



Leader in
Level Measurement

Installation and Operating Instructions

Z-tron IV™
Point Level Control

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Z-tronIV-LM

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Z-tron IV™ Point Level Control



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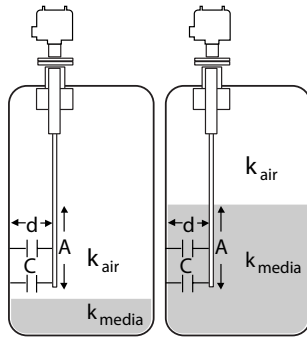
Section 1

Section 1: Introduction

These instructions are for the AMETEK Drexelbrook Z-tron IV™ Series Point Level Control.

The label on top of the electronic unit identifies the model number of the Z-tron IV level control.

1.1 System Description



$$C = \frac{kA}{d} \quad C \uparrow = \frac{k \uparrow A}{d}$$

Figure 1-1
Capacitance Probe
(Insulating Media)

Cote-Shield™ action is designed into all Z-tron IV level controls and enables the instrument to ignore the effect of buildup or material coating on the sensing element.

The electronic unit:

- Provides double-pole double-throw dry relay that changes state when material reaches a specific point on the sensor. The relay contacts may be used to operate alarms, solenoid valves, or other low power devices.
- Provides a 0-60 second time delay for agitated vessels.

The 700-series sensing element:

- Is mounted on the tank or in the process.
- Provides a change in radio frequency (RF) admittance indicating presence or absence of material.

1.2 Technology

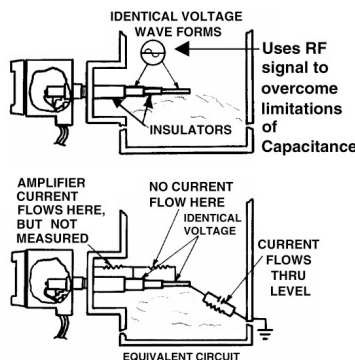


Figure 1-2
RF Admittance Probe
with Cote-Shield

In a simple capacitance probe type sensing element, when the level rises and material covers the probe, the capacitance within the circuit between the probe and the medium (conductive applications) or the probe and the vessel wall (insulating applications) increases. This is due to the dielectric constant (k) of the material, which causes a bridge misbalance. The signal is demodulated (rectified), amplified and the output is increased. There are drawbacks, however, especially when there is coating of the probe.

An RF Admittance level transmitter is the next generation. Although similar to the capacitance concept, The Z-tron employs a radio frequency signal and adds the Cote-Shield™ circuitry within the Electronics Unit.

This patented Cote-Shield™ circuitry is designed into Z-tron series and enables the instrument to ignore the effect of buildup or material coating on the sensing element. The sensing element is mounted in the vessel and provides a change in RF admittance indicating presence or absence of material.

The Cote-Shield™ element of the sensor prevents the transmission of RF current through the coating on the sensing element. The only path to ground available for the RF current is through the material being measured.

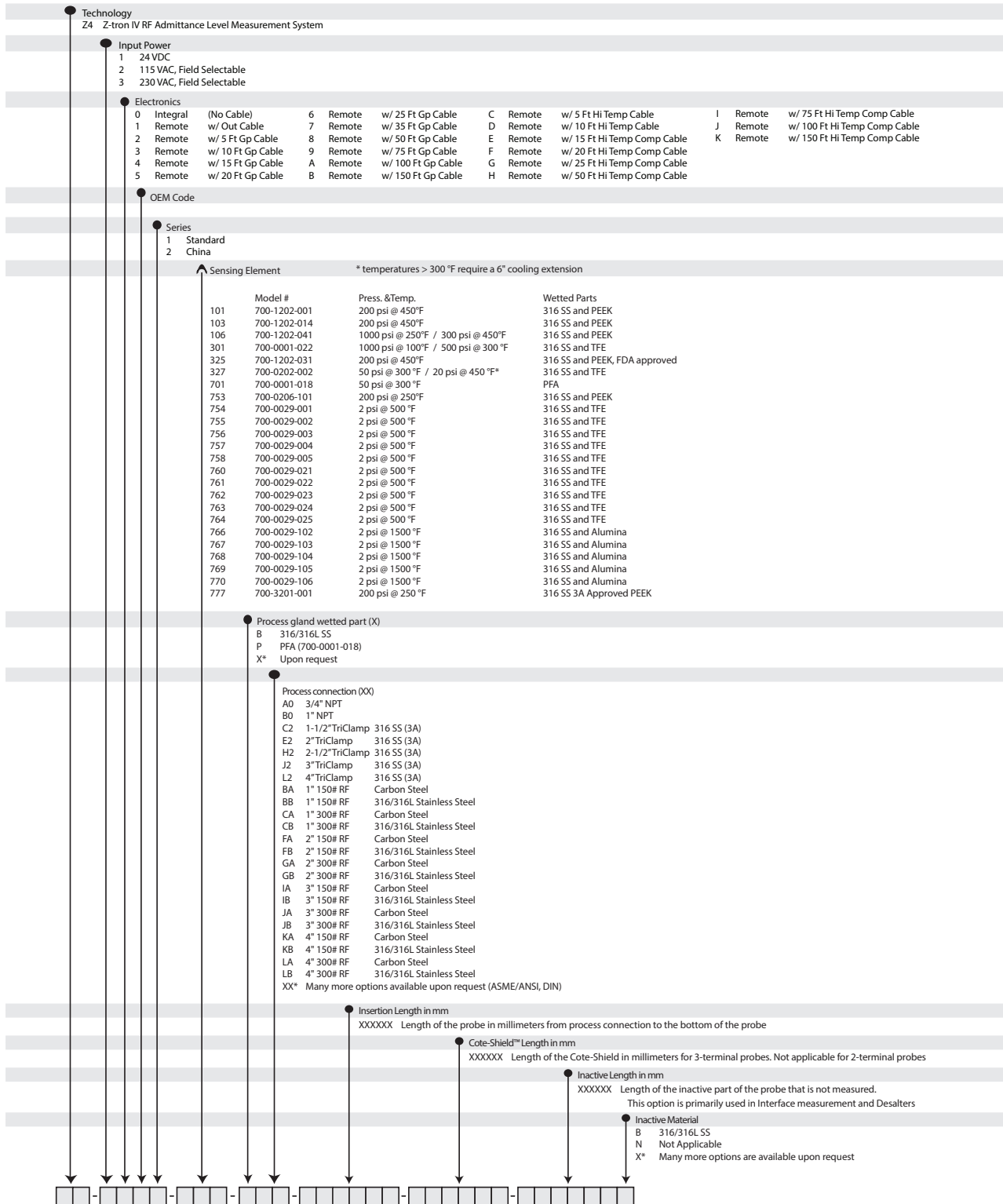
The result is an accurate measurement regardless of the amount of coating on the probe, making it by far the most versatile technology, good for very wide range conditions from cryogenics to high temperature, from vacuum to 10,000 psi pressure, and works with all types of materials.

1.3 Spare Parts

115/ 230 VAC Electric Unit
24 DC Electronic Unit

Part # - 385-0075-042
Part # - 385-0075-041

1.4 Model Number



* Consult Factory

Section 2: Installation

2.1 Unpacking

Carefully remove the contents of the shipping carton and check each item against the packing list before destroying any packing materials. If there is any shortage or damage, report it to the factory at 1 + 215-674-1234.

2.2 Mounting the Level Control

The Z-tron IV Level Control is available with the electronic unit and sensing element as a single integral assembly. Extended sensing element lengths and special mountings can be provided to fit specific applications.

- The Z-tron IV Level Control is designed for industrial applications, but it should be mounted in a location as free as possible from vibration, corrosive atmospheres, or any possibility of mechanical damage.
- For convenience when adjusting, place the electronic unit in a reasonably accessible location. Ambient temperature should be between -40°F and 145°F (-40°C to 63°C).
- It may be mounted either vertically or horizontally. Conduit runs must avoid moisture infiltration into the housing and conduit. See Figures 2-1.



Note: The 700-0001-018 and 700-0001-022 are designed for vertical mounting only

- Avoid mounting closer than 1 inch to any tank structure. Material bridging from structure to sensing element can cause false alarms. Close proximity to tank structure also increases the sensing element's standing capacitance.
- When installing flange-mounted sensing elements, keep mating surfaces and bolts free of paint and corrosion to ensure proper electrical contact with vessel. Avoid using excessive amounts of TFE tape when installing threaded sensing elements.
- When installing sensing element with threaded connection, place the wrench on the flats closest to the mounting threads, see fig 2.2. For sensing elements without wrench flats a pipe wrench can be used. Do not turn the housing or conduit.
- The recommended minimum Cote Shield length is to extend 2" into the vessel past the anticipated wall build-up. Consult factory before mounting the instrument with shorter Cote Shield lengths
- Protect the insulation on the sensing element against cuts and scrapes during installation.

Figure 2-3 provides typical mounting dimensions.

