Installation and Operating Instructions

Series M502-9000-33
Ztron™ Level Control
using 402-3000 Electronics
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1.0 Introduction

The instructions in this manual are for the Drexelbrook Ztron™ Series point level control with a 402-3000 transmitter (also referred to as MKII Type Ztron). The label on top of the electronic unit identifies the type of unit.

1.1 System Description

The Ztron Series control includes a sensing element with integral electronics. See Figure 1-1.

The Ztron control is mounted so that the sensing element is in or near the material being measured. It provides a change in RF admittance indicating presence or absence of material. The sensor portion consists of three sections; center (measuring portion), ground, and Cote-Shield. The Cote-Shield terminal guards against the transmission of RF current through most coatings on the sensing element (from the center measuring element to ground) until the level reaches the setpoint. See Figure 1-2.

Cote Shield™ action is designed into each unit and enables the instrument to ignore the effects of most build-up or material coatings on the sensing element, when properly installed and applied.

The Drexelbrook Ztron control is a precision RF (radio frequency) relay output level switch. It provides relay contact closure when material reaches a preset point in a vessel. The standard double-pole double-throw relay contacts may be used to operate alarms, solenoid valves, or other low power devices.

Figure 1-1
Typical Ztron Series Point Level Control

Figure 1-2
Cote-Shield Terminal
2.0 Specifications

A. Power Requirement:
   95-145 Vac, 50/60 Hz, 5 watts
   maximum-standard; 215-265 Vac,
   50/60 Hz, 5 watts maximum-
   optional.

B. Sensitivity: .3 pF or less

C. Load Resistance:
   Center to Ground, 1500Ω
   Center to Shield, 750Ω
   Shield to Ground, 750Ω

D. Fail-Safe: Field adjustable to
   either High-Level Fail-Safe (HLFS)
   or Low-Level Fail-Safe (LLFS).

E. Output: DPDT Relay Closure

F. Ambient Temperature: -40°F to
   140°F (-40°C to 60°C)

G. Temperature Effect: .3pF/50°F

H. Line Voltage Effect: .2pF/20V @
   120 Vac

I. Contact Rating: Non-inductive 5A
   @ 240 Vac.

J. Stability: .1pF/6 mo. max. shift

K. Spark Protection: 10 amp built in

L. Mounting: 3/4” NPT (std.)

M. Insertion Length: as specified

N. Housing:

   The standard explosionproof
   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

   FM approved for Class 1, Groups
   A,B,C, and D (Div. 1 or 2) and Class
   II, Groups E,F, and G (Div. 1 or 2).

O. Time Delay (Option): 0-90 seconds

Additional specifications are given in
Table 2-1

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Process Temperature and Pressure</th>
<th>Process Wetted Parts</th>
<th>Center Rod O.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>502-9000-33</td>
<td>300°F @ 50 psi</td>
<td>316 SS and TFE</td>
<td>3/8”</td>
</tr>
</tbody>
</table>
3.0 Installation

3.1 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 immediately to the factory.

3.2 Mounting for Integral Unit

The Ztron Series control is designed for field mounting. However, it should be mounted on the vessel so that vibration, corrosive atmospheres, and any possibility of mechanical damage are minimized. If this is not possible, the Drexelbrook LCS series instrument with remote-mounted electronics should be substituted.

For convenience at start-up, it is best to locate the Ztron Series control in a reasonably accessible location. It may be mounted either vertically or horizontally. See Figure 3-1.

The actual mounting location often depends on the placement of nozzles or openings into the vessel. Do not mount the instrument through a nozzle which exceeds the first insulator on the sensing element. See Figure 3-1A. Be sure to protect the insulation on the sensing element against cuts and scrapes during installation.

Figure 3-1A
Mounting Through a Nozzle

Figure 3-1
Mounting the Sensing Element
3.3 Mounting for Remote Unit

Figure 3-1B shows the mounting requirements for a remote unit.

