AUTOMATIONDIRECT.com

ProSense® Submersible Level Transmitters

User Manual

Manual 1st. Ed.

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ProSense Submersible Level Sensors Manual

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Please include the Manual Name and the Manual Issue, both shown below, when communicating with Technical Support regarding this publication.

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1st Edition	07/14	Original

Notes:

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Chapter 1
Product Introduction

In This Chapter...

Product Introduction

Product Description

The ProSense SLT series submersible level sensors provide continuous liquid level measurement by sensing the hydrostatic pressure produced by the height of liquid above the sensor and providing a 4-20 mA output signal compatible with PLC's, panel meters, data loggers, and other electronic equipment. The shielded cable with atmospheric vent tube and a tough polyurethane jacket incorporating an exclusive "water block" liner beneath the jacket is attached to the sensor using an over-molding process that prevents moisture intrusion. The SLT1 series has a slim 1-inch diameter housing and a ported bullet nose cap for protection of the sensor diaphragm. The SLT2 series features a large 2.75 inch diameter PTFE flexible diaphragm surrounded by a 316 stainless steel non-fouling protective cage. Accessories include a desiccant vent filter, aneroid bellows, junction boxes, and replacement nose caps.

Features

- Models with ported nose cap or non-fouling cage for diaphragm protection
- Durable 316 SS construction for reliable, long life in harsh environments
- Shielded cable with atmospheric vent; over-molded to prevent moisture intrusion
- 1/2 inch NPT male threaded conduit connection on the sensor housing standard
- Pre-calibrated ranges up to 50 psig (115.3 ftWC) to meet the most common submersible level applications
- +/-0.25% accuracy standard
- All sensors include UL and FM hazardous location approvals for intrinsically safe applications and are CE marked
- Made in the USA

Applications

- Lift station monitoring
- Tank liquid level
- Landfill leachate monitoring
- Construction by-pass pumping
- Dewatering
- Pump control
- Slurry tank liquid level
- Wastewater

Approvals

UL and FM certification for intrinsic safety options are standard for ProSense SLT series transmitters. Their respective installation control drawings can be found in Chapter 5. All products are CE compliant to EN 61326-1:2006 and EN 61326-2-3:2006 and labeled accordingly.

These units are designed for installation in a Class I, Division 1, Groups A, B, C, and D, Class II, Division 1, Groups E, F and G, Class III, Division 1 hazardous location when connected to appropriate Intrinsically Safe barrier as detailed in the control drawing located in Chapter 5.

INSTALLATION & MAINTENANCE

In This Chapter...

Installation & Maintenance

Care and Handling

Our transmitters are designed for rugged use. However, they need protection from over pressure and sharp impact. Penetrate the surface slowly, vertically and only to the depth necessary when lowering a transmitter into a liquid. Avoid dropping the unit from above the surface. Clean all transmitters as instructed in the "Cleaning Your Transmitter" section that appears later in this chapter. Direct probing of the diaphragm or attempts to remove protective screens will damage the sensor, voiding the warranty. The protective covering (or similar protective device) that is shipped with each transmitter should be attached to the transmitter at all times. It should only be removed prior to installation or cleaning.

Warning: Potential Electrostatic Charging Hazard

In hazardous locations:

- Avoid building up static charge on the plastic accessories.
- Use damp rag to wipe the plastic accessories to avoid static build up.

General Installation Procedures

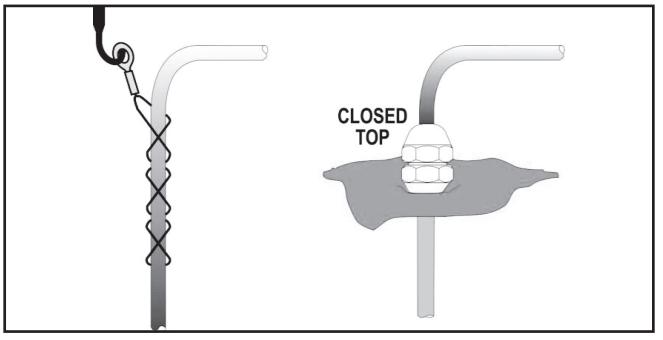
The following is important installation and preventive maintenance information. If for any reason you should need technical assistance, call us at 1-800-633-0405.

Transmitter Anchors

Most users either suspend our submersible transmitters in stilling wells or attach them to rigid conduit. This is done to prevent damage to the transmitter from shock caused by water turbulence. It is not advisable to tie your transmitter to a pump or to piping, as any problem with the transmitter could require that the pump be pulled from the installation. This could prove to be very expensive.

Some applications use a bracket to clamp the transmitter to a fixed object (i.e., wall, ladder, step) or require the unit to be suspended without any protective still well or attachment device. In all installations, care should be taken to ensure no damage occurs to the cable.

Cable Anchoring Schemes



Transmitter Submersion

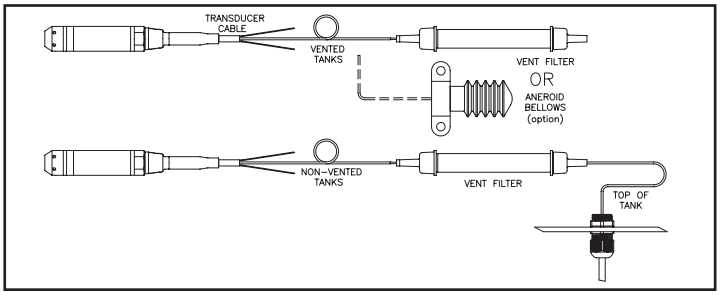
Damage to submersible cable is one of the more common causes of transmitter failure. Lower your transmitter into the liquid slowly, making sure the cable does not drag over sharp edges and only to the depth necessary. Avoid dropping the unit from the surface.

