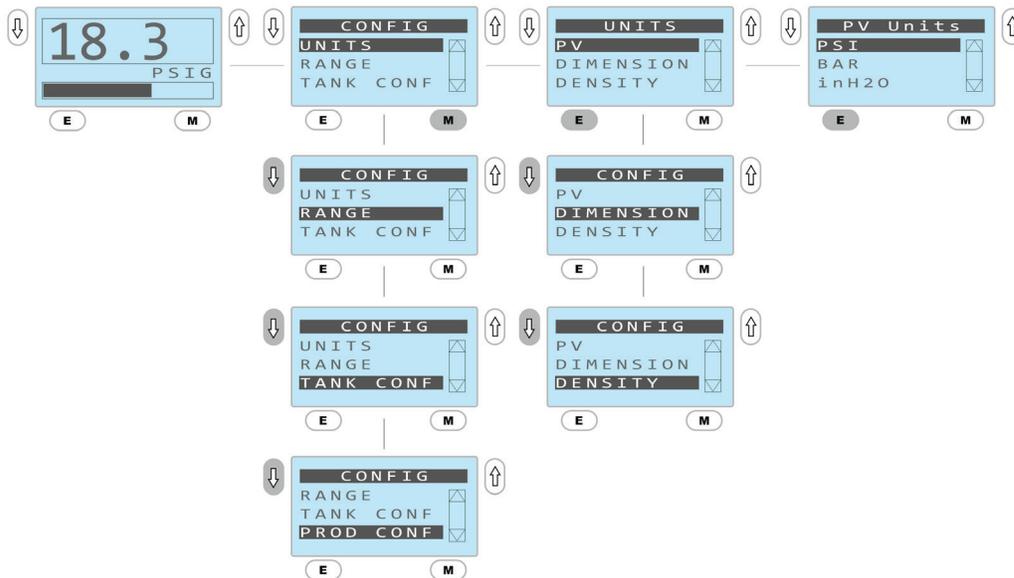
Pressing the up and down arrows moves the highlighted item.
Pressing "E" while an item is highlighted selects that menu item
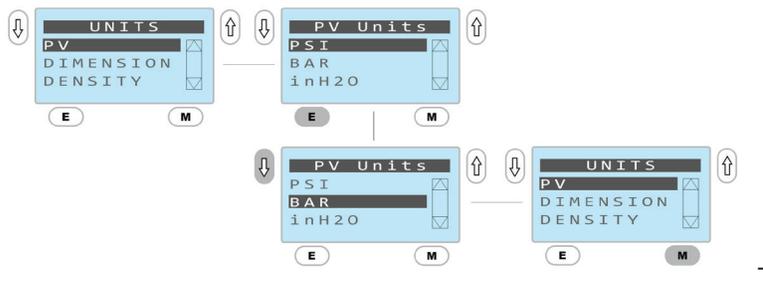Pressing the "M" button moves back one level

7.2 - Units

There are three units which may be chosen for the transmitter.

- **PV –** represents the units of the primary variable to be transmitted. This may be pressure, volume, mass, or height

- **Dimension –** represents linear measurement units to be used when describing tank dimensions and may be chosen in Inches or meters

- **Density –** represents the density or specific gravity units products will be described with.

7.2.1 Units Configuration for Pressure Output

If the transmitter is to be used as a pressure measurement device or as a hydrostatic level measurement device with the following units of output this menu should be used: PSI, Bar, in of H2O, mm of H2O, mm of HG, mBar, or kPA

If Pressure units will be used, dimension and density units do not need to be chosen as tank and product configurations are not required.
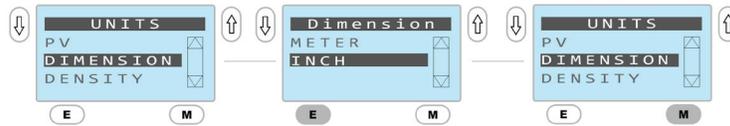

Once the desired units are highlighted pressing the "M" button will store the selection and move up one level in the menu. Once units are changed all unit dependent menus will change to those units. For example: range, alarms, etc

7.2.2 Units Configuration for Volume, Mass, and Height Outputs.

Units of height, (inches and mm) will scale relative to fluid level compensated for density. Units of volume and mass (KG, LB, Gallon, Liter, HectoLiter, PCT vol) will output linearly with respect to those variables compensating for nonlinear portions of a vessel. The display will show the volume or mass located below the bottom of the sensor when no product is present and will respond after product covers the sensor diaphragm. Hectoliter option is available only on firmware revision L3H.01.06.0 and later.

To configure a unit for volume, mass or height outputs the following actions must be taken.

1. Choose the dimension units as shown:

2. Select the density units as shown:

*note SG refers to specific gravity

3. Complete the tank configuration as shown in section 7.4

4. Complete the product configuration as shown in Section 7.5

5. Return to the Units menu to configure the primary variable (PV) units as shown:
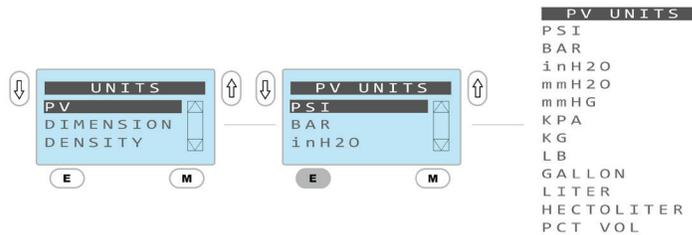
*Once a tank is selected and density is entered the full list of units is available

Once the desired units are highlighted pressing the "M" button will store the selection and move up one level in the menu. Once units are changed all unit dependent menus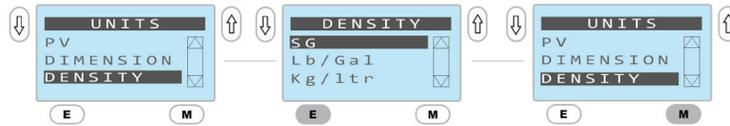 will change to those units. For example: range, alarms, etc Units of height, (inches and mm) will scale relative to fluid level compensated for density. Units of volume and mass (KG, LB, Gallon, Liter, PCT vol) will output linearly with respect to those variables compensating for nonlinear portions of a vessel. The display will show the volume or mass located below the bottom of the sensor when no product is present and will respond after product covers the sensor diaphragm.

7.3 - Range

The Lower Range Value (LRV) and Upper Range Value (URV) may be chosen when the sensor is used with pressure units. When height, volume, or mass units are used the LRV and URV are calculated automatically but may be viewed to aid in PLC programming. The L3 is also capable of setting the span based on the pressure applied to it (autospan).

7.3.1 Configuring Range for Pressure Ouput

The menu below shows adjustment of the LRV and URV for pressure output ranges. It should be noted that the PV units should be set to the desired units before performing this action.
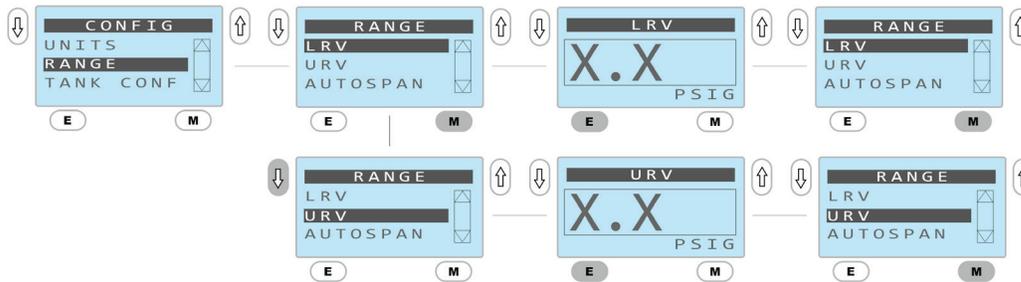
When the LRV or URV is displayed the Up and Down arrows may be used to adjust the value as desired. The LRV may be set from vacuum to 0 for gauge sensors, except 5 PSI sensors which are adjustable from -5 PSI to 0 (the LRV is not adjustable for absolute sensors).