![Diagram of Mounting for Remote Unit]

Figure 3-1B
Remote Ztron Mounting

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Installation

Figure 3-3A
Wiring of the Sensing Element to the Remote Electronic Unit

- Electronics Housing
- Ground (Green)
- Shield (Red)
- Probe (Blue)
- Probe Conduit
- Power & Relay Wiring
- J80- SERIES CABLE UP TO 25'

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3.4 Sensing Element Wiring

The sensing element connections to the integral electronics have been made at the factory. If it is necessary to rewire the sensing element to the electronics, see Figure 3-2 for proper connections. All of the sensing element connections are made to the land side of the circuit board. Be sure that the shield wire (orange) and the center wire (blue) are twisted.

3.5 Power Wiring

All power connections are made to the terminal strip on the top of the electronic chassis. See Figure 3-3.

![Figure 3-2](image1)

Wiring of the Sensing Element to the Electronic Unit

![Figure 3-3](image2)

Power and Relay Connections to the 120 Vac Unit
3.6 Relay Connections

The Ztron relay has a double-pole double-throw (DPDT) contact closure. 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 top of the electronic chassis. See Figure 3-3. For contact closures in high- and low-level fail-safe, see Figure 3-4.
4.0 Calibration/Operation

This section contains the calibration and operation information for the Ztron Series point level controls.

4.1 Start-Up

Before applying power to the instrument, be sure that the power wiring is correct. See Section 3.4.

**Warning:** Units in hazardous areas.

Before the explosionproof housing cover is removed to calibrate the Ztron control, the area must be checked and known to be non-hazardous. When calibration is complete, the cover must be replaced. Each connection to the explosionproof case must be equipped with an approved seal fitting.

4.2 Controls

4.2.1 Operating Point Adjustment

There is a single operating adjustment used to control the level at which the relay operates. See Figure 4-1. Turning this adjustment clockwise (CW) will raise the level at which the relay operates, and turning the adjustment counterclockwise (CCW) will lower the level at which the relay operates. The LED (on) indicates the relay is energized.
4.2.2 Fail-Safe Selector

Fail-safe describes the level condition which causes the unit to alarm and the output relay to de-energize.

High-Level Fail-Safe (HLFS) means the relay will de-energize under high level conditions, or upon loss of power. Low-Level Fail-Safe (LLFS) means the relay will de-energize under low level conditions, or upon loss of power. The instrument is supplied in the fail-safe requested when the order is placed. (HLFS, if not specified).

The fail-safe may be changed in the field by moving the position of the fail-safe connection located on the instrument circuit board. See Figure 4-1 for location of fail-safe selector and Figure 4-2 for fail-safe position.

Figure 4-2 Fail-Safe Selector
4.3 Calibration Procedures

All Ztron controls (except for model 502-3000-918) are factory set to switch in all water-based conducting materials. No calibration adjustment is necessary.

If the calibration adjustment has been tampered with, see Section 4.4 for recalibration of the unit in conducting materials.

If you suspect the material to be insulating, use one of the following calibration procedures.

4.3.1 Calibration of Horizontal Controls in Insulating Materials

A. Be sure the material level is well below the end of the sensing element. See Figure 4-3.

Figure 4-3
Level Below the Sensing Element

B. Turn the operating point adjustment to the full counterclockwise (CCW) position. See Figure 4-1.

C. Turn the adjustment slowly clockwise (CW) until the relay just operates. (LED changes states).

D. Increase the material level until it is well above the sensing element. See Figure 4-4. (LED changes states)

Figure 4-4
Level Above the Sensing Element

E. Mentally note the position of the adjustment tool.

F. Counting the number of turns, turn the adjustment slowly clockwise (CW) until the relay once again just operates, or you come to the end of the adjustment travel.

G. Turn the adjustment back counterclockwise (CCW) one half the number of turns that were counted.

H. For recalibration, record that half number of turns counted as "preload." See Section 4.4.

Calibration is now complete.

Note: If less than one turn of the adjustment was observed between the sensing element covered and uncovered, please consult the factory.
4.3.2 Calibration of Vertical Controls in Insulating Materials or Vertical Insulated Controls (502-3000-918) in Conducting Materials

Note: The LED (on) indicates that the relay is energized or in normal condition (not alarm).