Vent Filter (Desiccant) or Aneroid Bellows Installation

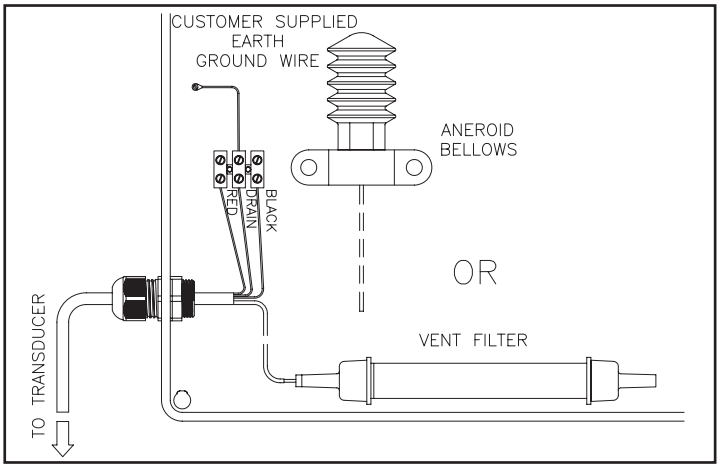
Always install a vent filter (desiccant) or aneroid bellows immediately after transmitter installation. Failure to use one or the other could result in premature failure of the transmitter; which would not be covered by warranty. If you use a vent filter (desiccant), you should establish a regular maintenance schedule. You should change your vent filter when it is 75% depleted (pink color). Replacement filters are available at a nominal cost. Do not remove the old vent filter until a new one is available. The most common failure mode of our transmitters is moisture and corrosion damage due to lack of use or maintenance of the vent filter. A clean vent filter (desiccant) allows air into the desiccant filter and allows the transmitter to properly vent with changes in barometric pressure.

To install/replace either the aneroid bellows or the vent filter (desiccant), simply unplug the old unit from the vent tube and plug the 0.062 inch x 1 inch PEEK (Polyetheretherketone) connector tube (supplied with each filter or bellows) into the vent tube.

Reference Connection Schemes



Submersible Cable Termination



Polyurethane Jacketed Cable

Most installations of our submersible level transmitters connect our polyurethane cable to a junction box. From this junction box users typically run their own cable to the required instrumentation.

Polyurethane Jacketed Cable Cont.

Specifications for our standard polyurethane jacketed cable are as follows:

Specifications	Submersible Cable
Min. OD	0.28 in (7.10 mm)
Max OD	0.31 in (7.87 mm)
Conductors	2–22 AWG
Insulation Conductors Outer jacket	Polyurethane
Shield	36 gauge spiral tinned copper wire foil shield with drain wire
Vent Tube	Polyethylene, 0.060 in ID (1.52 mm)
Cable Pull Strength	200lbs (90kg)
Min. Bend Radius	1 in (25.4 mm)

The submersible level transmitter junction boxes provide a water-resistant enclosure for electrically connecting the transmitter cable to the user's system via a terminal strip. The enclosure also provides a convenient location for terminating the transmitter's vent tube to a vent filter (included in Part No. SLT-JB1) or an aneroid bellows (included in Part No. SLT-JB2). The enclosure is constructed of polycarbonate with a clear top incorporating a neoprene seal. The junction box is rated IP66. Mounting screws are provided. Many users require a compression fitting to secure our polyurethane jacketed cable as it enters a junction box. Care needs to be taken that you do not over-tighten the fitting and damage the cable.

The vented cable termination end is specially prepared at the factory to eliminate the potential for moisture migration. Where the lead wires emerge from under the jacket, there is potting material and a shrink tube "boot". Every effort should be made to leave this feature intact. Should the cable be longer than needed for the installation, it is recommended that the excess length be accommodated in a service loop and that the potted end of the cable NOT be shortened.

The cable attached to this instrument is specifically engineered for submersible applications. The polyurethane outer jacket provides long term reliability under most conditions. The cable should be handled carefully, however, as the jacket may be subject to cutting should it be "raked" over extremely sharp edges. To guard against water incursion should an inadvertent minor cut occur, we have incorporated an exclusive "water block" feature immediately beneath the jacket. The cable is fully shielded, with the shield connected to the metal housing at the transmitter end and terminated in a drain wire at the termination or user end. The shield should always be terminated to a good earth ground, unless the transmitter is installed in an area where galvanic corrosion is known to be a serious problem.

Cable Protection

An inexpensive way to protect the cable from damage is to connect an inexpensive flexible 5/8 inch garden hose to the 1/2 inch conduit fitting with an inexpensive female PVC 1/2 inch NPT x 3/4 inch NHT swivel fitting, available at your local hardware store. These options are not supplied by AutomationDirect.com.

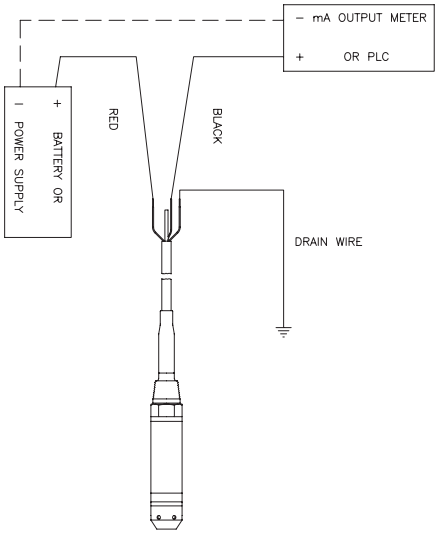
Bending of Cable

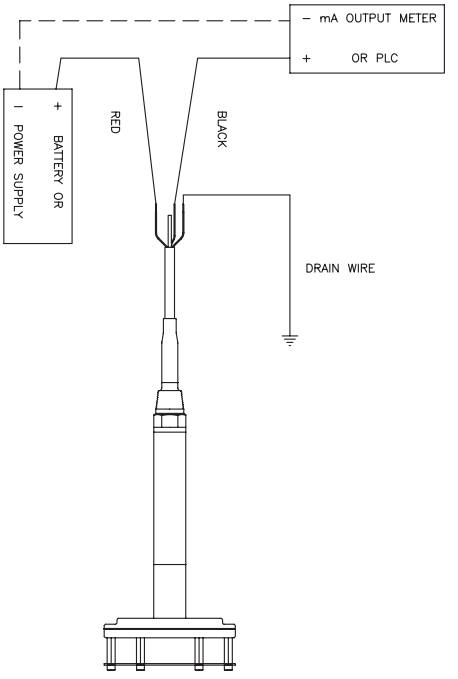
Our polyurethane jacketed cables are quite flexible. Use care to ensure that when bending the cable to suit your installation you do not crimp the vent tube inside the cable. Consequently, do not bend the cable more than a radius of 1 inch.

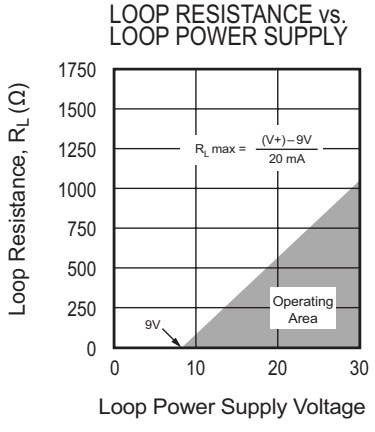
Cable Compression

Many users require a compression fitting to secure the polyurethane jacketed cable as it enters a junction box. Use care to not over-tighten the fitting so as to damage the cable.