The URV may be set from 10% of the sensor limit up to the sensor limit.

7.3.2 Viewing Range for Volume, Mass, and Height Outputs

When in volumetric, mass, or height units the LRV and URV are calculated automatically based on the tank dimensions and product density. The calculated values may be viewed as follows:
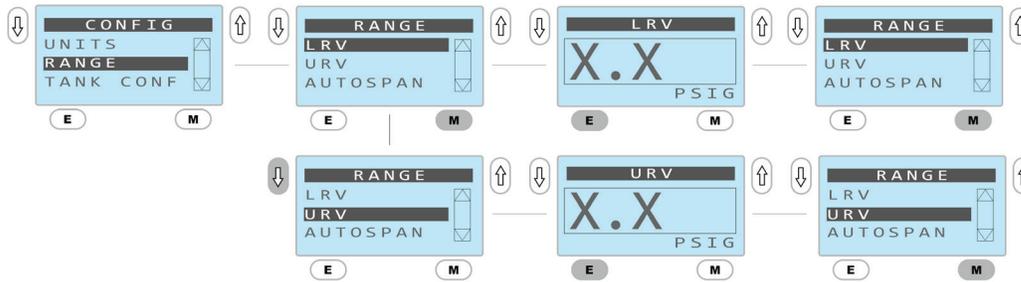
7.3.3 Using the Autospan Feature

The autospan feature may be used to set the URV based on the pressure on the sensor. This can only be done when pressure is present or a vessel is filled to the desired upper limit. Autospan can only be used with pressure units.

7.4 – Tank Configuration

To configure tanks, drawings or measurements must be available. Tanks must be configured to use height, volume, or mass units. Dimensional units should be chosen as shown in section 7.2.2. The tank type should be chosen as follows:
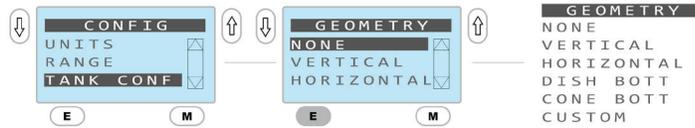
If tank dimensions are not entered or are not compatible with the sensor range the following message will appear.

D= Sensor Height
G= Tank Slope

When this message is displayed the geometry menu cannot be exited until the dimension error is fixed unless tank geometry of "none" is selected.

7.4.1 – Vertical Tanks
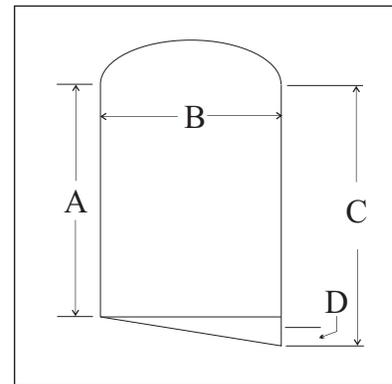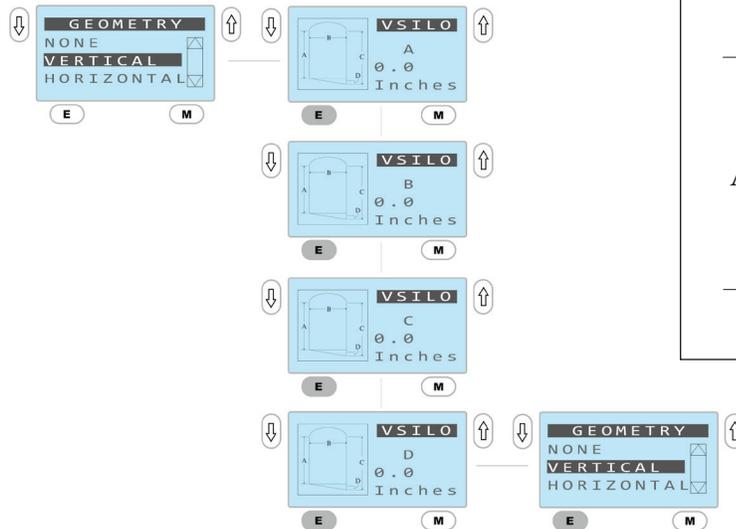
D= Sensor Height

Increment the value of each dimension using the up and down arrows until the desired measurement is set. Press "E" to move to the next dimension.

7.4.2 – Horizontal Tanks

Dish ends are per the ASME standard
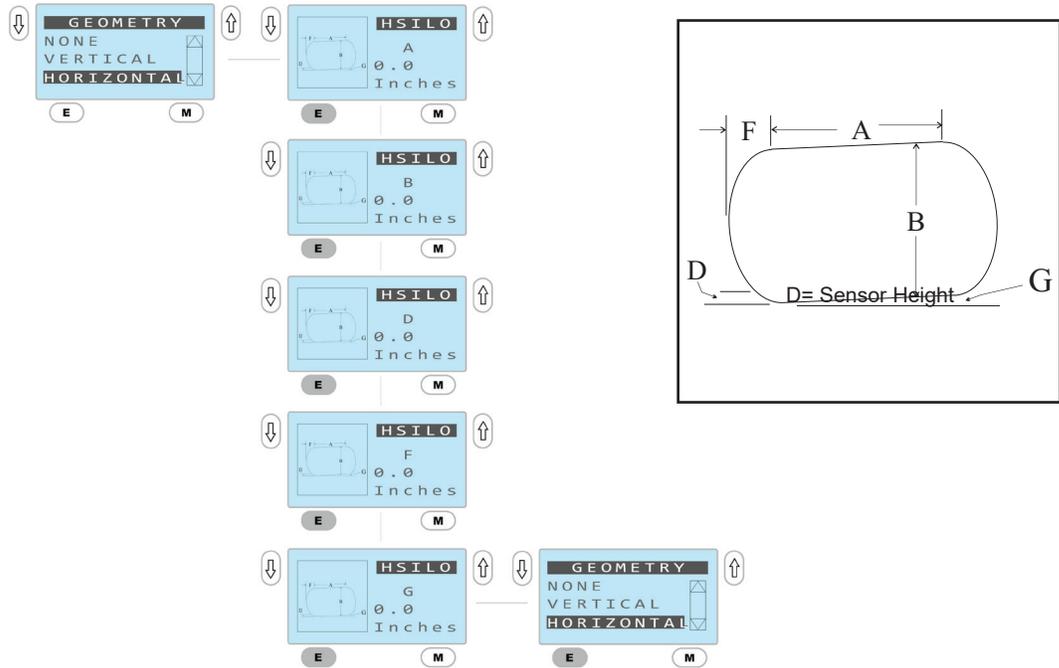
Increment the value of each dimension using the up and down arrows until the desired measurement is set. Press "E" to move to the next dimension.