A. Set the level to a point on the active section of the sensing element where control is desired (3 inches of coverage minimum). See Figure 4-5.

B. With the calibration screwdriver supplied, start from the full counterclockwise (CCW) position and, counting the number of turns, turn the operating adjustment clockwise (CW) until the relay just operates (LED changes states). See Figure 4-1.

C. Record the number of clockwise turns for recalibration.

Calibration is now complete.

Note: If the dielectric constant or conductivity of the material changes, the point of operation may change.

4.4 Recalibration

If the amount of preloading was recorded at the time of initial calibration, the instrument can now be replaced without experimentally determining the proper amount of preload.

A. For recalibration using the procedure in Section 4.3.1, follow steps A, B, and C, then turn the adjustment further clockwise (CW) the amount of preload.

B. For recalibration using the procedure in Section 4.3.2, turn the adjustment clockwise (CW), from the full CCW position, the amount of the recorded preload.

C. For recalibration in conducting materials (factory set), use the calibration screwdriver to turn the adjustment to the full clockwise (CW) position. No other adjustment is necessary.
5.0 Troubleshooting

5.1 Introduction

The Ztron instruments are designed to give years of unattended service. No periodic or scheduled maintenance is required.

There are no specifically recommended spare parts. However, if the application is critical, it is best to have a spare electronic chassis available in the event of a component failure. In most cases, a failed chassis should be returned to the factory for repair.

Backup Systems

"Drexelbrook equipment is built with great care and subjected to rigorous quality control. Even so, failures of any equipment can and do occur. Sound engineering practice demands that, whenever equipment failure may result in more than an inconvenience, a completely independent backup system be employed so that failure of either the unit or the backup unit will not permit a hazardous condition to occur."

If a difficulty should occur when operating your unit, test each part individually for proper operation.

The following troubleshooting procedures are recommended in checking out the Ztron level control. If attempts to locate the difficulty fail, notify the local factory representative, or call the factory direct (1-800-527-6297).

5.2 Testing the Electronics

A. See Figure 5-1. Disconnect the sensing element wires from the instrument by removing the blue wire from the center terminal and the orange wire from the shield terminal. Leave the power connected.

B. Connect a capacitor, any value from 10 to 50 pF, across the center and ground terminals.

C. Starting with the operating adjustment in the extreme counterclockwise (CCW) position, turn the calibration screwdriver clockwise (CW) until the relay just operates.

![Image of testing the electronic unit]

**Figure 5-1**
Testing the Electronic Unit
**Troubleshooting**

D. Rotate the adjustment back and forth about this point, observing the travel of the screwdriver between relay pull-in and relay drop-out. If the instrument is working properly, the screwdriver should travel less than 1/4 turn to operate the relay.

If the instrument is not working properly, consult the factory service department (1-800-527-6297).

5.3 Testing the Sensing Element

A. See Figure 5-2. Disconnect the shield wire (orange) and the center wire (blue) from the electronic unit.

B. If there is a material coating on the sensing element, use the analog ohmmeter to measure the following resistance values:

---

**Figure 5-2**
Testing the Sensing Element
Resistance, center wire to shield

Resistance, shield to ground

Resistance, center wire to ground

C. Readings from step B should be greater than:
   Center to shield - 750Ω
   Shield to ground - 750Ω
   Center to ground - 1500Ω

D. Clean any coating from sensor.

E. With no material coating on the sensing element, use an analog ohmmeter to measure the following resistance values:

   Resistance, center wire to shield

   Resistance, shield to ground

   Resistance, center wire to ground

F. If all three readings are not above 1 megohm, consult the factory.

5.4 Testing the Relay Circuits

A. The relay circuit consists of one set of double-pole, double-throw contacts brought out to a terminal strip. When the instrument is properly adjusted, two pairs of contacts will open with high or low level, and two pairs will close with high or low level.

B. Adjust the instrument as described in Section 5.2.

C. Relay operation may generally be heard as an audible click when the background noise is not too high. Use one of the methods shown in Figure 5-3 to determine if the relay contacts are switching.