2.2 Mounting the Level Control (continued)

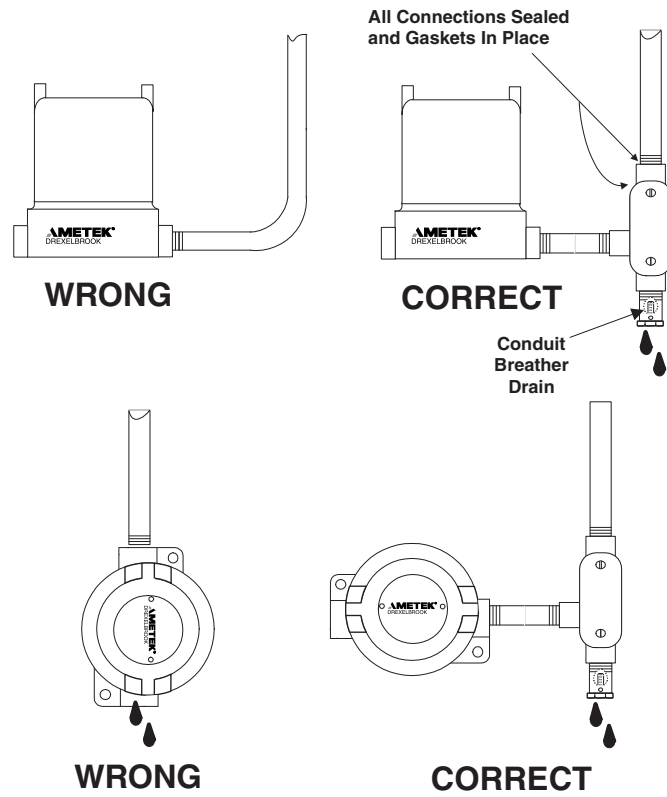


Figure 2-1
Z-tron IV Level Control Mounting Recommendations

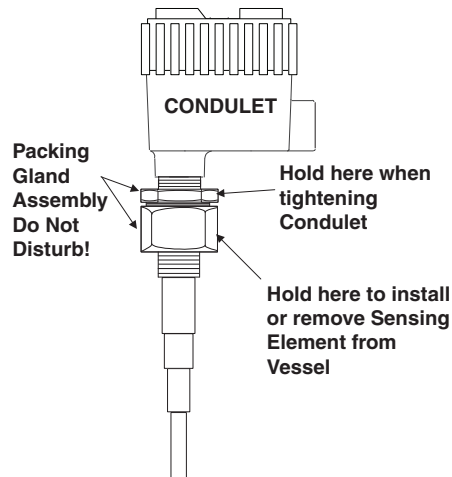
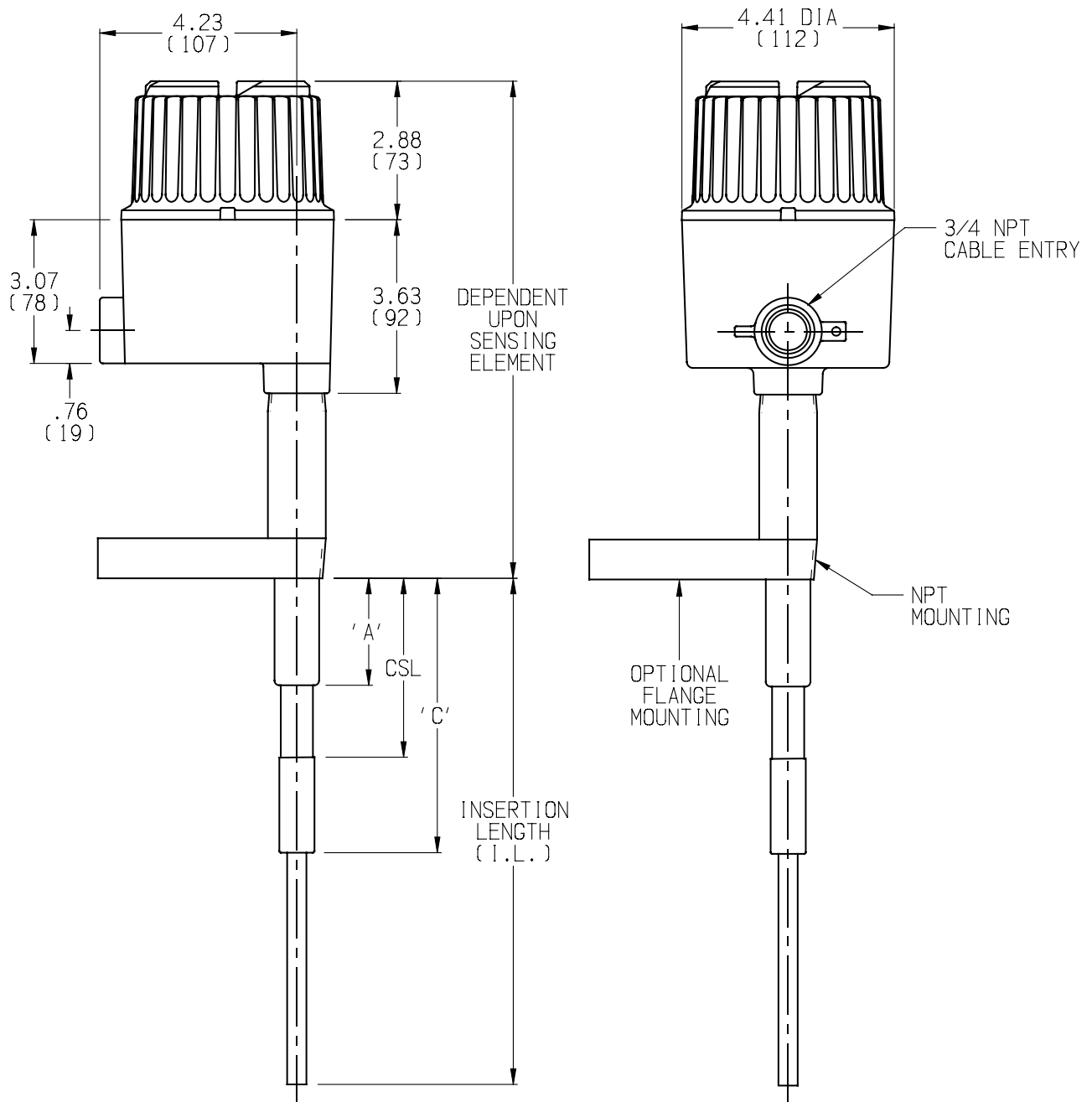


Figure 2-2
Z-tron IV Level Control Installation Guidelines

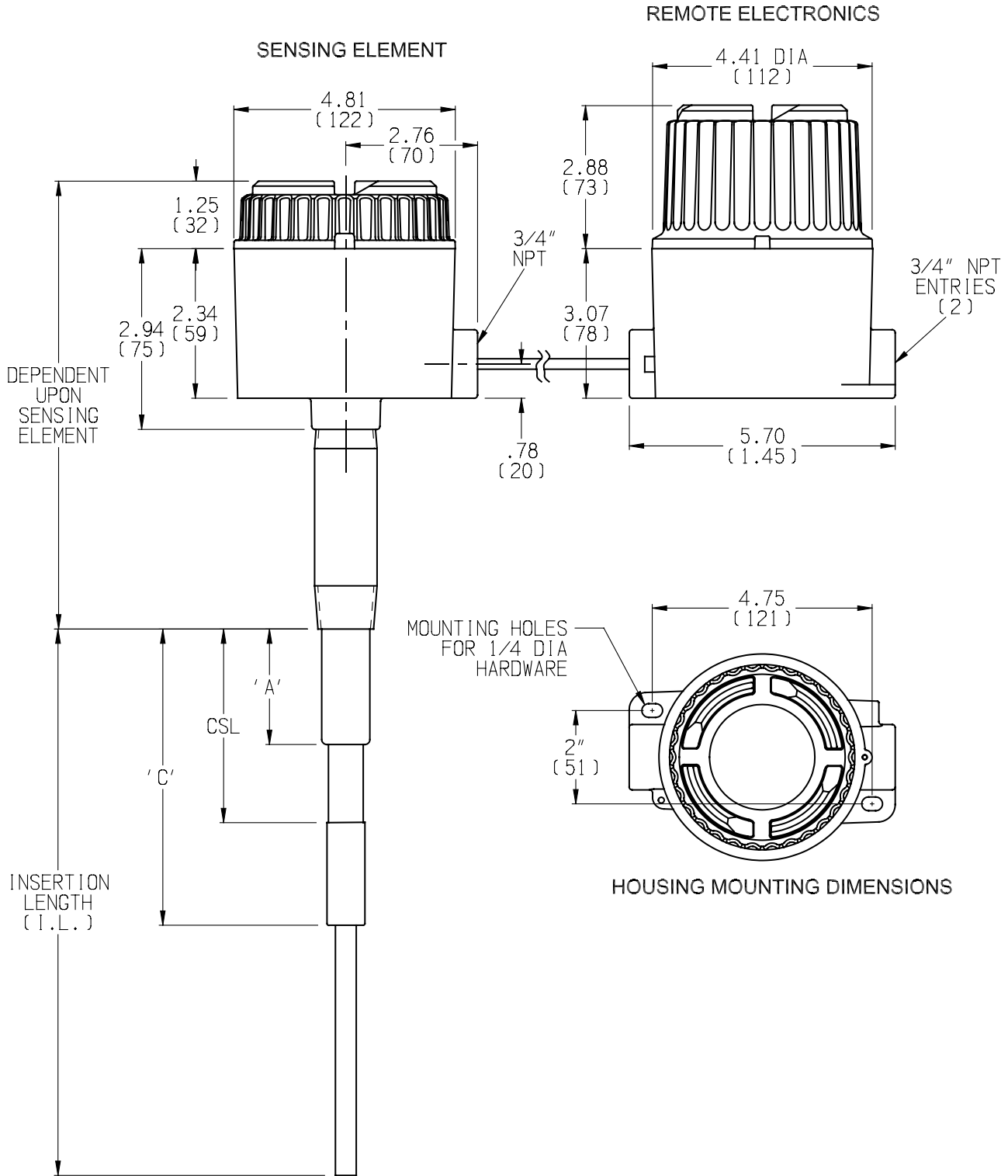
2.3 Integral Mounting Dimensions



DIMENSIONS ARE IN INCHES (mm)

Figure 2-3-1
Mounting Dimensions

2.4 Remote Mounting Dimensions



DIMENSIONS ARE IN INCHES (mm)

Figure 2-3-2
Mounting Dimensions

2.5 3A Probe Mounting Dimensions

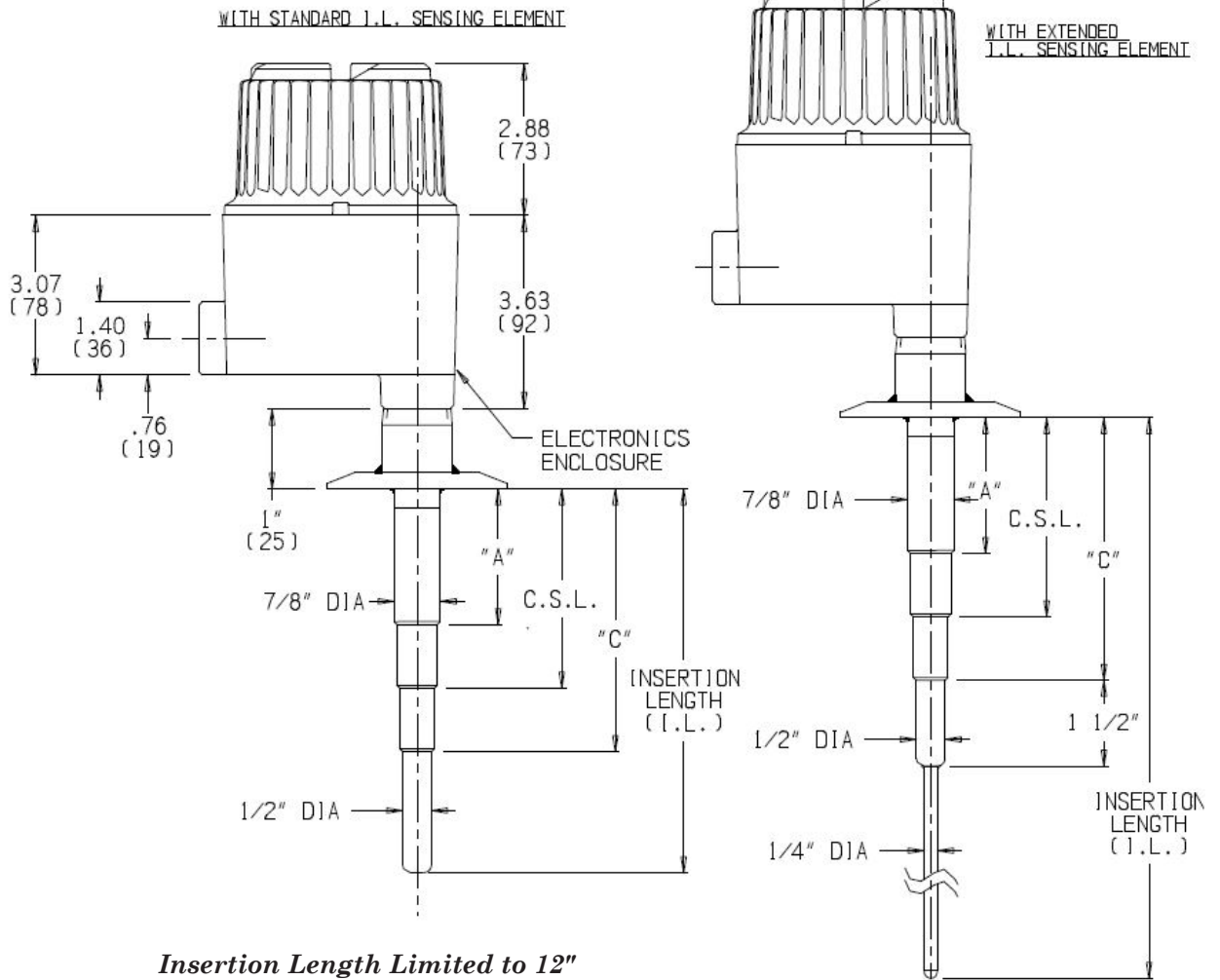


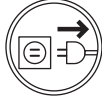
Figure 2-3-3
3A Mounting Dimensions

2.6 Power Wiring



CAUTION

Do not make/break any electrical connections without first disconnecting electrical power at the source.