> * Ensure product config is set to product being used for calibration. i.e. Water, Skim Milk, etc.
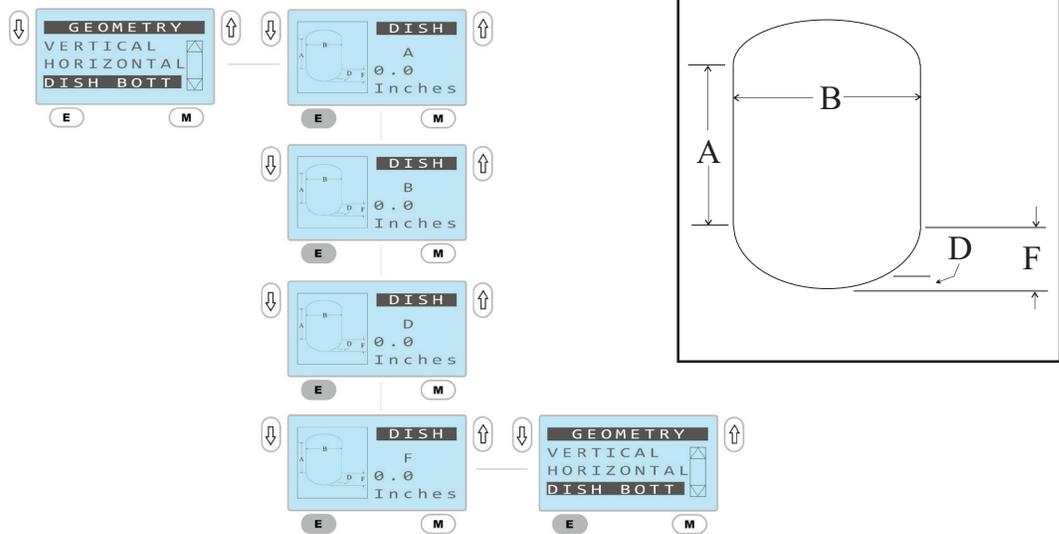
7.4.3 – Dish Bottom Tanks

Dish bottom is per the ASME standard

Increment the value of each dimension using the up and down arrows until the desired measurement is set. Press "E" to move to the next dimension

7.4.4 – Cone Bottom Tanks
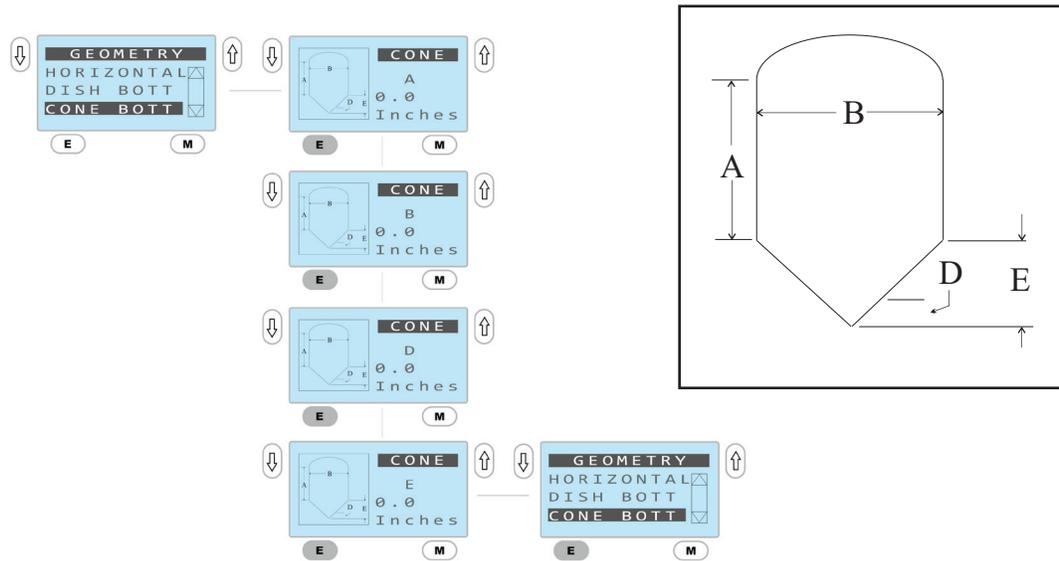
Increment the value of each dimension using the up and down arrows until the desired measurement is set. Press "E" to move to the next dimension

7.4.5 – Custom Tanks

If the desired tank geometry is not available or tank drawings or dimensions are not available a wet calibration may be done to configure a custom tank. Please note this procedure requires a reference flow meter and must be done sequentially while filling the vessel*. The user must decide the number of points required and then pump the amount of process fluid into the vessel and assign that value. The process is a guided as shown below:
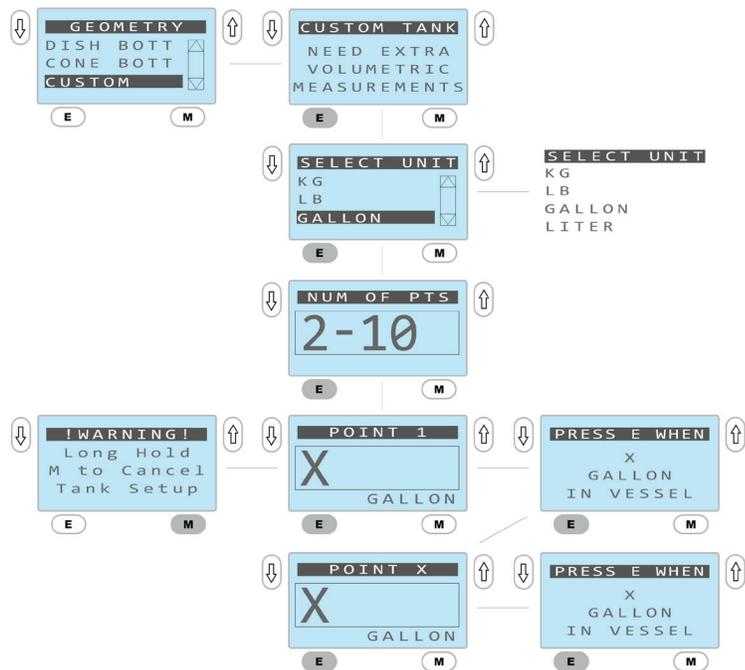
The up and down buttons may be used to select the number of points and the volume or mass present in the vessel.

7.5 – Product Configuration

Use of height, volume or mass units requires the selection of a product density. For the convenience of the user 10 common products are pre-loaded on the device and an additional 5 custom products may be stored at a time. When a new product is put in a tank it is important to change the product configuration to avoid errors in output due to changes in density.

7.5.1 Selection of Pre-loaded Products

Pre-loaded products may be chosen from the product configuration menu as shown:
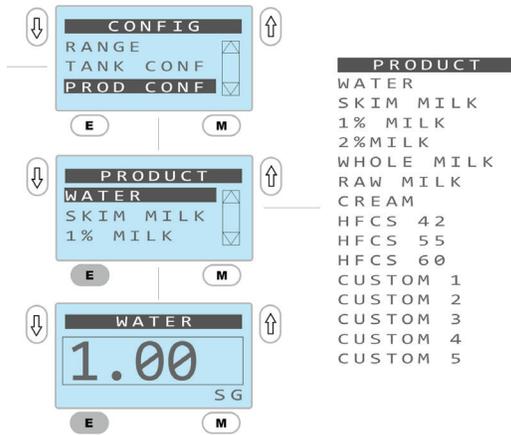
10 products come pre-loaded with densities in the units chosen. Adjustments can be made with the up and down buttons when the value is shown.