4-20 mA Wiring







SLT1 & SLT2 Series Wiring Connection	
4–20 mA output (22AWG conductors in a shielded cable with vent tube)	
+ Excitation	Red
- Excitation	Black
Shield	Drain Wire

Maximum Cable Lengths and Minimum Supply Voltage

At 25ºC the 22AWG conducting copper wire used in our polyurethane jacketed cable has a resistance of 16.45 ohms per 1000 feet (304m).

Maximum Cable Lengths and Minimum Supply Voltage Cont.

Using Ohms Law (E=IR) where E=voltage, I=current and R =resistance, a 20mA signal requires 0.329 volts to drive it along 1000 feet (304m) of 22AWG copper wire (E=16.45 x 0.020). This drop is seen on both the supply and return wire for a total loop voltage drop of 0.658 volts.

Connect the cable shield (drain wire) to a good earth ground. This will protect the transmitter from relatively minor transient voltages. The only exception to this rule is if high rates of electrolytic corrosion have been previously experienced with grounded submersible devices. In this case it may be better to leave the shield disconnected.

Protective Cage Diaphragm Protector

The ProSense SLT2 comes standard with a field removable diaphragm protector (one-inch or 25mm standoff). The protective cage diaphragm protector can easily be taken off by removing six (6) fasteners located on the bottom of the unit.

Position Sensitivity

The transmitter should be installed so that the diaphragm located behind the nose cap is oriented in a vertical position, otherwise the unit could exhibit an offset.

Vent Filter (Desiccant) Maintenance

Warning: Potential Electrostatic Charging Hazard

In hazardous locations:

- Avoid building up static charge on the plastic accessories.
- Use damp rag to wipe the plastic accessories to avoid static build up.

If you use a vent filter (desiccant), you should establish a regular maintenance schedule. You should change your vent filter when it is 75% depleted (pink color). Replacement filters are available at a nominal cost from the AutomationDirect.com. Do not remove the old vent filter until a new one is available.

Clogged Nose Cap or Dirty Diaphragm

Either of these conditions could result in erroneous readings from your transmitter.

Warning: NEVER attempt to clean your transmitter's nose cap or diaphragm with any object. This could dent or scar the sensor diaphragm and cause permanent damage to the transmitter.

Cleaning your Transmitter

Materials required:

- Personal protection equipment (i.e. safety glasses, chemical resistant gloves)
- 3 Plastic bowls 8-12 inches (200-300 mm) in diameter and 4-6 inches (100 - 150 mm) deep
- Supply of clean, lint-free cleaning rags
- Mild dishwashing detergent (i.e. Dawn)
- 16 ounces Tub & shower cleaner (i.e. The Works)
- 3-4 gallons of clean fresh water

Preparation

- Prior to cleaning your submersible level transmitter, ensure that all appropriate procedures have been followed to remove any hazardous materials from the cable and transmitter.
- The vent filter (desiccant) or aneroid bellows must be properly attached.
- The cable should be coiled to ensure ease of handling and it must be protected against the possibility of accidental abrasion and/or penetration of the cable jacket by sharp objects.
- A lead length of 1 to 1 ½ feet (0.3 - 0.45 m) of cable from the transmitter should be allowed to facilitate handling during cleaning.

Your work surface needs to be clean and free of clutter and large enough to accommodate all materials required in addition to the transmitter and cable. Fill one of the bowls with fresh water, one with a mild dishwashing detergent mixed with water and the last with 16 ounces (0.45 kg) of a tub & shower cleaner.

Cleaning Steps

Step 1: Holding the cable 6 inches (150mm) from the transmitter, immerse the unit in the bowl containing the mild dishwashing/water solution detergent and stir for 20-30 seconds. Remove and rinse in the bowl containing the fresh water, using the same stirring motion used in the detergent solution. Rinse and wipe dry.

Step 2: Holding the body of the transmitter with one hand so that you are looking at the retaining screen protecting the sensor, carefully remove the sensor nose cap by simply unscrewing it from the transmitter body. Do not touch the sensor diaphragm with your finger or any other object. Also, do not try to dry the inside portion of the transmitter, as you risk damaging the pressure sensor.

Step 3: Place the transmitter in a vertical position with the sensing end facing downward in the bowl containing a tub & shower cleaner for approximately 15-20 seconds. Rinse in the bowl containing clean water and wipe dry the external casing only. Place the protective nose cap in the same solution for 15- 20 seconds, rinse and wipe dry.

Step 4: Holding the transmitter in a vertical position so that you can see the face of the sensor, screw the protective nose cap back into place.

Chapter 3

Product Accessories

In This Chapter...

Product Accessories

Warning: Potential Electrostatic Charging Hazard

In hazardous locations:

- Avoid building up static charge on the plastic accessories.
- Use damp rag to wipe the plastic accessories to avoid static build up.

Nose Caps & Protective Cage

There are sensor protection options for the ProSense submersible level product line.

- The SLT1 series features a ported polyoxymethylene (POM) nose cap with #8-32UNC-2B threaded-hole where weight accessories can be attached.

Warning: Use caution when inserting a screw into the nose cap as the maximum insertion length should not exceed 0.175 in.

- The SLT2 features a wide mouth non-fouling cage protecting a 2.75 in PTFE flexible diaphragm.

Vent Filter (Desiccant) or Aneroid Bellows

All submersible level transmitters with molded cable attachment require an optional protective barrier that guards against moisture buildup in the cable vent tube. These barriers ensure reliable operation and long life as they protect sensitive electronic components from mildew and prevent the formation of a liquid column in the vent tube. Any such liquid column directly affects the instantaneous calibration of the transmitter.

Always install a vent filter (desiccant) or aneroid bellows immediately after transmitter installation. Failure to use one or the other could result in premature failure of the transmitter; which would not be covered by warranty. If you use a vent filter (desiccant), you should establish a regular maintenance schedule. You should change your vent filter when it is 75% depleted (pink color). Replacement filters are available at a nominal cost. Do not remove the old vent filter until a new one is available. The most common failure mode of our transmitters is moisture and corrosion damage due to lack of use or maintenance of the vent filter. A clean vent filter (desiccant) allows air into the desiccant filter and allows the transmitter to properly vent with changes in barometric pressure.

To install/replace either the aneroid bellows or the vent filter (desiccant), simply unplug the old unit from the vent tube and plug the 0.062 inch x 1 inch PEEK (Polyetheretherketone) connector tube (supplied with each filter or bellows) into the vent tube.

FAQ's & TROUBLESHOOTING

In This Chapter...