Ensure that wiring, electrical fittings and conduit connections conform to the electrical codes for the specific location.

The Z-tron IV level control is a general purpose device and is not agency approved for use in hazardous locations. If agency approval is required, contact your local AMETEK Drexelbrook representative or call 1-215-674-1234.

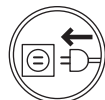
Refer to Figures 2-4-1 and 2-4-2 for the appropriate power wiring and use the following procedure to wire the Z-tron IV level control:



1. Ensure that all power to the wiring is off.
2. Remove the cover.
3. The power connections are made to terminals 1, 2, and 3 on the electronic chassis, using 12 gauge wire (max.).
4. **115 / 230 VAC Only** (Input voltage is field selectable)
 - a. Use jumpers on side of electronic chassis to select input voltage.
 - b. Input voltage jumper selection must match input voltage or electronic chassis may be damaged.
5. The alarm relays are wired as shown in Figure 2-5.
6. Review Checklist:
 - a. Wiring correct.
 - b. Input voltage matches instrument label and jumper selection.
 - c. Proper output connections.
 - d. Use 12 gauge wire max.
7. Replace the cover prior to restoring power.



Be sure the power wiring and voltage are correct. Improper wiring may cause permanent damage, personal injury, and void the factory warranty!



8. Apply power.

2.6 Power Wiring (continued)

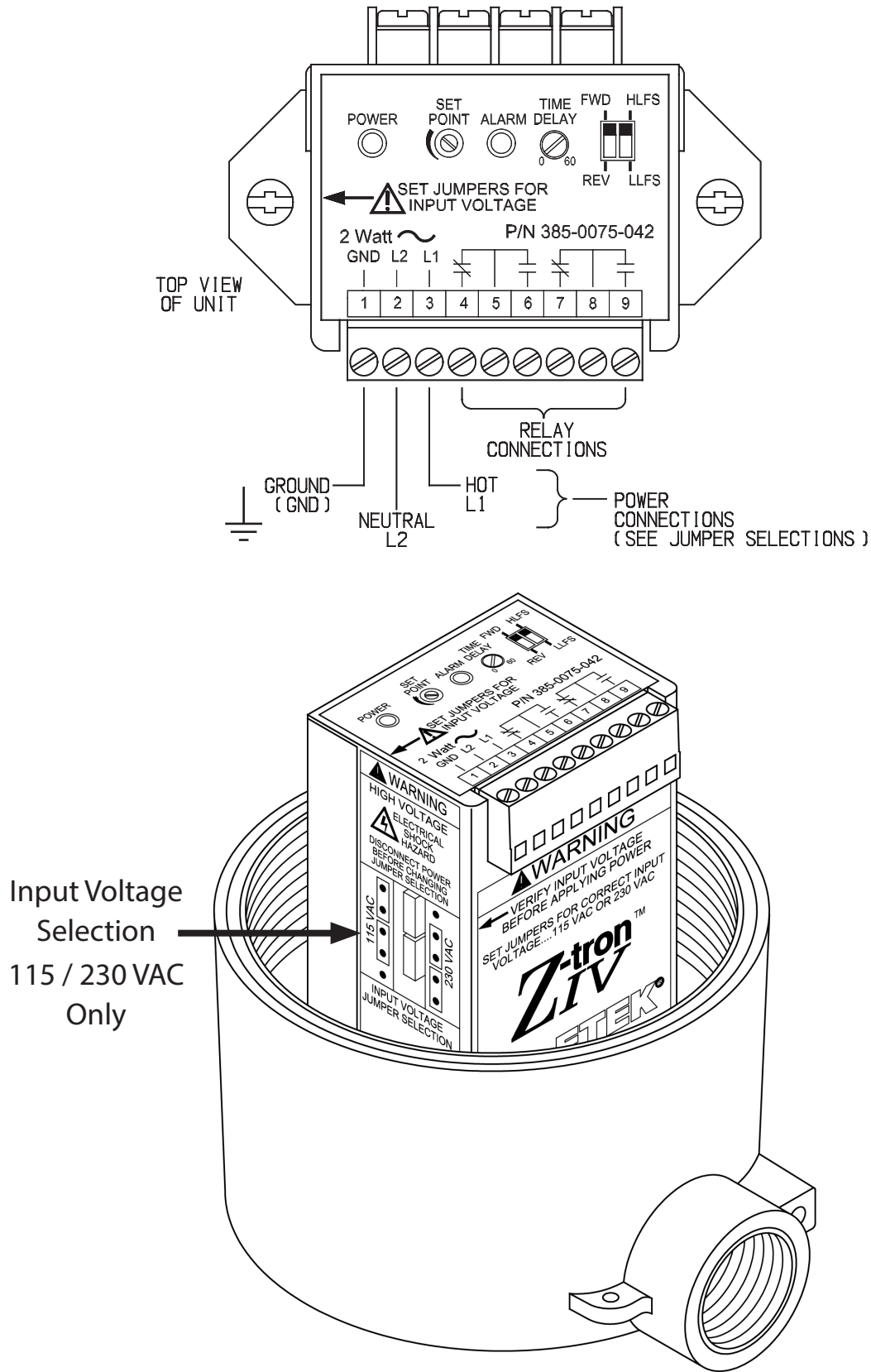


Figure 2-4-1
Power Wiring

2.6 Power Wiring (continued)

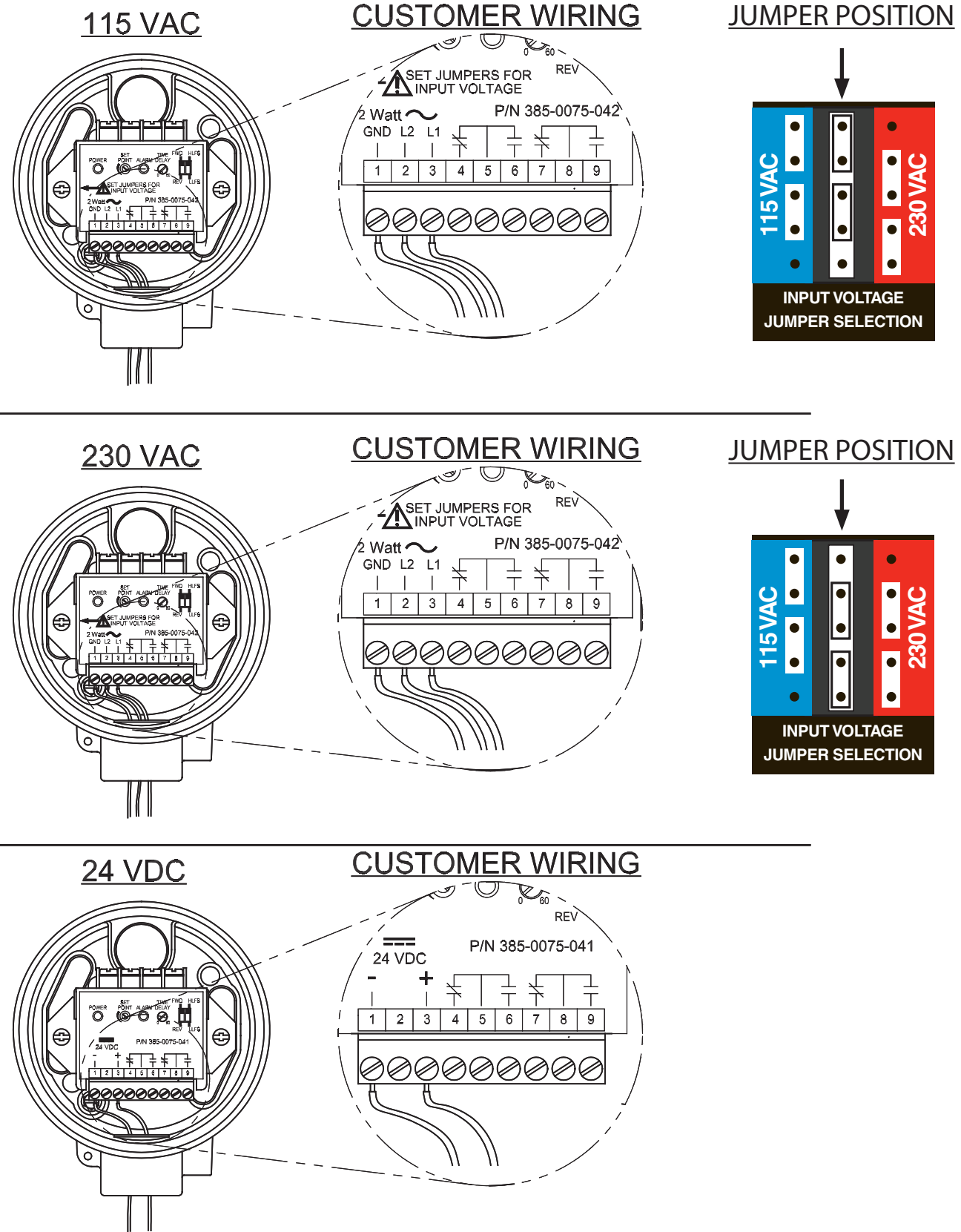
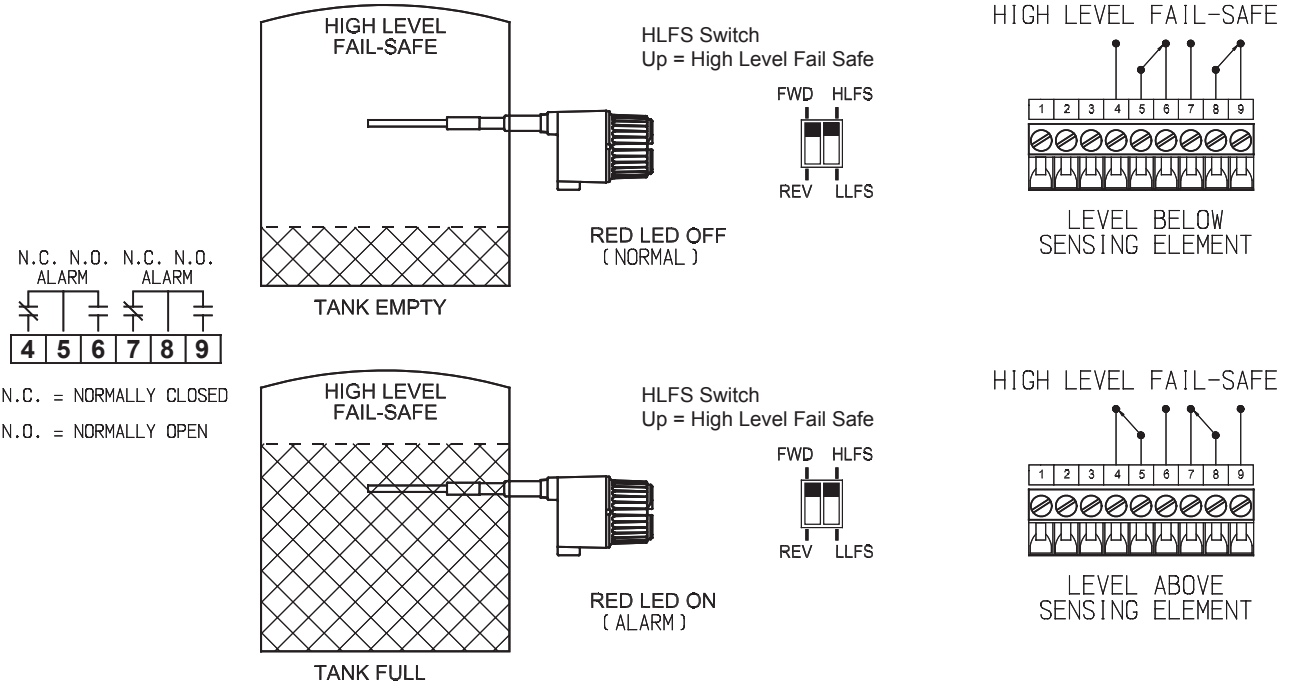


Figure 2-4-2
Power Wiring

2.7 Relay Wiring

Refer to Figure 2-5 for the relay contact wiring. The Z-tron IV relay has double-pole, double-throw (DPDT) dry contacts. The relay serves as a switch and does not provide the power to operate an annunciator or other equipment. All relay connections are made to the terminal strip on the electronic unit. Refer to Figure 3-1 for the Fail Safe Selector Switch location.