7.5.2 Configuration of Custom Products

If the customers product is not preloaded it may be programmed as one of the available 5 custom products. Once configured with a name and density value the custom product may be highlighted to select for use.
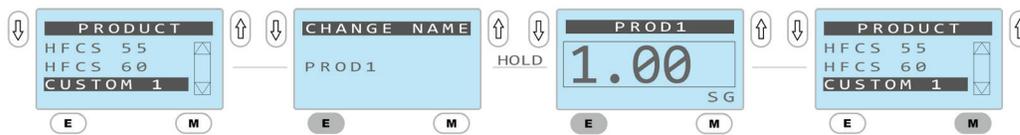
Up and down arrows increment characters and value. E moves to the next character and Long Hold E moves to the Value. Alpha numeric values and symbols may be used in the name.

7.6 – Alarm Configuration

Depending on the configuration the L3 will have either 1 alarm (IO-Link version) or 2 alarms (Hart version) available. Each alarm may be set up as follows. Alarms 1 and 2 have identical configuration menus. When enabled, if the alarm is activated the backlight of the display will blink to notify the operator. The blinking feature can be disabled through the menu option. Also, alarm activation can be delayed until process pressure/level is above/below setpoint for set period of time. Alarm Flash and Alarm Delay options are available only on firmware revision L3H.01.06.0 and later.
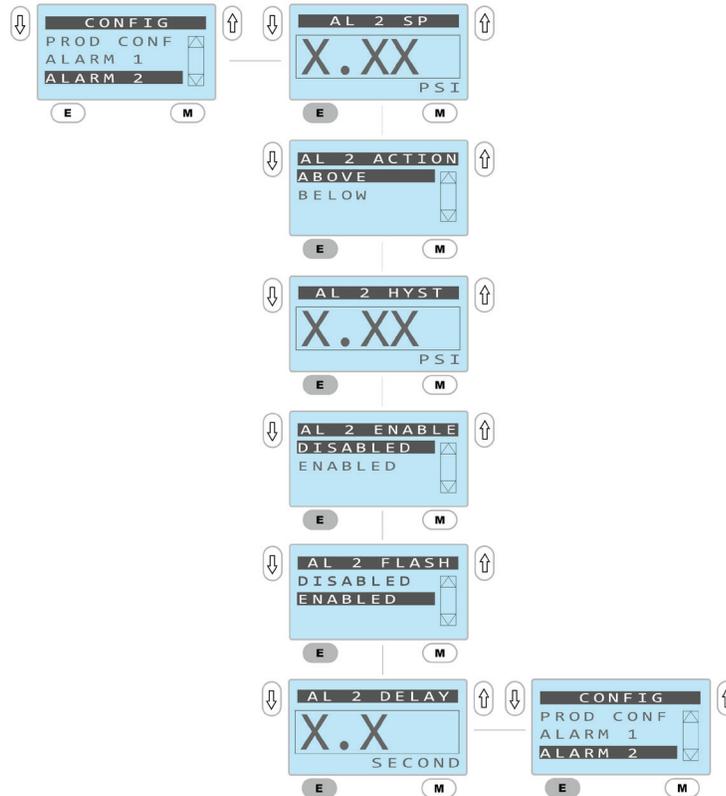
7.7 – Switch Output Configuration

For the L3 with IO-Link a single digital output is available when wired for IO-Link operation but not using IO-Link communication as the output is shared between IO-Link and digital out. For the Hart version the L3 is equipped with a normally open 50mA fused contact which can be used to switch a small load or provide a digital output when one side is provided with DC voltage. The switch may be assigned to alarm 1, alarm 2, or may actuate when a warning or error message is displayed.
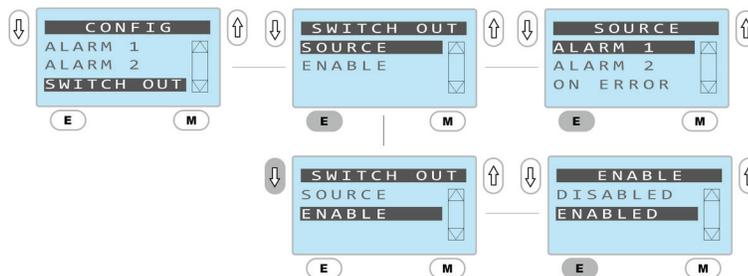
7.8 – Dampening

The analog output can be digitally dampened to decrease the magnitude of large process fluctuations with a high frequency. The dampening value should be raised when the output is showing high frequency high magnitude fluctuations. The dampening factor can be adjusted from 0-10.

7.9 – mA Configuration

The mA configuration menu contains options to adjust the loop output to match the control system reading the signal, adjust the failure mode, and change the loop direction.

7.9.1 – mA Calibration

When a transmitter is added to a system for the first time a mA calibration should be performed to ensure the sensor's 4mA and 20mA points align with the control system in which it is installed. Because input cards are variable this will provide the best results and avoid programming an offset in the PLC.

The mA calibration requires the device to be installed in a control loop where the mA value may be read by observed by the operator and the display may also be accessed.
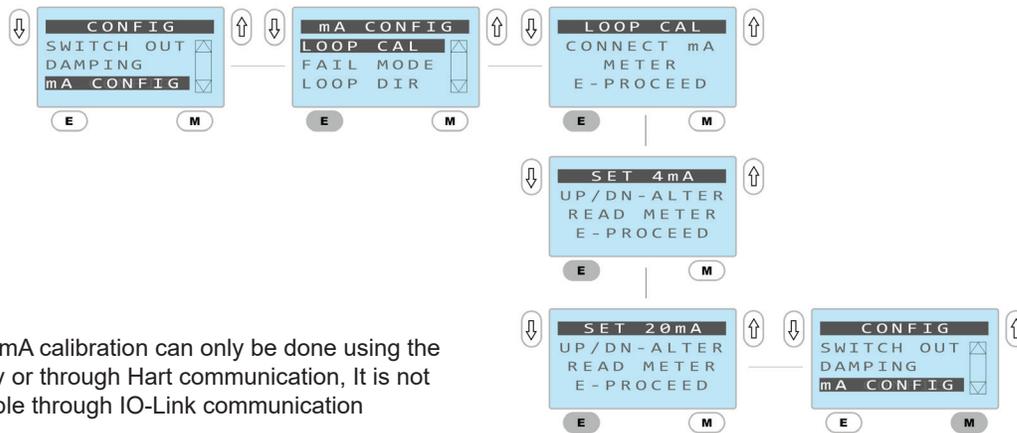
Note: mA calibration can only be done using the display or through Hart communication, It is not available through IO-Link communication

7.9.2 – Failure Mode Selection

The L3 may be set to fail low (3.8mA output) or fail high (20.2mA output) when a valid process variable cannot be output.

7.9.3 – Loop Direction

The loop direction may be reversed (20mA -4mA). This is accomplished as follows:
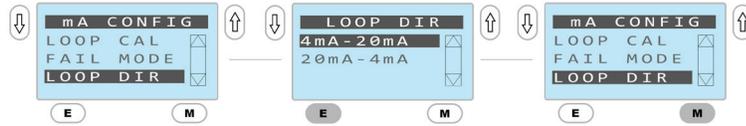
7.10 – Re-zero

The L3 transmitter is sensitive to both orientation and clamping forces during installation. It is important to re-zero the sensor after it has been installed. Additionally, if the diaphragm is dented or goes through a period of stress such as being steamed for the first time, it is important to zero the sensor.