Frequently Asked Questions		
1.	***Question***	What installation ideas do you have to help me get rid of electrical noise interfering with the signal?
	Answer	We strongly encourage you to secure our cable shield to a good earth ground. Armed with this precaution and the fact that our transmitters are CE approved for electromagnetic interference, you should have few problems. Either try to eliminate the source of noise or move the transmitters as far away from it as possible.
2.	***Question***	The cable on the submersible transmitter always seems to get cut and damaged. What am I doing wrong?
	Answer	The cable should not be bent around rough or sharp edges. Always use a cable reel during transport. Where possible, suspend the unit in a perforated 2 inch (50mm) PVC pipe and thread the cable through protective conduit to the nearest junction box.
3.	***Question***	I have an application where the transmitter is frequently damaged by voltage spikes. What can be done to prevent this?
	Answer	At a minimum, make sure the cable shield is connected to an earth ground as near as possible to the transmitter. A surge protector device (purchased separately) will handle typical spikes that might come in through the power lines as well as surges that travel through the ground due to nearby lightning strikes.
4.	***Question***	How much impact shock can your submersible transmitters withstand?
	Answer	Our transmitters are not shock tested and the lower pressure ranges can be damaged if dropped from several feet onto a hard surface like concrete. We recommend that the protective shipping sleeve remain in place until the unit is installed.
5.	***Question***	How do I attach your vent filter or aneroid bellows to my cable vent tube?
	Answer	The vent filter can be mounted anywhere convenient, preferably out of the weather. It can be mounted in any position and connects to the cable vent tube via the extension tube with connector tube provided. The aneroid bellows must be mounted in a way that its movement is not encumbered. It is provided with a mounting base.
6.	***Question***	Any ideas for preventing marine growth on your submersible transmitters?
	Answer	A marine grease is sometimes useful in preventing buildup. Remove the threaded nose cap to facilitate applying the grease. Take care not to damage the diaphragm when applying the grease and not to trap air bubbles against the sensing diaphragm
7.	***Question***	How many measurements can you make before the diaphragm on the sensor fails?
	Answer	In normal operation - millions of cycles. We find that sensor failure is rarely due to diaphragm fatigue.
8.	***Question***	What if the cable is too long? Can I cut it off?
	Answer	It is recommended that any excess cable length be accommodated in a service loop and that the cable NOT be shortened.

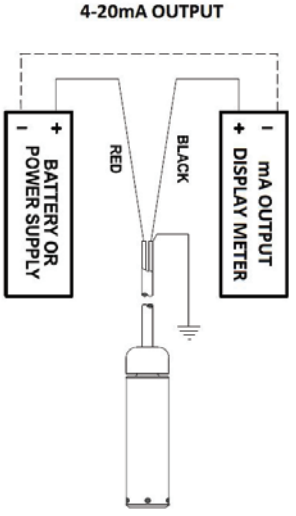
Frequently Asked Questions Cont.		
9.	Question	What if the supplied cable is not long enough?
	Answer	If longer transmitter cable is needed, terminate the sensor in an SLT-JB1 or SLT-JB2 junction box and run standard non-vented instrumentation cable between the junction box and the measuring electronics.
10.	Question	Does it make any difference if I mount the transmitter in a vertical or horizontal position?
	Answer	Yes. Our units will experience a certain amount of position sensitivity. You should mount it in a vertical position throughout the measurement cycle. If you lay the transmitter down, the user must realize that an offset will occur.
11.	Question	What happens when you freeze your transmitter in a column of water?
	Answer	Depending on the level range of the unit, over pressure of the unit is possible. In harsh environments where debris is common and ice shifts, you might expect damage to both the transmitter and cable.

Transmitter Field Checks & Troubleshooting

The following is a field check procedure for Level Transmitters. It is designed to provide the information you need to isolate problems that may occur when using a transmitter. Do these checks to determine in advance whether the transmitter is operating properly.

When a problem is encountered with a transmitter, it is helpful to test the transmitter independently from the rest of the system, thereby establishing where to concentrate the troubleshooting effort. It is important to determine if the fault lies in the transmitter or the instrument reading the transmitter signal, i.e. digital panel meter, programmable logic controller, etc. If all of the following transmitter tests deliver normal results, the problem may be found elsewhere in your system.

Below is a simple hookup diagram for a 4-20 mA transmitter. The diagram above illustrates the attachment of the meter in series with the black (negative signal) wire of the transmitter using a 12-28 VDC power supply for transmitter excitation.



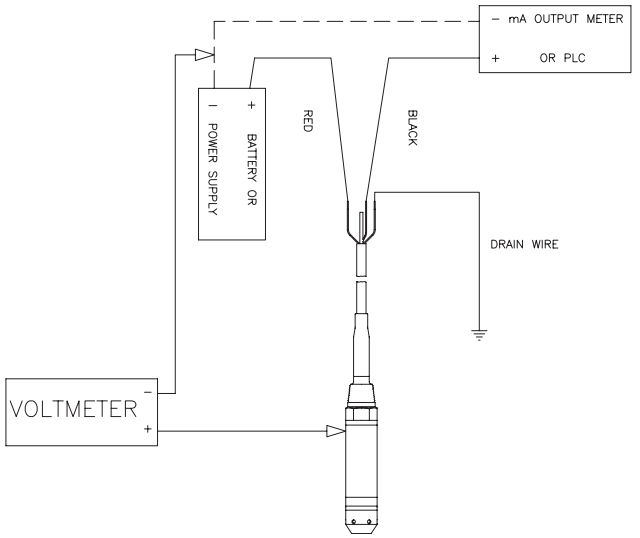
Transmitter Field Checks Cont.

Batteries are suggested to power the transmitter during testing to eliminate the possibility that line noise is passing through an improperly filtered, grounded, or damaged installation power supply. Use a handheld digital multimeter (DMM) capable of reading 4-20 mA of current resolution of at least 0.01 decimal places.

Once your transmitter is correctly configured per one of the diagrams, orient the transmitter in a vertical position with the pressure port down and then read the zero output on your meter. For a 4-20 mA output, the zero should be between 3.75 and 4.25 mA. If the transmitter is submersible, you may opt to test the unit's response in a container of room temperature water and observe its reaction to liquid pressure. It should return to the same zero point when removed. If the output is outside of these limits, note the results and continue to troubleshoot the transmitter per the suggested measurements shown below.

Case Check

These checks are performed to detect internal shorts either in wiring that might have made contact with the structural components of the transmitter, or from water intrusion that has made its way to the internal circuit board. In either case, there should be zero (0) voltage output on the case when the tests below are performed and checked with a digital multimeter.



Further Measurements

The following checks to the wiring should be made using a digital multimeter to insure that all connection wiring offer the listed resistance levels for proper operation.