High Level Fail Safe



Low Level Fail Safe

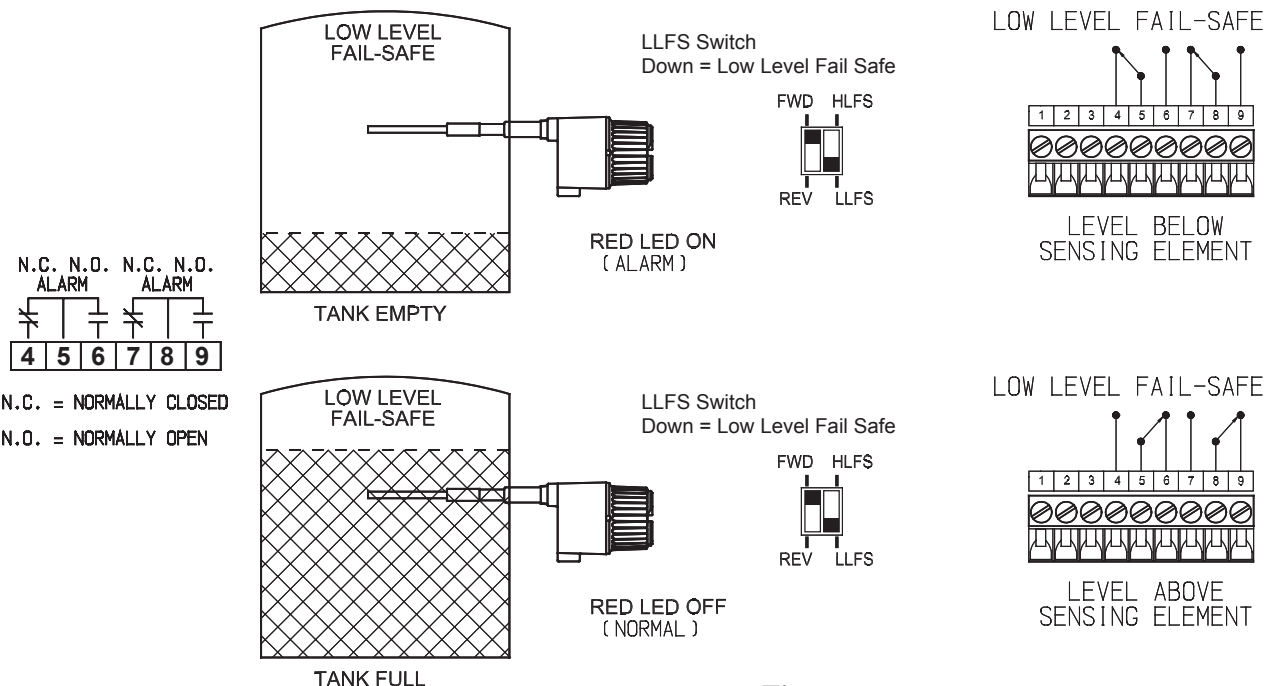


Figure 2-5
Relay Wiring

2.8 Wiring the Sensing Element (Remote)

If the Ztron electronic unit is mounted remotely from the sensing element, the cable connections from the sensing element to the electronic unit are made to the individual terminals on the side opposite the terminal strips.

See **Figure 2.6 / 2.7.**



NOTE

It is important that the sensing element cable is mechanically separated from the power wiring.

When installing remote-mount electronics, you must use the Drexelbrook supplied coaxial cable. The cable can be a maximum of 150 feet (46 meters). Termination kits are available to shorten the cable if necessary.

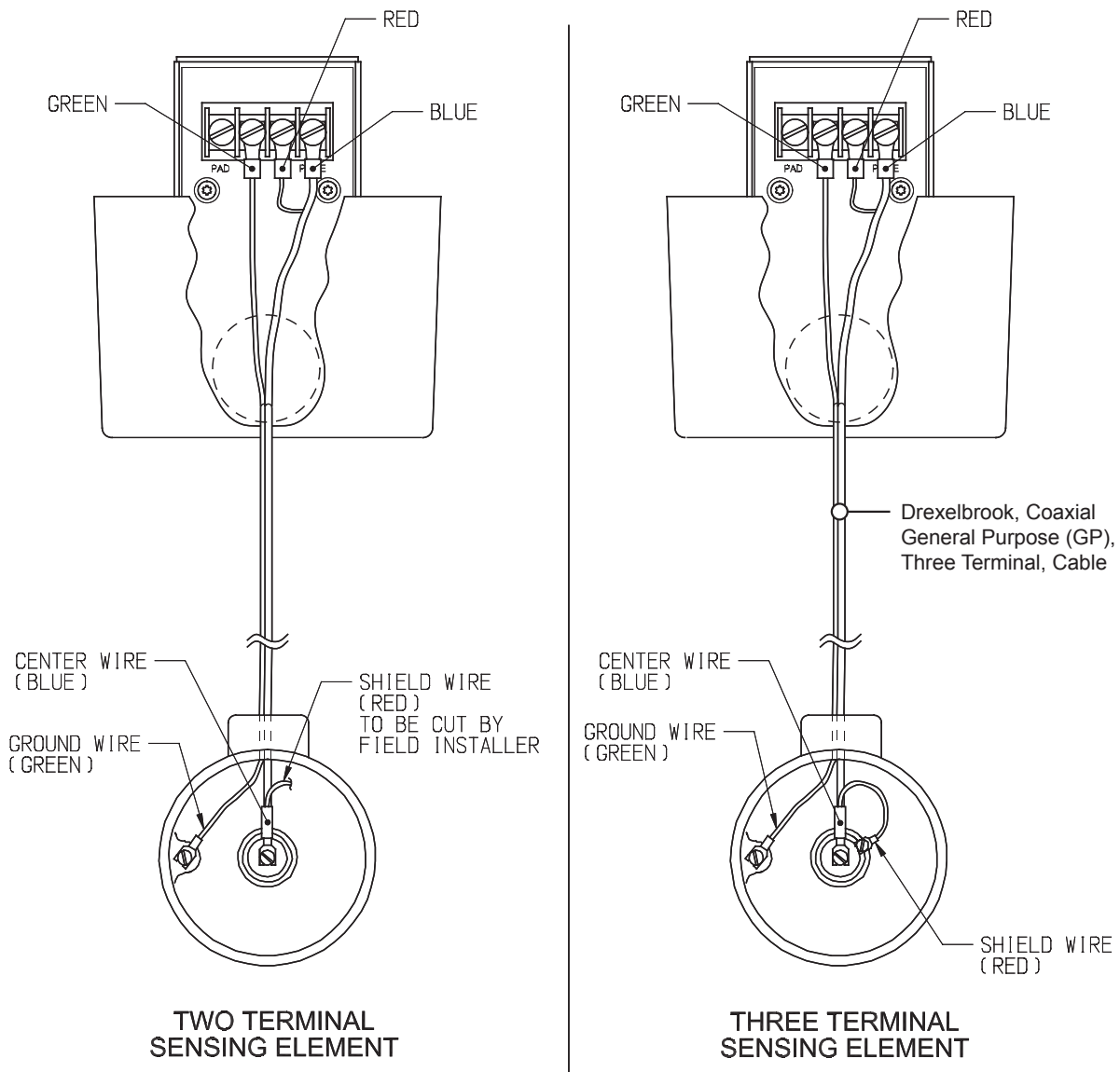


Figure 2-6
Wiring the Remote Sensing Element

2.9 Wiring the Sensing Element (Integral)

NOTE

It is important that the sensing element cable is Mechanically separated from the power wiring.

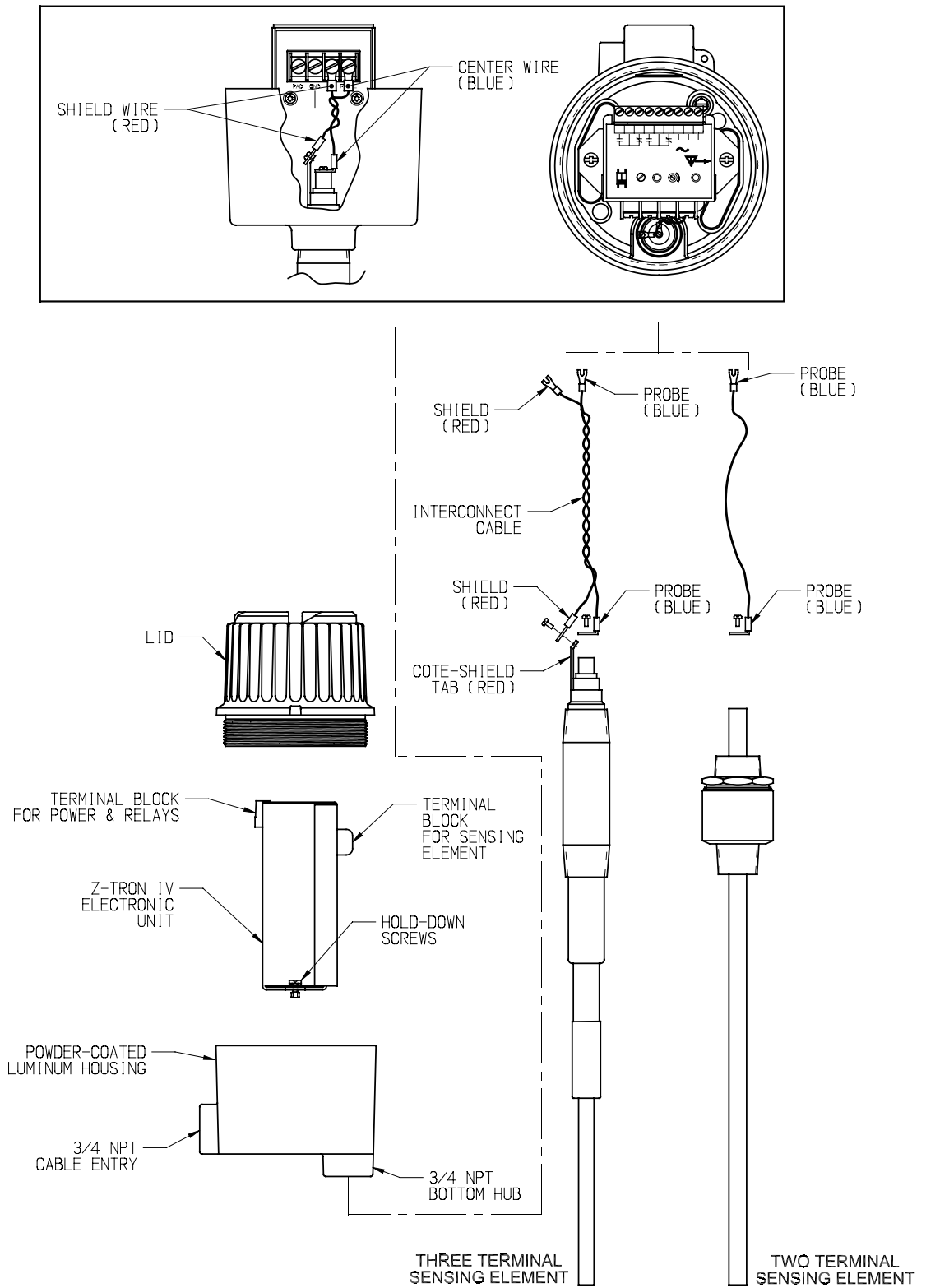


Figure 2-7
Wiring the Integral Sensing Element

Section 3: Operation

This section describes the operating switches of the Z-tron IV level control. Remove the dome lid and use a small screwdriver to set the operating controls.