7.11 – Factory Reset

The factory reset will reset customer configuration settings in the Transmitter (Puck)

7.11.1 – Transmitter Reset (Puck)

This will reset all ranges, alarms, tank, and product data.
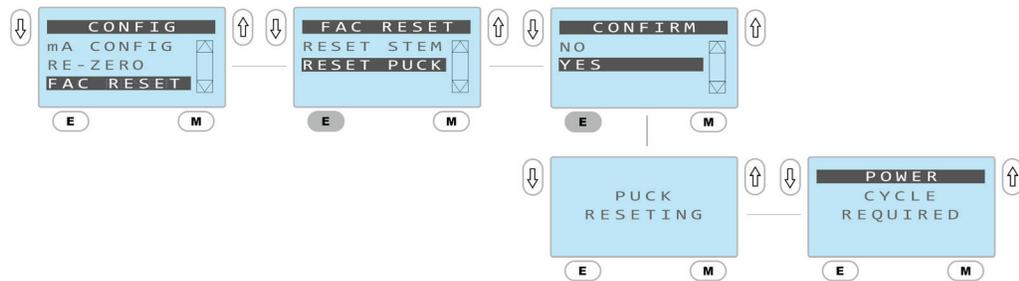
7.12 – Device Information

Through the device information screen the owner may access the following information:

Serial number, upper range limit (URL), lower range limit (LRL), device type, puck firmware revision, and sensor firmware revision

Section 8 - IO-Link Communication AOI and Communication Structure

L3 transmitters that are equipped with IO-Link communication can to be integrated through an IO-Link master into a PLC for configuration and data transfer. In this section we will give instructions on AOI files for integration into Allen Bradley PLCs and the message structure to map the process values into to other control environments.

Users should only change one parameter at a time when utilizing IO-Link communication. If users experience issues with the parameters reading or writing correctly, users should read or write one parameter at a time in order to resolve this issue.

8.1 AOI Files

AOI files can be downloaded from the Anderson-Negele website under the L3 product page

Step by step guide for setting the L3-IOLink AOI to Read process data.

Integrating these files into a A-B PLC are as follows:

1. Insert the L3-IOLink AOI
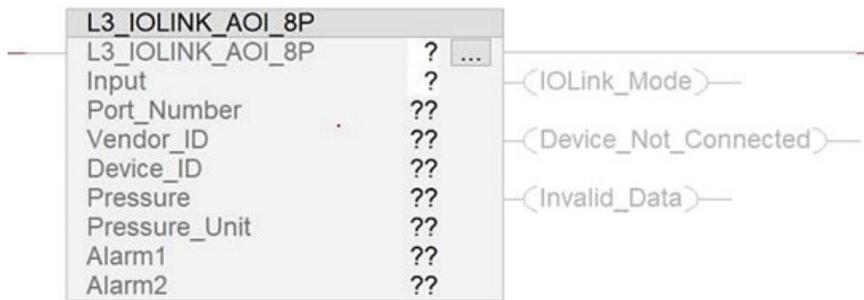
2. Once the AOI has been inserted in the Main Routine name the AOI to your desired name (here L3_IOLINK_Test2) and create a new parameter Tag with this name.
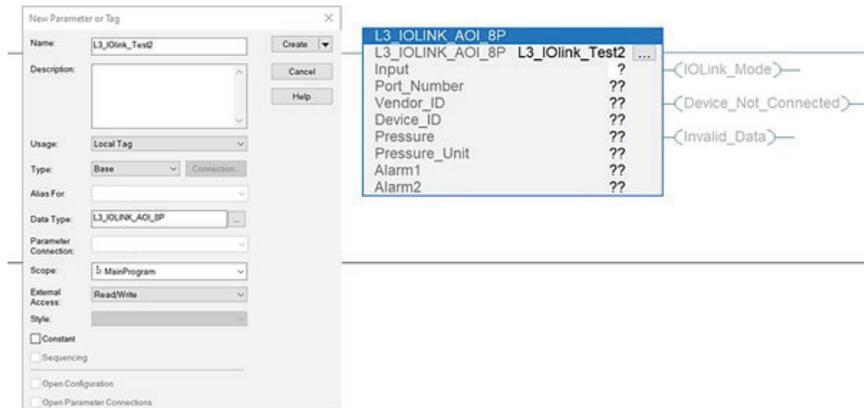
3. In the Add-On Instruction, specify the input in which the sensor is located and map it to the respective Master

Anderson -Negele
L3-IOLink Pressure
Sensor
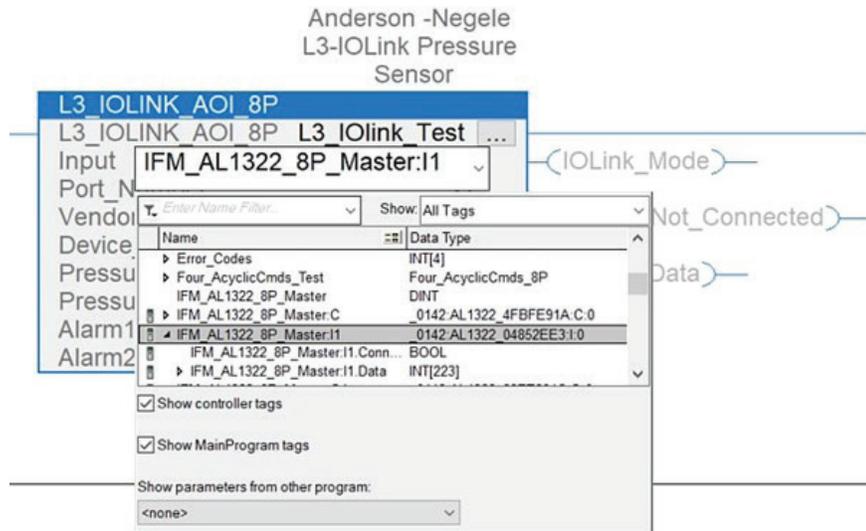
4. Enter the Port Number, download and run the project. After that the AOI will show the Process data and alarms state

Anderson -Negele
L3-IOLink Pressure
Sensor
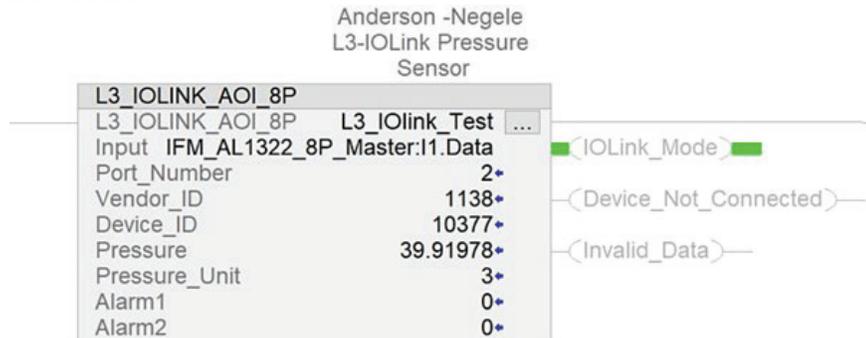
5. **Alarms** - The **alarms** values are one when they are triggered