4–20 mA	*Should Read*
+Excitation (red) to Shield (drain)	> 2.5 Mohms
-Excitation (black) to Shield (drain)	> 2.5 Mohms
Shield (drain) to Housing	< 2 ohms

Troubleshooting		
1.	***Symptom***	Transmitter fails to give output of any kind.
	Procedure	Isolate the problem to either the transmitter or the power supply/readout. See the Transmitter Field Check procedures in this section. If it can be determined that the transmitter is no longer operable, remove it from service for further analysis. If the transmitter output falls within the limits described above, the fault lies somewhere else in your system.
2.	***Symptom***	Transmitter has failed and has been removed for analysis.
	Procedure	Inspect the cable for physical damage. Cuts in the cable jacket can result in liquid incursion into the transmitter housing, which can cause permanent damage. Inspect the transmitter housing. It should be intact and free of corrosion. If the outer surface of the transmitter is pitted, this could be an indication of galvanic corrosion caused by stray ground currents. If this is the case, the transmitter will probably require replacement. If the external case exhibits none of these characteristics, carefully unscrew the nose cap and look into the pressure sensing end of the transmitter. The concentric rings of the sensing diaphragm should be visible. If they are not, it could be that residue has accumulated on the diaphragm, preventing it from responding properly to pressure changes. The transmitter can be cleaned by gently swishing the transmitter back and forth in a bucket of warm, soapy water until the residue softens and washes off. (See Cleaning Your Transmitter) Under no circumstances should any object or tool be used to remove residue from the sensing diaphragm or else permanent damage will be done. If cleaning the diaphragm does not solve the problem, contact AutomationDirect.com for further information.
3.	***Symptom***	Transmitter develops a negative offset and gets worse over time (actual level exceeds specified level).
	Procedure	This may be a sign that moisture has entered the reference (vent) tube in the cable and is inside the transmitter housing. This is usually the result of not maintaining the desiccant vent filter or of operating the transmitter without a desiccant filter or aneroid bellows. If caught early enough, the transmitter can be saved by coiling the cable and transmitter in a pan and placing it in a heat chamber at 50°C (122°F) for a minimum of 2 hours. Be careful that the heat chamber does not exceed 50°C (122°F) or both the transmitter and the cable can be damaged. Alternatively, suspend both the cable and transmitter in a vertical position (with vent tube down); overnight to allow water to drain from the transmitter and vent tube.
4.	***Symptom***	Transmitter suddenly fails during or just after a nearby lightning event.
	Procedure	This failure is usually caused by overvoltage due to ground transients resulting from a direct or indirect lightning event. These transients can travel distances of a mile or more. The transmitter should be replaced.
5.	***Symptom***	Transmitter response to pressure/level input changes becomes sluggish.
	Procedure	This is usually a sign that the sensing end of the transmitter has become fouled with residue. The transmitter must be removed from service and the sensing diaphragm cleaned as described in the Installation & Maintenance section.
6.	***Symptom***	Output reading is within limits but “freezes” at one point.
	Procedure	In certain environments “crust” may form over the sensing diaphragm, preventing the sensor from identifying changes in level. Removing the transmitter from service and cleaning it (as described in Item 2) will generally solve the problem.
7.	***Symptom***	No electrical output from your transmitter
	Procedure	Check all electrical connections to ensure they are correct and secure. Double check your power supply or use a battery (as described previously) to ensure the transmitter is getting power. If all checks OK, the problem could be a circuit board or the sensor in your transmitter. The most probable cause of this type of failure is damage to the submersible cable jacket allowing water to leak down the cable and into the transmitter housing or lightning damage.

<table>
<tr><th colspan="3">Troubleshooting Cont.</th></tr>
<tr><td rowspan="2">8.</td><td>Symptom</td><td>Formation of marine growth on a submersible transmitter.</td></tr>
<tr><td>Procedure</td><td>Certain transmitter construction materials, including, 316 stainless steel, attract marine life (snails) and algae. Clean as described in the Installation & Maintenance section. You can also coat the transmitter with marine grease. This may be the most effective and inexpensive way to protect your transmitter.</td></tr>
<tr><td rowspan="2">9.</td><td>Symptom</td><td>Submersible transmitter exhibits corrosion or pitting on body or diaphragm.</td></tr>
<tr><td>Procedure</td><td>Dissimilar metals (for example, your transmitter housing and your pump housing) in an electrolytic environment (fluid in your well) can lead to galvanic corrosion of the metal that is nearer the anodic end of the galvanic series. Likewise, a voltage potential between the ground wire of the transmitter and the ground of other equipment in the well can lead to galvanic corrosion. Installation of a sacrificial anode will help protect your transmitter from galvanic corrosion. Sacrificial anodes made of a zinc alloy that, being nearer the anodic end of the galvanic series than the 316 stainless steel housing of the transmitter, will corrode before the transmitter.</td></tr>
<tr><td rowspan="2">10.</td><td>Symptom</td><td>Transmitter has an offset error.</td></tr>
<tr><td>Procedure</td><td>Our submersible transmitters perform best when the sensing end is pointing in a downward manner. Keep in mind that you can experience offset error due to the position sensitivity or orientation change of the sensor. Offset errors are more prominent in low pressure applications with the sensing end of the transmitter lying flat or pointing upward.</td></tr>
<tr><td rowspan="2">11.</td><td>Symptom</td><td>I have a ProSense SLT series 4-20mA transmitter rated for 5 PSIG attached to a pressure source that is outputting 5 PSIG. With 20VDC being supplied I am getting 19.94 mA. I can't find the upper range allowance for the sensor, but this seems low to me. Does this mA reading fall into the acceptable range for the transmitter with the settings I've specified?</td></tr>
<tr><td>Procedure</td><td>When evaluating a transmitter it is sometimes convenient to make some broad generalizations in order to rapidly determine the condition of the unit. In general, transmitters that output a 4-20 mA DC signal have a 16mA DC span (20 - 4 = 16). If the transmitters accuracy is reported as being some percentage of its full-scale range, then the following table could be used in conjunction with the instructional notations to determine whether a more detailed analysis of data quality is required.
<table>
<tr><th>Accuracy Rating</th><th>Accuracy in mA DC</th></tr>
<tr><td>0.25% FS</td><td>0.05 mA</td></tr>
</table>
In order to approximately determine how many milliamps a transmitter should output at a given depth:
1. Determine the depth (in feet) at which the transmitter is installed.
2. Divide the depth value (from step 1) by the transmitter full-scale range (in feet). Record the value.
3. Multiply the value calculated in step 2 by 16 (the transmitter span in milliamps).
4. Add 4 to the product of step 3. This is the approximate value in milliamps that should be output by the transmitter at its current depth
In order to approximately determine the depth of a transmitter (in feet) using a given value of milliamps:
1. Divide the full-scale range of the transmitter (in feet) by 16. Record this value.
2. Subtract 4 from the milliamp output of the transmitter. Record this value.
3. Multiply the result of step 1 by the result of step 2. This is the approximate depth at which the transmitter is installed.</td></tr>
</table>

CERTIFICATIONS & DRAWINGS

In This Chapter...