The green LED (on) indicates power is applied to the unit.

3.1 Setpoint Control

There is a single operating point adjustment used to control the level at which the relay operates. See Figure 3-1.



This adjustment is an 20-turn potentiometer and does not have a mechanical stop. When in High Level Fail Safe condition, if the red light (LED) is OFF - turn CCW to find SP (relay changes state w/click & light turns ON)... turn CW if red light (LED) is initially ON.

In Low Level Fail Safe turn the setpoint adjustment in the opposite direction.

- Turning the setpoint adjustment clockwise (CW) raises the level at which the relay operates.
- Turning the setpoint counterclockwise (CCW) lowers the level at which the relay operates.
- The red LED (on) indicates that the relay is de-energized and the unit is in the alarm condition.

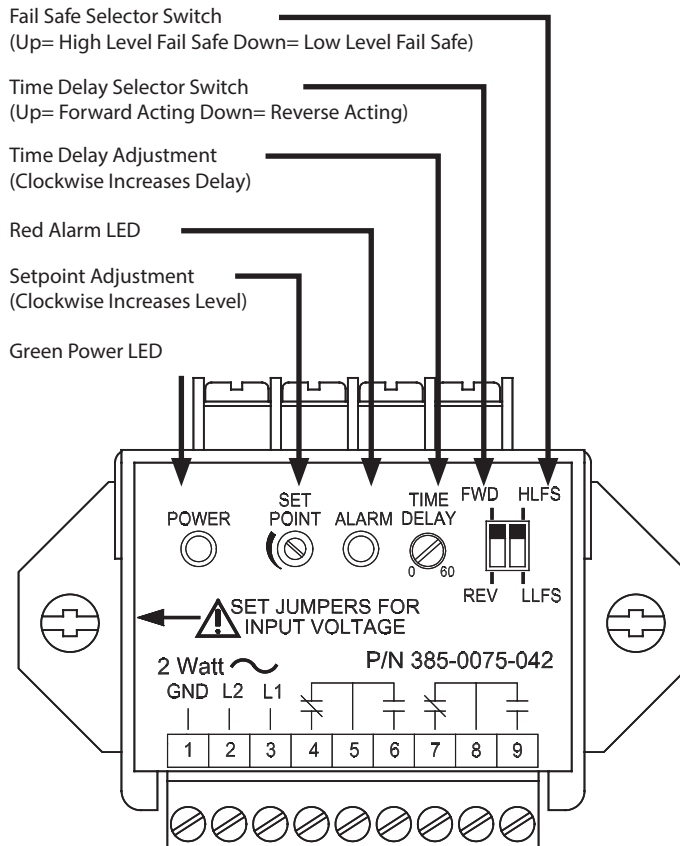


Figure 3-1
Z-tron IV Operating Controls and LED

3.2 Time Delay Control

The time delay adjustment is located on top of the instrument, as shown in Figure 3-1. It is used to help stop a repeated relay output due to agitation or waves in the vessel.



CAUTION:

THIS adjustment is a 270° (¾ turn) potentiometer. Do not turn it beyond its mechanical stops or damage to unit may occur.

The unit is shipped with the Time Delay set to zero (0) seconds. Using a small screwdriver, turn the adjustment clockwise to set anywhere from 0 to 60 seconds.

If the unit is waiting for a change in its alarm state, the alarm LED is blinking and the blinking period is equal to one second. One second period helps to accurately adjust time delay potentiometer to desirable value without necessity of using a stopwatch.

When the alarm LED is blinking, it uses one of two possible blinking modes. See Time Delay Action for definition of modes.

3.3 Time Delay Action

Time delay action describes whether the relay contacts are delayed from going into the alarm state or recovering from an alarm state.

- FWD: Forward acting delays the system from coming OUT of alarm. Long blinking mode, 0.9 second on and 0.1 second off.
- REV: Reverse acting delays the system from going INTO alarm. Short blinking mode, 0.1 second on and 0.9 second off
- The instrument is supplied with the time delay action set in the forward mode position.
- The time delay action may be selected in the field using the left slide switch located on the top of the instrument. See Figure 3-1.

Selecting Time Delay with Slide Switch:

Forward Acting - Left Switch UP.

Reverse Acting - Left Switch Down.

3.4 Failsafe

Failsafe describes the level condition which causes the output relay to de-energize, and determines the condition of the relay upon loss of power or upon the failure of most components.

- The failsafe mode may be selected in the field by changing the position of the right slide switch located on the top of the instrument. See Figure 3-1.
- High Level Failsafe (HLFS) means the relay will de-energize when level is high, indicating high level upon loss of power. (N.O. contacts open/N.C. contacts closed).
- Low Level Failsafe (LLFS) means the relay will de-energize when level is low, indicating low level upon loss of power. (N.O. contacts open/N.C. contacts closed).
- The instrument is supplied in the failsafe mode that is requested when the order is placed. If none specified, it will be shipped as High Level Failsafe (HLFS).

Selecting Failsafe with the Right Slide Switch:

High Level Failsafe (HLFS) - Right Switch is up.

Low Level Failsafe (LLFS) - Right Switch is down.

3.5 Start-up



Be sure the power wiring and voltage are correct.

Improper wiring may cause permanent damage, personal injury, and void the factory warranty!

See Section 2.6.

Section 4

Section 4: Calibration

This section contains the calibration information for the Z-tron IV Level Control.

CAUTION:



Do not open enclosure cover without verifying area is non-hazardous or make/break any electrical connections without first disconnecting electrical power at the source.

Ensure that wiring, electrical fittings and conduit connections conform to the electrical codes for the specific location.

The Z-tron IV level control is a general purpose device and is not agency approved for use in hazardous locations. If agency approval is required, contact your local AMETEK Drexelbrook representative or call 215-674-1234

4.1 Calibration in Conducting Material



700-0001-002 & 700-0001-018

Set to HLFS

Raise level to desired alarm point (1" minimum probe covered). Turn setpoint adjustment counterclockwise until red LED turns on. Set failsafe as required.

All Other Sensing Elements

All Z-tron IV controls are factory set to switch in conductive materials [setpoint adjustment is set to full clockwise (CW) position]. No calibration adjustment is necessary.

If this instrument had been previously adjusted for use in a insulating materials, and is now intended for use in a conducting material, use a small screwdriver to turn the setpoint adjustment to the full clockwise (CW) position. No other adjustment is necessary.

4.2 Calibration in Insulating Material [Horizontal Mount]

The following procedure is for high level fail-safe. If the unit is set for low level fail-safe LED operation will be opposite:

- 1) Quick Calibration (Either Vertical or Horizontal):
 - a) Be sure the material level is well below the sensing element. See Figure 4-1.
 - b) Turn the setpoint adjustment counterclockwise (CCW) until the red LED is on (red LED on indicates that the relay is de-energized and the unit is in the alarm condition).
 - c) Turn setpoint adjustment slowly clockwise (CW) until the relay just operates. (red LED off).
 - d) Turn setpoint adjustment an additional $\frac{1}{2}$ turn CW. Red LED will remain off
 - e) Calibration is complete

- 2) Optimal Calibration:
 - a) Be sure the material level is well below the sensing element. See Figure 4-1.
 - b) Turn the setpoint adjustment counterclockwise (CCW) until the red LED is on (red LED on indicates that the relay is de-energized and the unit is in the alarm condition).
 - c) Turn setpoint adjustment slowly clockwise (CW) until the relay just operates. (red LED off).
 - d) Increase the material level until it is well above the sensing element. See Figure 4-2. (LED changes state).
 - e) Note the position of the screwdriver.
 - f) Counting the number of turns, turn the setpoint adjustment slowly clockwise (CW) until the relay once again just operates.



If less than one turn of the adjustment was observed between the sensing element covered and uncovered, the sensor is not generating enough signal. Consult the factory for further options.

- g) Turn the adjustment back counterclockwise (CCW) one half the number of turns that were counted.
- h) Record number of turns and save for future calibration reference
- i) Calibration is now complete.

4.3 Calibration in Insulating Material [Vertical Mount]

The following procedure is for high level fail-safe. If the unit is set for low level fail-safe LED operation will be opposite:

- 1) Be sure the material level is well below the sensing element. See Figure 4-1.
- 2) Turn the setpoint adjustment counterclockwise (CCW) until the red LED is on (red LED on indicates that the relay is de-energized and the unit is in the alarm condition).
- 3) Turn setpoint adjustment slowly clockwise (CW) until the relay just operates. (red LED off).
- 4) Raise the level to a point on the active section of the sensing element where control is desired. Red LED should be on. See Figure 4-3.
- 5) Counting the number of turns, turn the setpoint adjustment clockwise (CW) until the red LED just turns off.
- 6) If less than 1 turn is required consult factory.
- 7) Turn setpoint adjustment slowly counterclockwise (CCW) until the relay just operates. (red LED on).
- 8) Calibration is complete.



If dielectric constant or conductivity of material changes, point of operation may change. Consult factory.

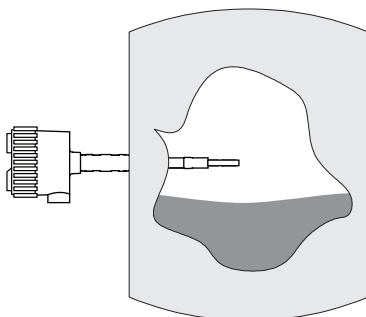


Figure 4-1
Level Below Horizontal Sensing Element

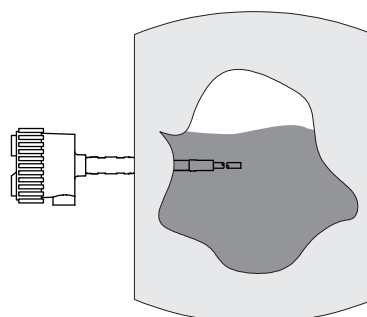


Figure 4-2
Level Above Horizontal Sensing Element

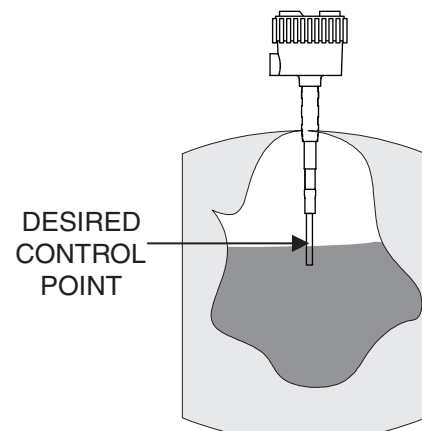


Figure 4-3
Level Covering Vertical Sensing Element

Section 5

Section 5: Troubleshooting

5.1 Introduction

The Z-tron IV Level Control is a solid-state device with no moving parts other than its relays, and requires no maintenance or adjustments. The units are designed to give years of unattended service.