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8.2 Process Data description

Process data In for the L3 IO-Link device is a 48-bit record which contains the current measurement value, active selected unit, alarm status.
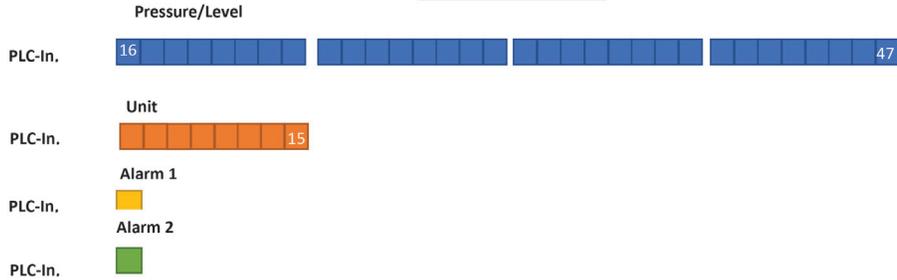
subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	16	Float32			ro			Process Value	
2	8	8-bit UInteger			ro			Unit	
3	0	Boolean	false = Inactive, true = Active		ro			Alarm 1	
4	1	Boolean	false = Inactive, true = Active		ro			Alarm 2	

Octet 0

bit offset	47	46	45	44	43	42	41	40
subindex				1				
element bit	31	30	29	28	27	26	25	24

Octet 1

bit offset	39	38	37	36	35	34	33	32
subindex				1				
element bit	23	22	21	20	19	18	17	16

Octet 2

bit offset	31	30	29	28	27	26	25	24
subindex				1				
element bit	15	14	13	12	11	10	9	8

Octet 3

bit offset	23	22	21	20	19	18	17	16
subindex				1				
element bit	7	6	5	4	3	2	1	0

Octet 4

bit offset	15	14	13	12	11	10	9	8
subindex				2				
element bit	7	6	5	4	3	2	1	0

Octet 5

bit offset	7	6	5	4	3	2	1	0
subindex	//////	//////	//////	//////	//////	//////	4	3

PLC Mapping

Name	Description	Data type	Bit length	Bit offset
Pressure/Level	Process value indicating pressure/level	Float 32T	32	16
Unit	Unit of Pressure/Level	UIntegerT	8	8
Alarm 1	Status of Alarm 1	BooleanT	1	0
Alarm 2	Status of Alarm 2	Boolean T	1	1

- Pressure/level can be identified from the above record with bit offset 16 which indicates the current measurement value. Note: Level measurement is possible only if the tank configuration is completed.
- Unit is also part of the process data which can help in identifying the current active unit. The units are from the below list.
- 0 = PSI, 1 = BAR, 2 = inH20, 3 = mmH20, 4 = mmHG, 5 = mBAR, 6 = kPA, 7 = KG, 8 = Lbs, 9 = Gallons, 10 = Litres, 11 = Hectoliter, 12 = Volume percent
- Alarm 1 indicates the status of the active/inactive state of the Alarm1. Alarm 1 configuration can be made from the available parameters.
- Alarm 2 indicates the status of the active/inactive state of the Alarm2. Alarm 2 configuration can be made from the available

Parameters

Name	Description	Index	Sub-Index	Data-type	Bit-length	Bit-offset	Gradient	Off-set	Access Rights	Allowed Values	Default Value
Vendor Name		16	0	StringT					RO		Anderson-Negele
Vendor Text		17	0	StringT					RO		www.anderson-negele.com
Product name		18	0	StringT					RO		L3
Product ID	Device identifier	19	0	StringT					RO		10377 - 30 PSI 10409 - 100 PSI 10441 – 500 PSI 11369 – 6 PSI
Product text	Additional information of the device	20	0	StringT					RO		Pressure and level transmitter
Serial Number		21	0	StringT					RO		
Hardware Revision		22	0	StringT					RO		HWV-0.01
Firmware version		23	0	StringT					RO		
Device Status		36	0	UIntegerT	8				RO	0 = Device is OK 1=Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure	0 = Device is OK
Pressure/Level unit	Currently selected pressure/level unit	74	0	UIntegerT	8				RW	0 = PSI, 1 = BAR, 2 = inH20, 3 = mmH20, 4 = mmHG, 5 = mBAR, 6 = kPA, 7 = KG, 8 = Lbs, 9 = Gallons, 10 = Litres, 11 =Hectoliter, 12 = Volumepercent	0 = PSI
Range LRV	Lower range value of the pressure/level	75	0	Float32	32		1	0	RW for pressure RO for Level	-14.7 to 30 PSI -14.7 to 100 PSI -14.7 to 500 PSI 0 to 6 PSI	
Range URV	Upper range value of the pressure/level	76	0	Float32	32		1	0	RW for pressure RO for Level	-14.7 to 30 PSI -14.7 to 100 PSI -14.7 to 500 PSI 0 to 6 PSI	

Name	Description	Index	SubI ndex	Dataty pe	Bitleng th	Bitoff set	Gradient	Off set	Access Rights	Allowed Values	Default Value
Tank & Product configuration	For level measurement	79	0	Record T	1352				RW		
Tank type	Currently selected tank type			UInteg erT	8	1344			RW	0 = None, 1 = Vertical, 2 =Horizontal, 3 = Dish Bottom, 4 = Cone Bottom, 5 = Custom	0 = None
Tank Dimension Unit	Unit for entering the tank dimensions			UInteg erT	8	1336			RW	0 = Meter, 1 = Inches	0 = Meter
Custom Tank no.of points	No.of points to be entered for custom tank			UInteg erT	8	1328			RW	2 – 10	2
Custom tank unit	Units in which points for custom tank are represented			UInteg erT	8	1320			RW	0 = kg, 1 = lb, 2 = gallon, 3 = litre	0 = Kg
Product Type	Product type for the level measurement			UInteg erT	8	1312			RW	0 = Water, 1 = Skim Milk, 2 = 1% Milk, 3 = 2% Milk, 4 = Whole Milk, 5 = Raw Milk, 6 = Cream, 7 = HFCS 42, 8 = HFCS 55, 9 = HFCS 60, 10 = Custom1 11 = Custom2 12 = Custom3 13 = Custom4 14 = Custom5	0 = Water
Density Unit	Units for density of the product in the tank			UInteg erT	8	1304			RW	0 = SG, 1 = Lb/Gal, 2 = Kg/Ltr	0 = SG
Vertical Tank Dimensions	Dimensions for vertical tank type						0.001	0	RW		
A				UInteg erT	32	1272					
B				UInteg erT	32	1240					
C				UInteg erT	32	1208					
D				UInteg erT	32	1176					

Name	Description	Index	Sub-Index	Data-type	Bit-length	Bit-offset	Gradient	Off-set	Access Rights	Allowed Values	Default Value
Horizontal tank dimensions	Dimensions for horizontal tank type						0.001	0	RW		
A				UIntegerT	32	1144					
B				UIntegerT	32	1112					
D				UIntegerT	32	1080					
F				UIntegerT	32	1048					
G				UIntegerT	32	1016					
Dish Bottom tank dimensions	Dimensions for dish bottom tank type						0.001	0	RW		
A				UIntegerT	32	984					
B				UIntegerT	32	952					
D				UIntegerT	32	920					
F				UIntegerT	32	888					
Cone bottom tank dimensions	Dimensions for cone bottom tank type						0.001	0	RW		
A				UIntegerT	32	856					
B				UIntegerT	32	824					
D				UIntegerT	32	792					
E				UIntegerT	32	760					