DATE	REV	ECO	REVISION	BY	CHK	EOR
04/01/14	A	N/A	INITIAL RELEASE	TAH	xxx	xxx
07/28/14	A1	N/A	Removed the optional mounting bracket from sheet 3	TAH	xxx	xxx

The Transducers listed below are designed for installation in a Class I, Division 1, Groups A, B, C and D, Class II, Division 1, Groups E, F, and G, Class III, Division 1 hazardous location when connected to Associated Apparatus as described in note 1.

Series SLT-a-b-Lc

a = pressure connection: 1=Nose Cap 2=Cage
b = pressure range: 0-50 psi
c = cable length

Notes: (applies to all figures on sheet 2)

1. Associated Apparatus shall provide intrinsically safe connections which meet the following parameters.

V_{max} ; For all barrier channels used.
I_{max} ; Combined current for all barrier channels used.
C_i ; For all barrier channels used.
L_i ; For all barrier channels used.
P_i ; Combined power for all barrier channels used.

V_{oc} or $V_T \leq V_{max}$ $\quad C_a \geq C_i + C_{leads}$*
I_{sc} or $I_T \leq I_{max}$ $\quad L_a \geq L_i + L_{leads}$*
P_o or $P_T < P_i$

* Includes all cable connected to the barrier including the transducer cable.

Selected barriers must be third party approved as providing intrinsically safe circuits for the application, and have Voc or Vt not exceeding Vmax and Isc or It not exceeding Imax, and the Po of the barrier must be less than or equal to the Pmax of the intrinsically safe equipment, as shown in the Table of Entity parameters.

2. Control Room apparatus shall not generate in excess of 250V (U_{max}).

3. Installation should be in accordance with Article 504 in the National Electrical Code, ANSI/NFPA 70 and ISA RP-12.06.01

4. Float unused wires in cable. Insure that these wires are electrically isolated from other conductors.

DO NOT SCALE DRAWING
UNLESS OTHERWISE NOTED

PART NUMBER

ProSense
by AutomationDirect.com

DRAWN	DATE
TAH	4/01/14

CHECKED	APPROVED	DATE

PRODUCT TITLE: Submersible Level Transmitters

EOR	APPROVED	DATE
xxx		

DRAWING TITLE: CERTIFICATION DRAWING, FM

MATERIAL	SCALE	PROJECTION	DRAWING NUMBER	REVISION	SHEET
	NTS	▷ ◎	ADC1010	A1	1/3

DATE	REV	ECO	REVISION	BY	CHK	EOR
4/1/14	A	N/A	INITAIL RELEASE	TAH	xxx	xxx
07/28/14	A1	N/A	Removed the optional mounting bracket from sheet 3	TAH	xxx	xxx

Class I, II, III, Div. 1 Groups A-G Hazardous Location
Figures 1-3

→ Entity Parameters
V_{max}= 28V
I_{max}= 110mA
C_i =0.064µF
L_i = 0
P_i = 1W

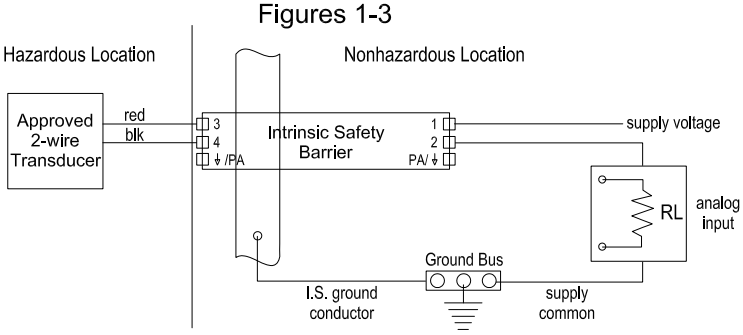


Figure 1. Return Lead Floating

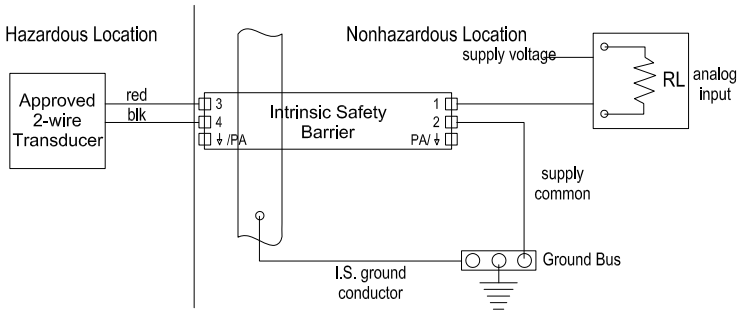


Figure 2. Return Lead Grounded

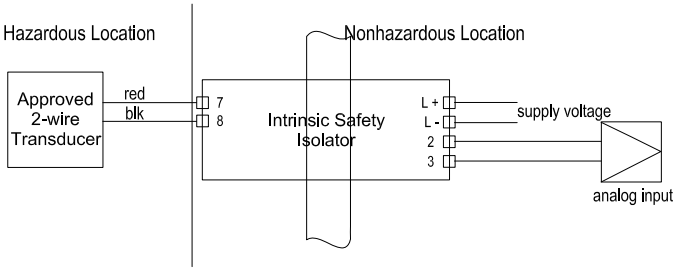


Figure 3. Field Circuit Isolated

Wiring diagram for 2-wire, 4-20mA output.

Class I, II, III, Div. 1 Groups C&D (only) Hazardous Location

→ Entity Parameters
V_{max}= 28V
I_{max}= 186mA
C_i =0.064µF
L_i = 0
P_i = 1.3 W

WIRING DIAGRAMS SAME AS FIGURES 1,2 & 3

WARNING!
AGENCY APPROVED DRAWING. REVISIONS MUST BE SUBMITTED FOR AGENCY APPROVAL.