A spare electronic chassis is recommended for every 10 units so that, in case of a failed unit, a critical application will not be delayed while the unit is returned to the factory for repair.

Use the following troubleshooting procedures to check out the Z-tron IV Level Control. If attempts to locate the difficulty fail, notify your local Drexelbrook representative, or call the factory direct at +1 215-674-1234.

5.2 Testing Electronic Unit

It is recommended to begin with Electronic Unit:

1. Verify that green LED is illuminated and the proper voltage is applied to the electronic unit.
2. Change fail-safe selector switch (Fig 3-1). If red LED and relay do not change states, electronic unit has failed.
3. On the back of the electronics unit (side opposite power connections) remove the probe wires from under the blue & red screws.
4. With the instrument in High Level Fail Safe turn the setpoint adjustment counterclockwise (CCW) until the red LED is on (red LED on indicates that the relay is deenergized and the unit is in the alarm condition).
5. Turn setpoint adjustment slowly clockwise (CW) until the relay just operates. (red LED off).
6. Rotate setpoint adjustment back and forth about this point, observing travel of screwdriver between relay pull-in and relay drop-out. If properly operating, screwdriver should travel less than $\frac{1}{4}$ turn to operate the relay. If not, electric unit has failed.

5.4 Testing Relay Circuits

5.3 Testing Sensing Element

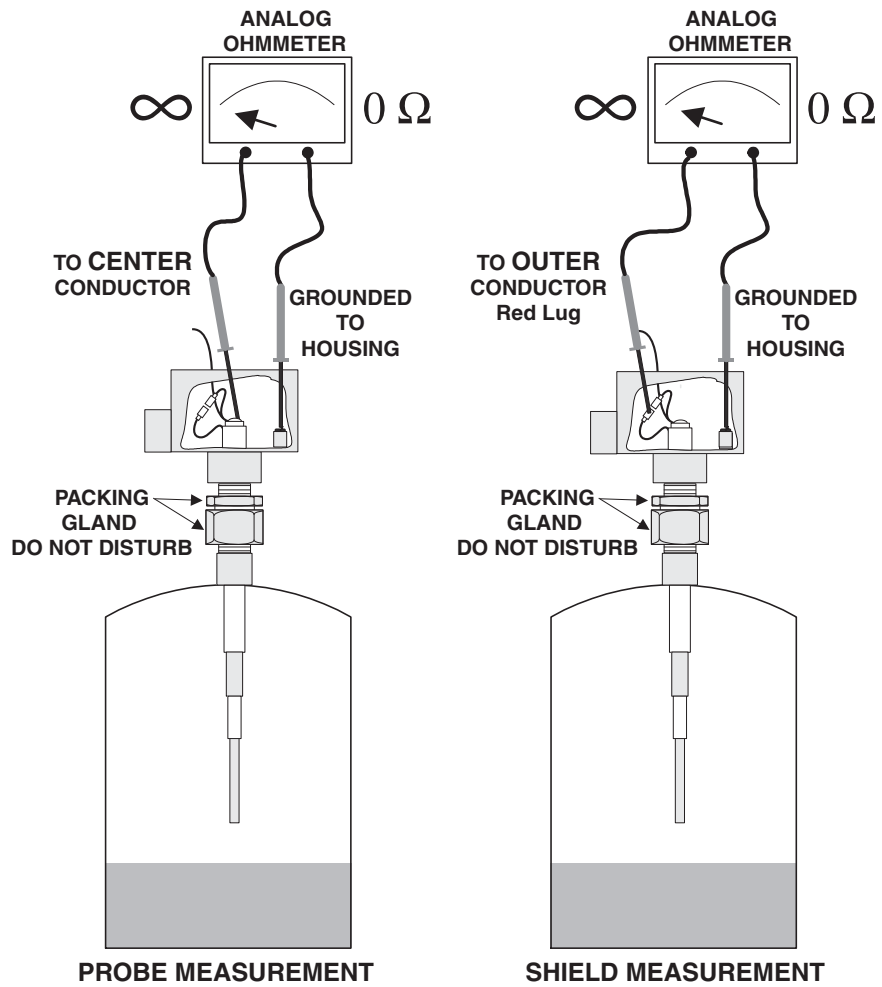
With level below the sensing element:

1. Disconnect remote cable, if applicable.
2. Use an analog ohmmeter¹ that is set to the R x 1K ohm scale. Measure the resistances between each pair of sensing element connections. See Figure 5-1. Record values in Table.
 - a. If the process material is conductive, it is normal to measure some resistance between sensing element connections. The lowest permissible resistance values are:

Center Conductor to Housing	1500 ohms.
Center Conductor to Cote Shield	750 ohms.
Cote Shield to Housing	750 ohms.
3. Clean sensing element and repeat resistance measurements with the sensing element external to the vessel.
 - a. A clean sensing element should measure an open circuit on all resistance tests.
 - b. If resistance values increase to an open circuit the resistance was installation or coating related. The most common causes are:
 - i. Cote Shield element does not extend sufficiently into the vessel. Verify the CoteShield element extends at least 2" into the vessel and past wall build-up.
 - ii. Extremely conductive coating on the sensing element. This may require changing the sensing element or electronics. Contact the factory for recommendations.
 - iii. Sensing element is touching vessel. A resistance reading of less than 10 ohms to ground (sensing element housing or tank) is usually due to a metal-to-metal short circuit. Verify that the sensing element is not touching any vessel structure.
 - c. If the sensing element still shows resistance between terminals of less than 10K ohms, it is possible that moisture is present internal to the sensing element. It may be possible to dry the sensing element until the resistance increases to a value in excess of 10K ohms. However this is an indication the integrity of the sensing element has been compromised. Contact the factory for recommendations.

¹A digital ohmmeter will often produce a resistance measurement that is higher than the actual value.

5.3 Testing Sensing Element (continued)



Sensing Element in Vessel		
Center Conductor to Housing	_____	Ohms
Center Conductor to Cote Shield	_____	Ohms
Cote Shield to Housing	_____	Ohms
Sensing Element Cleaned		
Center Conductor to Housing	_____	Ohms
Center Conductor to Cote Shield	_____	Ohms
Cote Shield to Housing	_____	Ohms

*Figure 5-1
 Checking the Sensing Element
 Center = Probe
 Outer = Shield
 Housing = Ground*

The relay circuits consist of a double-pole double-throw relay brought out to a terminal strip. Figure 5-2 shows the relay when the unit is in an alarm condition

Using an ohmmeter, perform the following steps to check out the relay circuits:

1. Apply power to the unit
2. Connect ohmmeter as shown in Figure 5-3.
3. Change fail-safe switch position. Ref Figure 3-1
4. Relay should change state. Ohmmeter should change from measuring an open circuit to short circuit or from measuring a short circuit to measuring an open circuit. An audible click may be observed if the background noise is low.
5. Repeat until all 4 pairs have been checked.
6. If any pair does not show a change in resistance the unit has failed.

5.6 Possible Problems and Causes

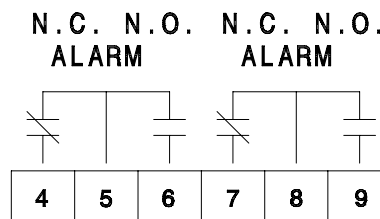


Figure 5-2
Relay Circuit Operation

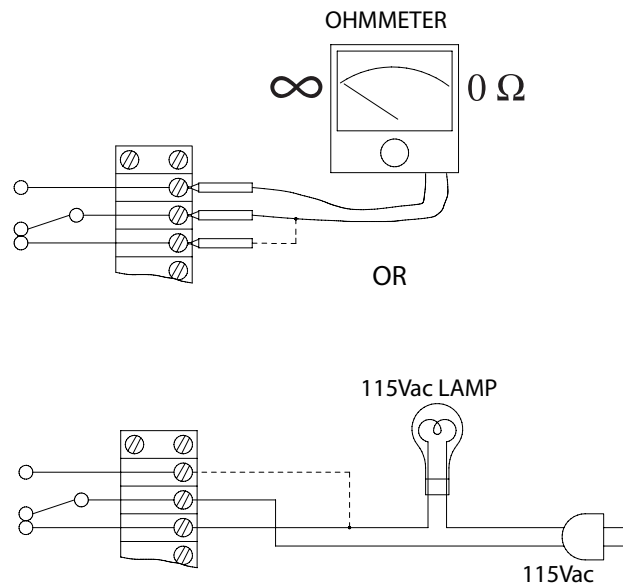


Figure 5-3
Relay Circuit Troubleshooting

5.5 Testing Remote Cable

1. Disconnect remote cable from electronic unit and sensing element.
2. Using an ohmmeter measure the resistances as shown in Figure 5.4
 - A. Check for shorts.
 - i. Connect ohmmeter to cable center wire and ground wire. Measure resistance as shown.
 - ii. Move ohmmeter leads and repeat for all measurements shown.
 - iii. If resistance is less than 100 k-ohms cable has failed
 - B. Check for continuity.
 - i. Short center wire to ground wire and measure resistance as shown. Should be close to 0 ohms
 - ii. Short center wire to shield and repeat.
 - iii. If resistance is greater than 10 ohms cable has failed