Name	Description	Index	SubIndex	Datatype	Bitlength	Bit-offset	Gradient	Offset	Access Rights	Allowed Values	Default Value
Custom tank height	Height Points for custom tank						0.001	0	RW		
Height 1				UIntegerT	32	728					
Height 2				UIntegerT	32	696					
Height 3				UIntegerT	32	664					
Height 4				UIntegerT	32	632					
Height 5				UIntegerT	32	600					
Height 6				UIntegerT	32	568					
Height 7				UIntegerT	32	536					
Height 8				UIntegerT	32	504					
Height 9				UIntegerT	32	472					
Height 10				UIntegerT	32	440					
Custom tank volume	Volume points for custom tank						0.001	0	RW		
Volume 1				UIntegerT	32	408					
Volume 2				UIntegerT	32	376					
Volume 3				UIntegerT	32	344					
Volume 4				UIntegerT	32	312					
Volume 5				UIntegerT	32	280					
Volume 6				UIntegerT	32	248					
Volume 7				UIntegerT	32	216					
Volume 8				UIntegerT	32	184					
Volume 9				UIntegerT	32	152					
Volume 10				UIntegerT	32	120					
Custom Product name				StringT		32			RW	Upto 0 Characters	
Density	Density of selected product			UIntegerT	32	0	0.001	0	RW		

Name	Description	Index	SubIndex	Datatype	Bitlength	Bitoffset	Gradient	Offset	Access Rights	Allowed Values	Default Value
Dampening	Amount of dampening applied to process value	80	0	UIntegerT	8				RW	0 - 10	1
Alarm 1	Configuration for Alarm 1		0						RW		
Setpoint		107		UIntegerT	32		0.001				
Trigger Action		108		UIntegerT	8					0 = Above, 1 = Below	0 = Above
Hysteresis		109		UIntegerT	32		0.001				
Enable		110		UIntegerT	8					0 = Disabled, 1 = Enabled	0 = Disabled
Alarm 2	Configuration for Alarm 2		0						RW		
Setpoint		111		UIntegerT	32		0.001				
Trigger Action		112		UIntegerT	8					0 = Above, 1 = Below	0 = Above
Hysteresis		113		UIntegerT	32		0.001				
Enable		114		UIntegerT	8					0 = Disabled, 1 = Enabled	0 = Disabled
mA Fail mode	Provides output of 3.8 or 20.2 mA if device error occurs	169	0	UIntegerT	8				RW	0 = Fail high, 1 = Fail low	0 = Fail High
mA Loop direction	Selects 4-20 or 20-4 mA output	170	0	UIntegerT	8				RW	0 = 4-20mA, 1 = 20-4mA	0 = 4 – 20 mA
Custom Commands		2									
Re-Zero										160	
Factory Save	Save the current settings									162	
Puck Reset	Reset the device to the settings stored in puck									164	

Error Types

These are the error codes sent by the device for any unsuccessful parametrization of the device.

Code	Additional code	Name	Description
129 (0x81)	1 (0x01)	Invalid Tank Type	Select tank type from the available list
129 (0x81)	2 (0x02)	Invalid Dimension Unit	Select unit from the available list
129 (0x81)	3 (0x03)	Invalid Dimensions	Dimensions entered for the tank are not valid
129 (0x81)	4 (0x04)	Invalid Product type	Select the type of product from the available list
129 (0x81)	5 (0x05)	Invalid Product Density Unit	Select the unit from the available list
129 (0x81)	6 (0x06)	Invalid Range	Entered tank dimensions does not result in valid pressure range
129 (0x81)	7 (0x07)	Name Overlength	Name should be max of 10 characters
129 (0x81)	8 (0x08)	Units for tank config only	Tank should be configured first
129 (0x81)	9 (0x09)	No range modification allowed	Range cannot be modified if tank type is other than none
129 (0x81)	10 (0x0a)	Invalid no.of Points	No.of points should be selected between 2 - 10
129 (0x81)	11 (0x0b)	Invalid volumetric unit	Select the units for custom tank configuration points from the available list
129 (0x81)	12 (0x0c)	Invalid Point for custom tank	Points should be added in increasing order
129 (0x81)	13 (0x0d)	Input pressure high	Re-zero cannot be performed due to high input pressure
129 (0x81)	14 (0x0e)	Sensor not connected	Sensor stem is disconnected

Events

Events are visible in the Event log/Diagnostics section of the IO-Link software

Code	Type	Name	Description
35841 (0x8c01)	Warning	Simulation active	Check operating mode
35856 (0x8c10)	Warning	Process variable range overrun	Process data uncertain
35888 (0x8c30)	Warning	Process variable range underrun	Process data uncertain
36000 (0x8ca0)	Error	Stem not connected	No sensor connected
36001 (0x8ca1)	Error	Stem EEPROM not functional	EEPROM on stem not functional
36002 (0x8ca2)	Error	Stem ASIC not functional	ASIC on stem not functional
36003 (0x8ca3)	Error	Sensor not functional	Stem Bridge open circuit
36004 (0x8ca4)	Error	Stem not profiled	Stem does not have an active profile
36005 (0x8ca5)	Error	Stem profile corrupt	Profile in the stem is corrupted
36006 (0x8ca6)	Error	Stem EEPROM write Error	Write error occured in the Stem's EEPROM
36007 (0x8ca7)	Error	Stem EEPROM recovery error	Corruption of stem's EEPROM detected
36008 (0x8ca8)	Warning	Incompatible Range	Stem is out of range
36009 (0x8ca9)	Warning	Stem Changed	New sensor type detected
36010 (0x8caa)	Warning	Change Unit	Units of PV are changed
36011 (0x8cab)	Warning	Alarms are disabled	Alarms are disabled in the system
36012 (0x8cac)	Error	Stem EEPROM checksum error	Checksum mismatch for the data in the stem's EEPROM

Section 9 - HART Communicator Connection & DD (Device Descriptor) Menu Structure

L3 transmitters can be equipped with an optional HART output protocol and may be addressed via an external HART modem or alternatively via a portable HART communicator (HHT) compatible with HART 7.0.

9.1 Attaching HART Communicator

1. Power the L3 Transmitter. The signal loop must have at least 250ohms resistance for HHT function

2. Connect the HHT across the transmitter terminals or the resister loop

3. Turn on the HHT, wait until communications are established and the Home Menu is displayed

9.2 HART DD Menu Structure

All L3 functions as well as standard HART setup detail may be addressed via the HART DD menu. See following Menu DD for specific required paths.