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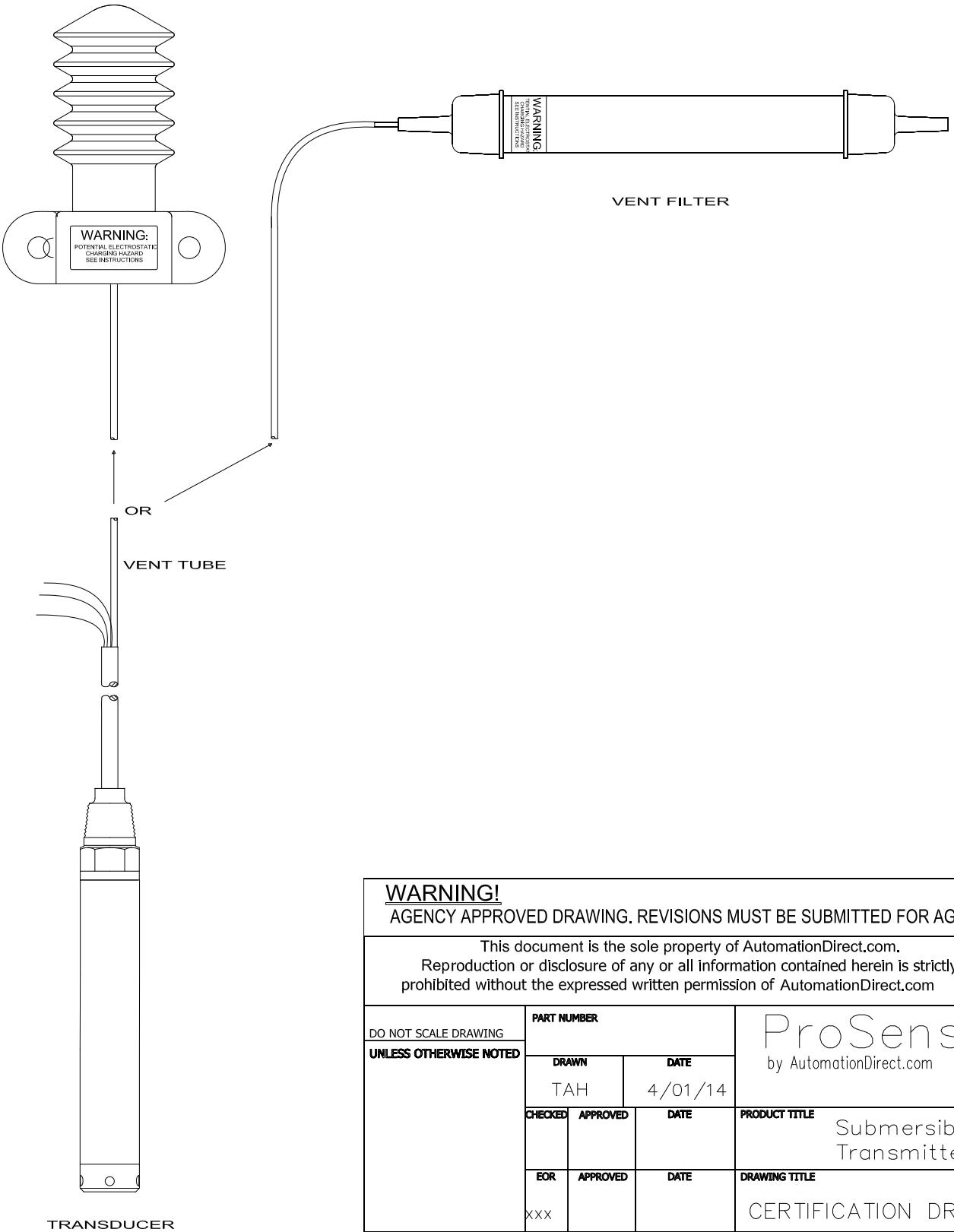
	CHECKED	APPROVED	DATE
	EOR: xxx	APPROVED	DATE
MATERIAL	SCALE: NTS	PROJECTION	DRAWING NUMBER: ADC1010

PRODUCT TITLE: Submersible Level Transmitters
DRAWING TITLE: CERTIFICATION DRAWING, FM
REVISION: A1
SHEET: 2/3

DATE	REV	ECO	REVISION	BY	CHK	EOR
4/2/14	A	N/A	INITAIL RELEASE	TAH	xxx	xxx
07/28/14	A1	N/A	Removed the optional mounting bracket from sheet 3	TAH	xxx	xxx

TYPICAL MECHANICAL INSTALLATION



WARNING!

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	CHECKED	APPROVED	DATE	PRODUCT TITLE: Submersible Level Transmitters
	EOR: xxx	APPROVED	DATE	DRAWING TITLE: CERTIFICATION DRAWING, FM
MATERIAL	SCALE: NTS	PROJECTION	DRAWING NUMBER: ADC1010	REVISION: A1 / SHEET: 3/3

DATE	REV	ECO	REVISION	BY	CHK	EOR
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Series SLTa-b-Lc

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b = pressure range: 0-50 psi
c = cable length

Notes: (applies to all figures on sheet 2)

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WARNING!
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	EOR: xxx	APPROVED	DATE	DRAWING TITLE: CERTIFICATION DRAWING, UL
MATERIAL	SCALE: NTS	PROJECTION	DRAWING NUMBER: ADC1011	REVISION: A1 / SHEET: 1/3

DATE	REV	ECO	REVISION	BY	CHK	EOR
4/1/14	A	N/A	INITAIL RELEASE	TAH	xxx	xxx
07/28/14	A1	N/A	Removed the optional mounting bracket from sheet 3	TAH	xxx	xxx

Class I, II, III, Div. 1 Groups A-G Hazardous Location
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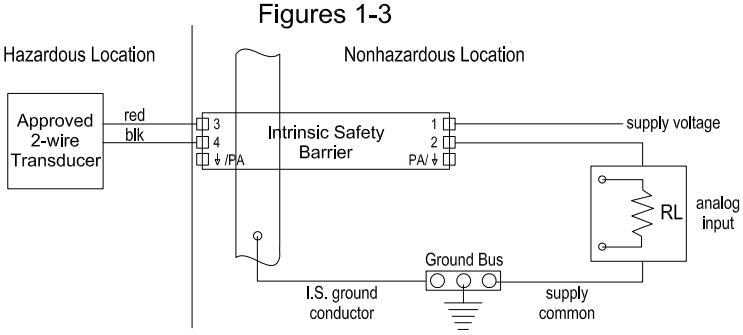