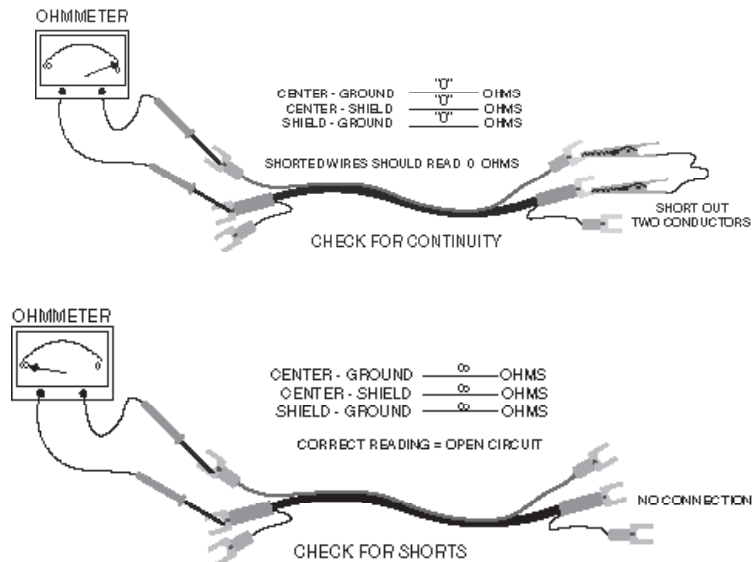


Figure 5-4
Testing Remote Cable

5.7 Factory Assistance

Problem	Possible Cause	Solution
1. Instrument indicates alarm at all times.	<ul style="list-style-type: none"> a. Severe coating build on sensing element (HLFS). b. Sensing element not “seeing” material (LLFS) due to fill angle. c. Sensing element cable damaged d. Defect in sensing element. e. Loss of power. f. Improper relay wiring. g. Improper calibration. h. Electronic unit malfunction. i. Shorted sensor. j. Water in housing or conduit. 	<ul style="list-style-type: none"> a. Need longer Cote-Shield. Consult factory. b. Need longer insertion length. Consult factory. c. See Section 5.3. d. See Section 5.3. e. Check power wiring. See Figure 2-4. f. See Section 2.5. g. See Section 4. h. See Section 5.2. i. See Section 5.3. j. Consult factory.
2. Instrument never indicates alarm.	<ul style="list-style-type: none"> a. Severe coating build-up on sensing element (LLFS). b. Sensing element not “seeing” material (HLFS) due to fill angle. c. Improper wiring. d. Improper calibration. e. Electronic unit malfunction. 	<ul style="list-style-type: none"> a. Need longer Cote-Shield. Consult factory. b. Need longer insertion length. Consult factory. c. See Section 2. d. See Section 4. e. See Section 5.2.
3. Instrument can't be calibrated.	<ul style="list-style-type: none"> a. Improper wiring. b. Insufficient signal from sensing element. c. Setpoint is beyond the tuning range of the electronics. d. Electronic unit malfunction e. Sensor covered with conducting material. 	<ul style="list-style-type: none"> a. See Section 2. b. Need longer insertion length. Consult factory. c. Consult factory. d. See Section 5.2. e. Calibrate with material below the sensor
4. Instrument gives a false alarm.	<ul style="list-style-type: none"> a. Improper calibration. b. Loose wiring. c. Electronic unit malfunction. d. Time delay required. e. Intermittent short of sensor. 	<ul style="list-style-type: none"> a. See Section 4. b. See Section 2. c. See Section 5.2. d. Consult factory. e. See Section 5.3.
5. Instrument operates intermittently.	<ul style="list-style-type: none"> a. Improper calibration. b. Loose wiring. c. Electronic unit malfunction. d. Dielectric (k) of material is too low. 	<ul style="list-style-type: none"> a. See Section 4. b. See Section 2. c. See Section 5.2. d. Need high sensitivity unit. Consult factory.

AMETEK Drexelbrook can answer any questions about The Z-tron IV series instrument. Call Customer Service at +1 215 674-1234.

If you require assistance and attempts to locate the problem have failed:

Contact your local Drexelbrook representative,

Telephone the Service department:

- +1 215 674-1234



FAX: Service Department + 215-443-5117

E-Mail: drexelbrook.service@ametek.com

Please provide the following information:

- Instrument Model Number
- Sensing Element Model Number and Length
- Original Purchase Order Number
- Material being measured
- Temperature
- Pressure
- Agitation
- Brief description of the problem
- Checkout procedures that have been performed and the results

5.8 Field Service

Trained Field Service Engineers are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Contact the service department for further details.

5.9 Customer Training

Periodically, AMETEK Drexelbrook instrument training seminars are held at the factory. These sessions are guided by Drexelbrook engineers and specialists, and provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. For more information call 215-674-1234.

5.10 Equipment Return

In order to provide the best service, any equipment being returned for repair or credit must be pre-approved by the factory.

In many applications, sensing elements are exposed to hazardous materials.

- **OSHA mandates** that our employees be informed and protected from hazardous chemicals.
- **Material Safety Data Sheets (MSDS)** listing the hazardous materials to which the sensing element has been exposed **MUST** accompany any repair.
- It is your responsibility to fully disclose all chemicals and **decontaminate** the sensing element.



To obtain a return authorization (RA#), contact the Service department at + 215-674-1234.

- Please provide the following information:
- Model Number of Return Equipment
- Serial Number
- Original Purchase Order Number
- Process Materials to which the equipment has been exposed.
- MSDS sheets for any hazardous materials
- Billing Address
- Shipping Address
- Purchase Order Number for Repairs
- Please include a purchase order even if the repair is under warranty. If repair is covered under warranty, you will not be charged.

Ship equipment freight prepaid to:

AMETEK-DREXELBROOK.
205 KEITH VALLEY ROAD
HORSHAM, PA 19044-1499
COD shipments will not be accepted.

Section 6: Specifications

Power Requirements:

AC Units - Field Selectable:

95-145 VAC, 50/60 Hz, 2 Watt

215-265 VAC, 50/60 Hz, 2 Watt

DC Units:

24 VDC Unit: 19-29 VDC input, 2 Watt

Sensitivity:

0.3pF or less

Operating Point Range:

0 - 80 pF (20 Turn Pot / 4 pF per Turn)

Extended range with external pad capacitor, Pad ratio 1:1

Load Resistance:

Center to Ground, 1500 Ohms

Center to Shield, 750 Ohms

Shield to Ground, 750 Ohms

Failsafe:

Field adjustable to either High-Level Fail-Safe (HLFS)

or

Low-Level Fail-Safe (LLFS)

Output:

DPDT relay closure

Contact Rating:

5A @ 120 Vac non-inductive

2A @ 230 Vac non-inductive

Ambient Temperature:

-40°F to 145°F (-40°C to 63°C)

Temperature Effect:

0.5pF/50°F

Line Voltage Effect:

0.2pF/20V @ 120 Vac

Stability:

0.15pF/6 mo. maximum shift

Spark Protection:

100 Amp

Mounting: (Probe Dependant)

¾-inch NPT (Typical)

Section 6: Specifications (Continued)

Housing:

The standard housing meets the following classifications:

Nema 1 General-Purpose
Nema 2 Drip-Tight
Nema 3 Weather-Resistant
Nema 4 Waterproof
Nema 5 Dust-Tight
Nema 12 Industrial Use

If hazardous area approval is required, use the Drexelbrook PXL The Point™ instrument for point level control.

Time Delay:

0-60 seconds (3/4 Turn Pot) 270° Potentiometer

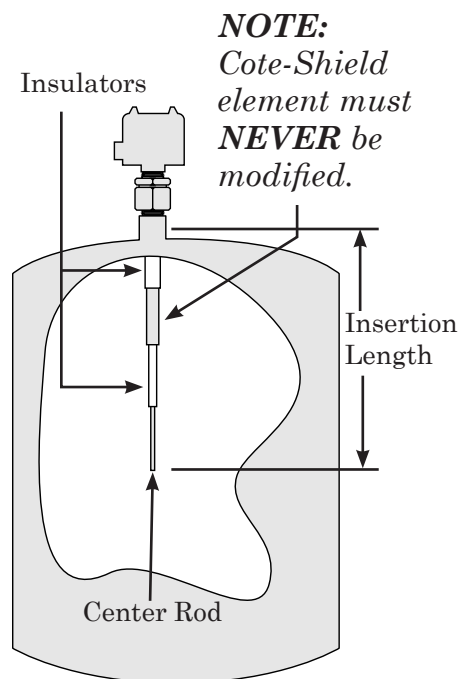
Approvals

FM / FMC 3810 General Purpose

Appendix A: Shortening or Lengthening the Sensing Element



CAUTION:
*The insulation length of either **Flush Sensing Elements** or **Insulated Sensing Elements** can **NOT** be changed. **Cable Sensing Elements** can only be shortened. Instructions are included with each unit.*



Note:
Any changes to probe length after calibration requires re calibration to ensure proper operation.

The Need

Sometimes your application calls for probe lengths other than the standard 18-inch or longer insertion lengths supplied. Shortening the sensing element is quite simple and can be done in the field. Lengthening the sensing element, however, is more difficult because the metal rod, typically 316 SS, must be welded.

Before making any Adjustments:

- 1) Read the following instructions thoroughly.
- 2) Remove power.
- 3) Disconnect the electronics.
- 4) Protect electronics from any static discharge.
- 5) Protect electronics from any heat.

Shortening

The bare metal center rod of the sensing element can be shortened with a hacksaw. Be careful not to cut either of the two insulators. See Figure on this page.

In applications using conductive or water-based materials, shortening is not a problem. Leave a minimum bare metal center rod length of two (2) inches.

For dry granular materials, such as powder, sand, corn, clinker, etc., you must leave a minimum bare metal center rod length of eight (8) inches. Consult the factory before shortening beyond this point.

Lengthening

To lengthen the sensing element, an extension rod can be welded onto the end of the bare metal center rod. Make sure that the extension rod is the same metal as the sensing element. Disconnect electronics before welding

An alternate option is to add a pipe coupling and a section of metal pipe or rod after threading the tip of the sensing element. In this case, the metal pipe need not be identical to the metal of the sensing element.

AMETEK, Inc.
TERMS AND CONDITIONS OF SALE

THE FOLLOWING TERMS/CONDITIONS, TOGETHER WITH ANY OTHER TERMS/CONDITIONS SPECIFICALLY AGREED TO IN WRITING BY SELLER, SHALL APPLY TO ALL ORDERS ("Order(s)") FROM, AND SALES OF PRODUCTS ("Products") OR SERVICES ("Services") TO BUYER. ANY ACCEPTANCE OF ANY ORDER OF BUYER IS CONDITIONED UPON THESE TERMS/CONDITIONS. ANY ADDITIONAL OR DIFFERENT TERMS/CONDITIONS PROPOSED BY BUYER IN ANY DOCUMENT ARE OBJECTED TO AND SHALL NOT BE BINDING UPON SELLER. No salesperson is authorized to bind Seller to any promise or understanding not expressed herein.

I. PRICES All prices are subject to change without notice in the event of any changes in cost of materials or labor, specifications, quantities, delivery schedules, customs duties, other factors beyond Seller's control, or in the event of delays caused by instructions of the Buyer, or failure of the Buyer to give Seller adequate information. Further, prices payable by the Buyer shall be subject to immediate increase, should the Seller as a result of governmental action or regulation including, without limitation, those contemplated by an investigation under Section 232 of the Trade Expansion Act of 1962 (19 U.S.C. §1862), incur additional duties, tariffs or restrictions on products sold hereunder, or on the raw materials that are used in making such products. In no event shall prices include any amounts imposed on the Buyer in connection with Buyer's purchases from Seller, such as taxes, including but not limited to Value Added Tax (VAT) or excise taxes, duties, tariffs, or any other costs assessed against the Buyer by a governmental authority.

II. DELIVERY Delivery dates are approximate and are dependent on prompt receipt by Seller of all necessary information. Seller may deliver all or any part of Products/ Services as early as 30 days in advance of agreed schedule. The point of delivery shall be "Ex-works" Seller's premises, unless otherwise specified by Seller. Upon delivery, title to Products and all risk of loss or damage thereto shall pass to Buyer. Where Buyer notifies Seller that it cannot take timely delivery of the Products, Seller may place such Products in storage, at the risk of Buyer, and Buyer shall reimburse Seller for all expenses incurred in connection with such storage. Buyer shall dispose of the packing materials for Products at its own expense, and shall defend, indemnify and hold harmless Seller from any legal obligations in connection with such packing waste.

III. PAYMENT A. The term of payment shall be net 30 days from date of Seller's invoice, unless otherwise specified. Payments shall be made by Buyer without any deduction or set-off. Unless otherwise agreed, payment shall be made in U.S. dollars. Seller may charge late payment fees at the rate of 1.5% per month, or the highest rate permitted by law, whichever is less, accruing daily.
B. If the financial condition of Buyer is unsatisfactory to Seller, Seller may require full or partial payment in advance, or satisfactory security, in the form of a letter of credit or otherwise. In the event of bankruptcy or insolvency of Buyer, Seller may immediately cancel any Order then outstanding.
C. Buyer grants Seller a purchase money security interest in Products located in the United States, or Services, as well as any proceeds, for the purpose of securing the obligations of Buyer hereunder. Buyer authorizes Seller to execute on Buyer's behalf and file such financing statements as Seller deems appropriate to perfect and notify Buyer's creditors of Seller's security interest.