Home Screen	Level 2	Level 3	Level 4	Level 5
PV Loop Current				
PV Value				
LRV				
URV				
Sensor Type				
Device Setup	Config	Units	PV	psi
				bar
				inH2O
				mmH2O
				mmHg
				mBar
				kPa
				kg
				lb
				gal
				L
				Vol%
			Dimension	m
				in
			Density	lb/gal
				kg/L
				SG

Note: Volumetric units are applicable only if the tank configuration is other than None. Changing units without configuring a tank will default the unit to inH20

Home Screen	Level 2	Level 3	Level 4	Level 5
Device Setup	Config	Range	Change Range	Change LRV and URV
			One Touch Span	Yes/No
		Tank Configuration	Select Tank Type	Vertical
				Horizontal
				Dish Bottom
				Cone Bottom
				Custom Tank
			Vertical Horizontal Dish Bottom Cone Bottom	Dimension Units
				Change Tank Dimensions (A, B, C, D, E, F, G, H)
				Tank Diagram
			Custom Tank	Custom Tank Calibration
				Review Custom Tank
		Product Configuration	Select Product	Water
				Skim Milk
				1% Milk
				2% Milk
				Whole Milk
				Raw Milk
				Cream
				HFCS 42
				HFCS 55
				HFCS 60
				Custom 1
				Custom 2
				Custom 3
				Custom 4
				Custom 5
			Density Unit	
			Product Densities	
		Alarm 1 Alarm 2	Setup	Change Alarm Settings
			Setpoint	
			Action	
			Hysteresis	
			Enable	
			Status	
		Switch Output	Source	Alarm 1
				Alarm 2
				On Error
			State	Disabled
				Enabled
		Damping	Change Value	
		mA Configuration	Calibrate Loop	Adjust 4mA and 20mA Reference
			Fail Mode	High (20.2 mA)
				Low (3.8 mA)
			Loop Direction	4mA to 20mA
				20mA to 4mA
		Re-Zero (Gauge)	Yes/No	
		Re-Zero (Absolute)	Enter Atmospheric Pressure	

Home Screen	Level 2	Level 3	Level 4	Level 5
Device Setup	Config	Device Information	Stem Serial Number	
			URL	
			LRL	
			Model	
			Puck Firmware	
			Stem Firmware	
	HART Setup	HART Configuration	Number of Response Preambles	Change Value
			Loop Current Mode	Disabled
				Enabled
			Polling Address	Change Value
		HART Information	Model	
			Manufacturer	
			Device ID	
			Universal Revision	
			Descriptor	Change Value
			Message	Change Value
			Date	Change Value
			Tag	Change Value
			Long Tag	Change Value
			Final Assembly	Change Value
		HART Output	Process Temperature	
			Pressure	
	Review	HART Review	Manufacturer	
			Universal Revision	
			Field Device Revision	
			Software Revision	
			Hardware Revision	
			Tag	
			Descriptor	
			Message	
			Configuration Change Counter	
		Device Review	Units	
			LRV	
			URV	
			URL	
			LRL	
			Damping	
			Puck Firmware Revision	
			Sensor Type	
			Sensor Serial Number	
Diagnostics	Error Information	Error(s)		
Maintenance Menu	Loop Test	4mA		
		20mA		
		Other		
		End		
	Error Information	Error(s)		
	Factory Reset	Stem Reset	Yes/No	
		Puck Reset	Yes/No	
		Save as Factory Settings	Yes/No	

Section 10 - Maintenance/Diagnostics

Warning! Do not remove this sensor from the process while it is operating. Removal while the process is operating can contaminate the process and could cause human injury.

Warning: Before removing for service or calibration, ensure that residual product has been flushed from the line and that internal pressure has returned to atmospheric pressure.

Anderson electronic sensors require very little maintenance, if any. We suggest that the sensor be inspected at 6 month intervals to ensure that they are not being subjected to physically abuse, moisture entering the housing, and that the wiring is sound.

Caution: Do not open the sensor enclosure in wet or spray-down environments. Moisture ingression can cause premature electronics failure.

External cleaning instructions: The external surfaces of this sensor can be cleaned along with the equipment or piping system that it is installed on, using cleaning and disinfecting solutions designed for use on hygienic equipment.

The L3 is equipped with diagnostic routines that monitor the sensor's function. Should an error occur the diagnostic display will flash an error code and the output will go to the failure state specified by the user. Errors may be caused by a number of reasons ranging from failed electronic components to user configuration errors. The code appendix below indicates possible codes with actions that should be taken to correct the problem. Error codes may be cleared to facilitate subsequent menu changes, however the output will remain at the specified failure state until error is addressed and the unit repowered. Always record the error code before attempting to clear it.

The display code may be erased as follows:

- From home screen press down and hold for several seconds. Some error codes will not erase until problem is resolved – Sensor displays current process value.

- Power cycle by removing power for 10 seconds then reattach power.

Caution: Improper replacement of components during service can result in process leakage, reduced pressure rating, system cleanability issues, incorrect output signal, or error code(s).

Error Code	Category	Customer Action
e500	Stem Not Connected	Check stem ribbon cable connection to puck. Power cycle.
e501	Stem Data Corruption	Replace stem.
e502	Stem Data Corruption	Replace stem.
e503	Stem Data Corruption	Replace stem.
e701	Internal System Failure	Reset error and power cycle. If error persists, replace puck.
e300	Stem Data Corruption	Factory restore the stem. If error persists, replace stem.
e301	Stem Data Corruption	Factory restore the stem. If error persists, replace stem.
e600	Stem Data Corruption	Factory restore the stem. If error persists, replace stem.
w100	Warning: Incompatible Range	Reconfigure puck to range compatible with stem. Reset error.
w101	Warning: Stem Type Changed	Reconfigure puck to range compatible with stem. Reset error.
w102	Warning: PV Unit Changed	Reconfigure puck to required PV unit. Reset error.
OVER	Warning: Over Pressure	Check Process. Sensor exposed to pressure/level above URV.
UNDER	Warning: Under Pressure	Check Process. Sensor exposed to pressure/level below LRV.
Alarm1	Alarm 1 Active	Check process. Check Alarm 1 settings.
Alarm2	Alarm 2 Active	Check process. Check Alarm 2 settings.
AL_DIS	Alarm Disabled	Check Alarm 1 and Alarm 2 settings.
NOISE	Warning: EMI Disruption	Check Process. Wiring of remote connection is exposed to extreme EMI.

Feel free to contact Anderson Technical Services Department (Phone: 800.833.0081 / E-Mail: techservice@anderson-negele.com) for further assistance with troubleshooting.

Section 11 - Warranty and Return Statement

These products are sold by The Anderson Instrument Company (Anderson) under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Anderson or from an Anderson distributor, representative or reseller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

Warranty

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Anderson factory and to conform at that time to the specifications set forth in the relevant Anderson instruction manual or manuals, sheet or sheets, for such products for a period of two years.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN AND ABOVE SET FORTH. ANDERSON MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

Limitations

Anderson shall not be liable for any incidental damages, consequential damages, special damages, or any other damages, costs or expenses excepting only the cost or expense of repair or replacement as described above.

Products must be installed and maintained in accordance with Anderson instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specifications or other operating condition beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty is void if the purchaser uses non-factory approved replacement parts and supplies or if the purchaser attempts to repair the product themselves or through a third party without Anderson authorization.
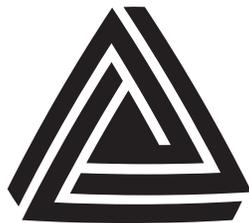
Returns

Anderson's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repairing or replacing (at Anderson's option), free of charge, the products which are reported in writing to Anderson at its main office indicated below.

Anderson is to be advised of return requests during normal business hours and such returns are to include a statement of the observed deficiency. The buyer shall pre-pay shipping charges for products returned and Anderson or its representative shall pay for the return of the products to the buyer.

Approved returns should be sent to:

    ANDERSON INSTRUMENT COMPANY INC.
    ATT: REPAIR DEPARTMENT
    156 AURIESVILLE ROAD
    FULTONVILLE, NY 12072 USA

ANDERSON-NEGELE