Figure 1. Return Lead Floating

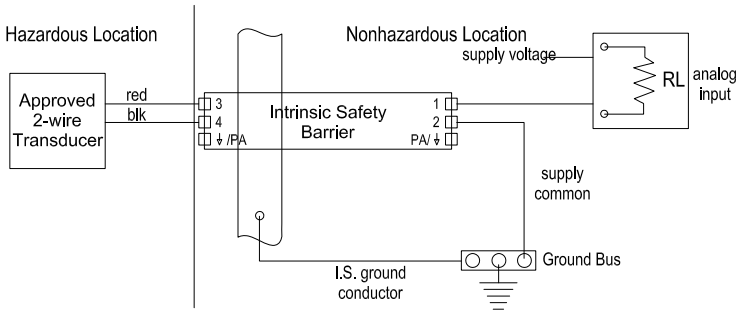

Figure 2. Return Lead Grounded

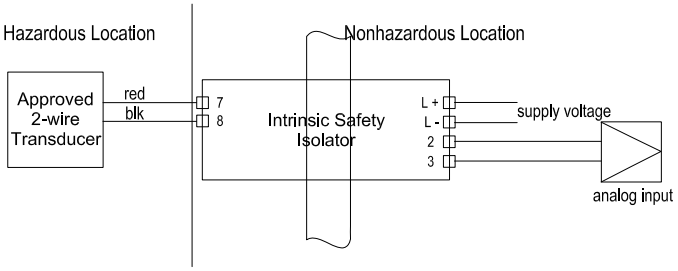

Figure 3. Field Circuit Isolated

Wiring diagram for 2-wire, 4-20mA output.

Class I, II, III, Div. 1 Groups C&D (only) Hazardous Location

→ Entity Parameters
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I_{max}= 186mA
C_i =0.064µF
L_i = 0
P_i = 1.3 W

WIRING DIAGRAMS SAME AS FIGURES 1,2 & 3

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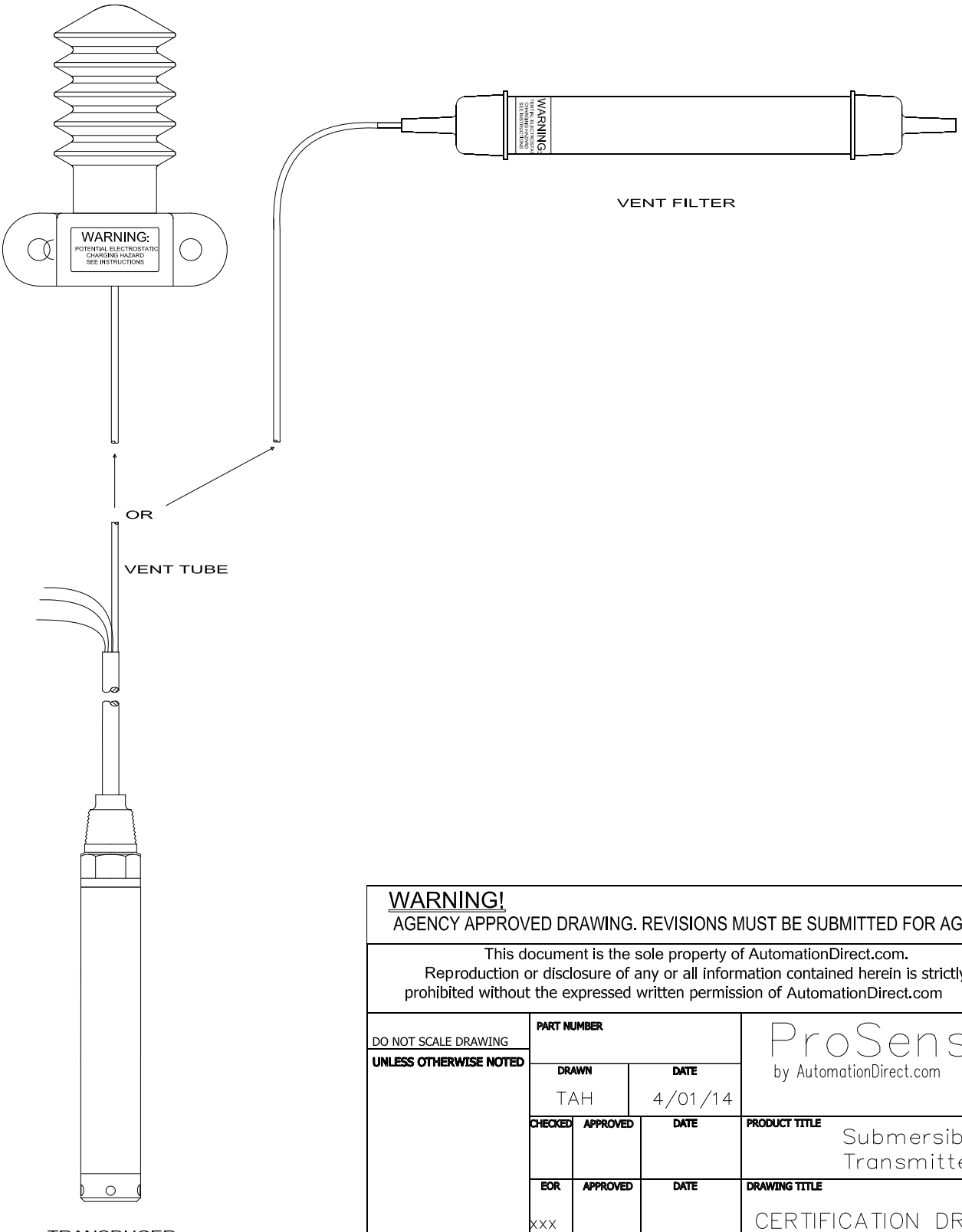
	EOR: xxx	APPROVED	DATE
	PRODUCT TITLE: Submersible Level Transmitters		
	DRAWING TITLE: CERTIFICATION DRAWING, UL		
MATERIAL	SCALE: NTS	PROJECTION	DRAWING NUMBER: ADC1011
	REVISION: A1	SHEET: 2/3	

DATE	REV	ECO	REVISION	BY	CHK	EOR
4/2/14	A	N/A	INITAIL RELEASE	TAH	xxx	xxx
07/28/14	A1	N/A	Removed the optional mounting bracket from sheet 3	TAH	xxx	xxx

TYPICAL MECHANICAL INSTALLATION



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MATERIAL	SCALE: NTS	PROJECTION	DRAWING NUMBER: ADC1011	REVISION: A1 / SHEET: 3/3

WARRANTY

In This Chapter...

Product Warranty

ProSense Submersible Level Transmitters carry a one-year warranty against defects in materials and workmanship.

If you have questions about the use of your transmitter contact our Technical Support Team at 1-800-633-0405.

***In the event a warranty claim is necessary Do Not Return Product. Please contact our Returns Team for instructions:**

Phone Number
(800) 633-0405
(770)-889-2858

Email:
ragroup@automationdirect.com