D. Difficulty in calibration can often be traced to improper wiring of the relay terminals to an annunciator or other panel device. Check the wiring against the relay chart in Figure 3-4. Be sure to use the diagram for the fail-safe in which the instrument is functioning.
## Troubleshooting

### 5.5 Possible Problems and Causes

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
</table>
| 1. Instrument indicates alarm at all times. | a. Coating build-up on sensing element (HLFS)  
b. Sensing element not "seeing" material (LLFS)  
c. Defect in sensing element  
d. Loss of power  
e. Improper wiring  
f. Improper calibration  
g. Electronic malfunction | a. Need longer Cote-Shield. Consult factory.  
b. Need longer insertion length. Consult factory.  
c. Sec. 5.3  
d. Sec. 3.4  
e. Sec. 3.3 & 3.4  
f. Sec. 4.3  
g. Sec. 5.2 |
| 2. Instrument never indicates alarm | a. Coating build-up on sensing element (LLFS)  
b. Sensing element not "seeing" material (HLFS)  
c. Improper wiring  
d. Improper calibration  
e. Electronic malfunction | a. Need longer Cote Shield.  
b. Need longer insertion length. Consult factory.  
c. Sec. 3.3 & 3.4  
d. Sec. 4.3  
e. Sec. 5.2 |
| 3. Instrument can't be calibrated | a. Improper wiring  
b. Insufficient signal from sensing element  
c. Setpoint is beyond the tuning range of the electronics.  
d. Electronic malfunction. | a. Sec. 3.3 & 3.4  
b. Need longer insertion length. Consult factory.  
c. Consult factory  
d. Sec. 5.2 |
| 4. Instrument gives a false alarm | a. Improper calibration  
b. Loose wiring  
c. Electronic malfunction | a. Sec. 4.3  
b. Sec. 3.3 & 3.4  
c. Sec. 5.2 |
| 5. Instrument operates intermittently | a. Improper calibration  
b. Loose wiring  
c. Electronic malfunction  
d. Dielectric (k) of the material is too low | a. Sec. 4.3  
b. Sec. 3.3 & 3.4  
c. Sec. 5.2  
d. High sensitivity unit may be required. Consult factory. |
6.0 Factory & Field Service

6.1 Telephone Assistance

If you are having difficulty with your Drexelbrook equipment, and attempts to locate the problem have failed, notify your local Drexelbrook representative, or call the factory direct using the service department. Drexelbrook Engineering Company is located at 205 Keith Valley Road, Horsham, PA 19044. The telephone number is 1-800-527-6297. To help us solve your problem quickly, please have as much of the following information as possible when you call:

Instrument Model # ____________________________
Probe Model # ________________________________
P.O. # ______________________________________
& Date _______________________________________
Cable Length __________________________________
Application ____________________________________
Material Being Measured ________________________
Temperature __________________________________
Pressure ______________________________________
Agitation ______________________________________
Brief Description of the Problem
_____________________________________________
_____________________________________________
Checkout Procedures that Failed
_____________________________________________
_____________________________________________

6.2 Equipment Return

Do not return equipment without first contacting the factory for a return authorization number. Any equipment being returned must include the following information in addition to that above.

Reason for Return _____________________________
Return Authorization # ________________________
Person to Contact at Your Company ____________
“Ship-To” Address ____________________________

If available, please also include the original P.O. # and the original Drexelbrook order #.

To keep the paperwork in order, you must include a purchase order with returned equipment, even though it may be coming back for warranty repair. You will not be charged if the equipment is covered under warranty. Please return your equipment with freight charges prepaid. We regret that we cannot accept collect shipments.

Drexelbrook usually has exchange units available for faster turnaround of repair orders. If you prefer your own unit repaired rather than exchanged, please mark clearly on the return unit, “Do Not Exchange.”

Standard electronic units are generally in factory stock. If the application is critical, a spare chassis should be kept on hand.

6.3 Field Service

Trained field service people 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.

6.4 Customer Training

Periodically, Drexelbrook instrument training seminars for customers 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 about these valuable workshops, write to Drexelbrook Engineering, Attn: Communications/Training Group, or call direct (215) 674-1234.