IV. VARIATIONS IN QUANTITY; CHANGES. Buyer shall accept delivery of quantities greater or smaller than the quantity specified in Order(s), provided that any such variation shall not exceed 5% of the quantity originally specified, or 2 units, whichever is greater. Seller shall not be required to give notice of any such variations other than in the applicable shipping notice and invoice. Seller reserves the option to make changes to Products or Services which do not affect form, fit, or function, and shall deliver Products to the latest configuration part number at the time of delivery.

V. EXPORT CONTROLS; FCPA; ANTI-BOYCOTT

A. Buyer shall not make any disposition of the Products, by way of transshipment, re-export, diversion or otherwise, except as applicable U.S. export laws and regulations may expressly permit, and other than in and to the ultimate country of destination specified on Order(s) or declared as the country of ultimate destination on Seller's invoices or in the End Use Statement that Buyer supplies Seller. Seller shall not be named as shipper or exporter of record or U.S. principal party-in-interest

(USPPI) unless specifically agreed to in writing by Seller in which case, Buyer shall provide Seller with a copy of the documents filed by Buyer for Export clearance purposes. At Seller's request, Buyer shall supply end-use and end-user information to determine export license applicability. Failure of Buyer to comply with this section shall constitute a material default allowing Seller to cancel related Order(s) without liability.

B. Buyer warrants that it shall not violate or cause the Seller to violate the U.S. Foreign Corrupt Practices Act of 1977 (FCPA), as amended, the United Kingdom Bribery Act (UKBA) of 2010, as amended, or their respective implementing regulations in connection with Buyer's sale or distribution of the Products and/or Services, and that Buyer does not know or have reason to believe that any consultant, agent, representative or other person retained by Buyer in connection with the sale and/or distribution of Products/Services has violated, nor caused Seller to violate the FCPA and/or the UKBA. Where Buyer learns of or has reason to know of any violation of FCPA and/or UKBA in connection with the sale or distribution of Products/Services, Buyer shall immediately advise Seller.

C. Buyer further warrants that Buyer shall not violate or cause Seller to violate the U.S. Antiboycott Provisions of the U.S. Export Administration Regulations issued pursuant to the U.S. Export Administration Act of 1979, as amended, in connection with Buyer's purchase of Products/Services and that Buyer shall not request or require Seller to make statements or certifications against countries that are not subject to boycott by the U.S.

VI. WARRANTIES A. Seller warrants that Products manufactured by Seller, when delivered, shall be free from defects in material/workmanship. Seller warrants that Services shall be performed in accordance with generally accepted industry practice. Seller's obligations under this warranty shall be limited exclusively to repairing or replacing, at Seller's option, any part of Products which, if properly installed, used and maintained, proved to have been defective in material or workmanship within 1 year from the date of shipment, or re-performing the Services. Seller warrants for a period of 1 year from the date of shipment that software or firmware, when used with Products, shall perform in accordance with Seller's published specifications. Seller makes no warranty, express or implied, that the operations of the software or firmware shall be uninterrupted or error-free, or that functions contained therein shall meet or satisfy the Buyer's intended use/requirements. Buyer shall notify Seller of any defect in the quality or condition of Products (including software/firmware) or Services within 7 days of the date of delivery or performance, unless the defect was not apparent on reasonable inspection, in which case, within 7 days after discovery of the defect. If Buyer does not provide such timely notification, it shall not be entitled to reject Products (including software/firmware) or Services, and Seller shall have no liability for such defect.

B. Seller's warranty obligations shall not apply to Products which (1) have been altered or repaired by someone other than Seller, or (2) have been subjected to misuse, neglect, or improper use or application, or (3) are normally consumed in operation, or (4) have a normal life inherently shorter than the warranty period stated therein.

C. No Products may be returned unless authorized in advance by Seller, and then only upon such conditions to which Seller may agree. Buyer must obtain a Return Material Authorization (RMA) number from Seller prior to any return shipment, and such RMA number must appear on the shipping label and packing slip. Buyer shall be responsible for returned Products until such time as Seller receives the same at its facility, and for all charges for packing, inspection, shipping, transportation or insurance associated with returned Products.

D. This section VI sets forth the exclusive remedies and obligations for claims based upon defects in or nonconformity of Products/Services, whether the claim is in contract, warranty, tort (including negligence of any degree or strict liability) or otherwise. **THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES,**

May 2018

WHETHER ORAL, WRITTEN, EXPRESS, IMPLIED OR STATUTORY. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY.

VII. PATENTS/INDEMNITY If Buyer receives a claim that Products, or part thereof manufactured by Seller infringes a patent, Buyer shall notify Seller promptly in writing and give Seller information, assistance and exclusive authority to evaluate, defend and settle such claim. Where Buyer has furnished specifications/designs for the manufacture of the allegedly- infringing Products, Buyer shall defend, indemnify and hold harmless Seller against third-party claims for infringement arising out of Seller's use of such specifications/designs.

VIII. LIMITATION OF LIABILITY
The total liability of Seller on any claim, whether in contract, tort (including negligence of any degree and strict liability) or otherwise arising out of, connected with, or resulting from the manufacture, sale, delivery, resale, repair, replacement or use of any Products/Services, shall not exceed the price allocable to the Products/Services or part thereof which gives rise to the claim. **IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT, WARRANTY, TORT, (INCLUDING NEGLIGENCE OF ANY DEGREE, STRICT LIABILITY OR PATENT INFRINGEMENT) OR OTHERWISE, SHALL SELLER, ITS AFFILIATES, SUBCONTRACTORS, OR SUPPLIERS BE LIABLE FOR ANY LOSS OF PROFIT OR REVENUES, LOSS OF USE OF THE PRODUCTS OR SERVICES, OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES, SERVICES OR REPLACEMENT POWER, DOWNTIME COSTS OR CLAIMS OF BUYER'S CUSTOMERS FOR DAMAGES OR FOR ANY SPECIAL, PROXIMATE, CONSEQUENTIAL, INCIDENTAL, INDIRECT OR EXEMPLARY DAMAGES.** If Buyer transfers title to, or leases Products sold hereunder to, or otherwise permits or suffers use by, any third party, Buyer shall obtain from such third party a provision affording Seller and its subcontractors/suppliers the protection of the preceding sentence. Any action against Seller must be brought within 18 months after cause of action accrues.

IX. EXCUSABLE DELAYS A. Seller shall not be liable for delays in delivery or failure to perform due directly or indirectly to causes beyond Seller's reasonable control including but not limited to: acts of God; war; terrorism; civil commotion; riots; embargoes; government regulations, orders, instructions or priorities; port congestion; acts of or failure to act on the part of Buyer or its agents/employees; fires; floods; sabotage; nuclear incidents; earthquakes; storms; epidemics; strikes; lockouts or other labor difficulties; shortages of or inability to timely obtain proper labor, materials, components, shipping space or transportation, fuel, supplies or power at current prices; or due to limitations imposed by the extent of availability of Seller's normal manufacturing facilities.

B. If a delay excused per the above extends for more than 90 days and the parties have not agreed upon a revised basis for continuing providing Products/Services at the end of the delay, including adjustment of the price, then either party (except where delay is caused by Buyer, in which event only Seller) upon thirty (30) days' notice may terminate the Order with respect to the unexecuted portion of the Products/Services, whereupon Buyer shall promptly pay Seller its reasonable termination charges upon submission of Seller's invoices thereof.

X. SOFTWARE/TECHNICAL/PROPRIETARY INFORMATION

A. Buyer shall not acquire any rights to any software which may be delivered with Products, except as granted in Seller's standard software license. Any software license granted in connection with Products shall be an interim license, which may be withdrawn, pending payment for Products in full.

B. The purchase of Products shall not include any right to supply of technical information such as drawings or specifications.

C. Proprietary information, including drawings, documents, technical data, reports, software, designs, inventions and other technical information supplied by Seller in connection herewith (hereinafter called "Data"), shall remain Seller's sole property and shall be held in confidence by Buyer. Data shall not be reproduced, used or disclosed to others by Buyer without

Seller's prior written consent. Upon completion of Order, Buyer shall promptly return all Data to Seller together with all copies or reprints thereof then in Buyer's possession or control, and Buyer shall thereafter make no future use, either directly or indirectly, of any Data or any information derived therefrom without Seller's prior written consent. The foregoing shall in no way obligate Seller to provide or supply Data.

XI. DIES, TOOLS, PATTERNS Seller's charges for dies, molds, patterns and the like represent the Buyer's proportionate cost thereof, it being expressly understood that they remain the property of Seller. Modifications made to dies, molds, patterns and the like in order to manufacture Products shall be at the discretion of Seller.

XII. GENERAL A. The rights and obligations of the Buyer and Seller hereunder shall be governed in all respects by the law of the Commonwealth of Pennsylvania, U.S.A. The exclusive forum for adjudication of any disputes shall be the federal or state courts of the Commonwealth of Pennsylvania, and Buyer/Seller hereby consent to personal jurisdiction and venue in such courts in any proceeding. The United Nations Convention on the International Sale of Goods shall not apply.

B. These Terms and Conditions of Sale together with any other terms specifically agreed to in writing by Seller constitute the entire agreement between Buyer and Seller and supersede any prior or contemporaneous representations, agreements, proposals, warranties, or understandings, oral or written, express or implied. No waiver, modification, amendment, rescission or other change to these Terms and Conditions of Sale shall be binding unless specifically agreed to in writing by an authorized representative of Seller.

C. The invalidity, of any part hereof shall not affect the validity of the remainder. The failure of Seller to assert any right at any time hereunder shall not prevent Seller's subsequent assertion of the same or different rights.

D. Buyer may not assign this contract without the prior written approval of the Seller.

XIII. PROHIBITION FOR HAZARDOUS USE

Products sold hereunder are not intended for application in, and shall not be used by Buyer in construction or application of a nuclear installation or in connection with use or handling of nuclear material or for any hazardous activity or critical application, where failure of a single component could cause substantial harm to persons or property, unless Products have been specifically approved for such activity or application. Seller disclaims all liability for loss or damage resulting from such unauthorized use and Buyer shall defend, hold harmless and indemnify Seller against any such liability, whether arising under breach of contract, warranty, tort (regardless of the degree of fault or negligence), strict liability or otherwise.

Where Seller approves the application of the Products in a nuclear facility, the Buyer shall, before such use or provision, arrange for insurance or governmental indemnity protecting the Seller against liability and hereby releases and agrees to indemnify the Seller and its suppliers for any nuclear damage, including loss of use, in any manner arising out of a nuclear incident, whether alleged to be due, in whole or in part to the negligence or otherwise of the Seller or its suppliers.

XIV. STATUTORY REQUIREMENTS

Seller reserves the right to make any changes in the general specifications of the Products which are required for the Products to conform to any statutory requirement.

XV. GOVERNMENT CONTRACTS

Only Federal Acquisition Regulation ("FAR") supplement clauses expressly accepted in writing by Seller shall be included or incorporated by reference herein. Seller shall not be bound by and makes no representation of compliance with any FAR or FAR supplement clauses that Seller shall not have expressly accepted in writing.

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