Calibration of Drexelbrook Ztron™ Level Control Switch Series 502-3000 with 402-2000 Transmitter

Tank Farm Maintenance Procedure Effluent Treatment Facility

USQ Not Required – ETF is a <Hazard Category 3 Radiological Facility

Table of Contents

1.0 PURPOSE AND SCOPE ............................................................ 3
   1.1 Purpose ........................................................................ 3
   1.2 Scope ........................................................................ 3

2.0 INFORMATION ........................................................................ 3
   2.1 General Information ......................................................... 3

3.0 PRECAUTIONS AND LIMITATIONS .................................... 4
   3.1 Radiation and Contamination Control .............................. 4
   3.2 Environmental Compliance ............................................ 4

4.0 PREREQUISITES ................................................................. 4
   4.1 Special Tools, Equipment, and Supplies ............................ 4
   4.2 Performance Documents .............................................. 4

5.0 PROCEDURE ........................................................................ 5
   5.1 Initial Setup ................................................................... 5
   5.2 Calibration of Bare Metal Probes in Conducting Material (Horizontal or Vertical) .... 7
   5.3 Calibration of Horizontal Controls in Insulating Materials .................................... 8
   5.4 Calibration of Vertical Controls in Insulating Materials (or Vertical Insulated Controls in Conducting Materials) ................................................................. 9
   5.5 As-Left Data (if Calibration Performed) ................................ 9
   5.6 Restoration .................................................................. 10
   5.7 Acceptance Criteria ....................................................... 10
   5.8 Review ....................................................................... 10
   5.9 Records ..................................................................... 10

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<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>10/08/2018</td>
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</tr>
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</tbody>
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---|-------------|---------|--------------|----
REFERENCE | ETF-EL18093 | A-2 | 10/08/2018 | 1 of 13
Calibration of Drexelbrook Ztron™ Level Control Switch Series 502-3000 with 402-2000 Transmitter

Figure 1 - Sensor Mounting .................................................................................................................. 11
Figure 2 - Calibration Adjustments ...................................................................................................... 12
Figure 3 - Fail Safe Settings .................................................................................................................. 13
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides a safe, uniform method for calibration of the Drexelbrook Ztron™ level control switch, series 502-3000 with 402-2000 transmitter.

1.2 Scope

This procedure applies to calibrating the Drexelbrook Ztron level control switch, series 502-3000 with 402-2000 transmitter.

2.0 INFORMATION

2.1 General Information

Ztron level switches use radio frequency transmission to determine presence or absence of material at the probe. When material is present or absent (depending on fail-safe setting), a double-pole, double-throw relay is actuated. Relay output may operate alarms, solenoid valves, or other low power devices.

Normal adjustment consists of a single control to set the operating point. Adjustment method depends on whether switch is mounted vertically or horizontally in process (see Figure 1 - Sensor Mounting).

Horizontal mounted probes can only be adjusted to detect presence or absence of material at switch mounting level.

Bare metal, vertical probes, in conducting material, can only be adjusted to detect presence or absence of material at the probe tip. A standard probe extends eighteen inches below the mounting, but may be cut off at any length up to mounting to change the measurement point.

Insulated (Teflon®-coated), vertical probes (or bare metal vertical probes in non-conducting material) may be adjusted to detect material level over a variable range of approximately one foot, beginning at three to six inches up the probe.

High-level fail-safe means the relay de-energizes on high level condition or on loss of power. Low-level fail-safe means the relay de-energizes on low level condition or on loss of power. Mode is jumper selected (see Figure 2 - Calibration Adjustments).

A time delay adjustment is optional. Time delay is with decreasing level on high-level fail-safe instruments and increasing level on low-level fail-safe instruments.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Radiation and Contamination Control

3.1.1 Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per ALARA Work Planning procedure, TFC-ESH-RP_RWP-C-03.

3.2 Environmental Compliance

3.2.1 In the event of a spill/leak/release, notify the SOM/FWS and respond per ETF-ERP-85B-003, Emergency Spill or Release at ETF.

4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Insulated adjustment tool (factory supplied with instrument)
- Continuity monitor (meter, test light, etc.)
- Stopwatch (if work package data sheet specifies time delay)
- Other tools, equipment and supplies as identified by FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- Vendor information VI-1373-010-003V, Drexelbrook Ztron™ Level Control Switch Series 502-3000 with 402-2000 Transmitter, Installation and Operating Instructions.
5.0 PROCEDURE

5.1 Initial Setup

Special Instructions

The following methods are acceptable for determining relay actuation:

Continuity monitor on relay (switch) output

Actuation of connected alarms (system conditions permitting).

Steps 5.1.1 through 5.1.3 are conditional, depending on method used to verify relay actuation.

Figure 1 through Figure 3 provide adjustments and relay contact logic.

Depending on sensor location and process considerations, it may be better to vary process level for some instruments, while for other instruments, better to loosen the mounting hardware and dip sensor into the process. The craft may use their discretion at these points in the procedure and use the method most appropriate.

5.1.1 REMOVE cover.

5.1.2 TAG AND DISCONNECT relay output lead(s).

5.1.3 IF using continuity monitor, CONNECT continuity monitor to relay output.

5.1.4 IF delay time is specified, DETERMINE fail-safe configuration (determines whether delay is on increasing or decreasing level).

NOTE - Once relay contact operation has been verified by acceptable method, switch LED may be used for remaining verification and adjustments.

5.1.5 IF data sheet specifies time delay, TIME following actuations AND RECORD delay time.
5.1 Initial Setup (Cont.)

5.1.6 INCREASE/DECREASE process level per data sheet,

OR

IF more appropriate due to sensor location and process considerations, PERFORM the following:

5.1.6.1 MARK sensor to indicate depth of installation
5.1.6.2 LOOSEN sensor clamp
5.1.6.3 DIP sensor into process.

5.1.7 CONFIRM relay changes state AND RECORD as-found data.

5.1.8 CHANGE process level in opposite direction from Step 5.1.6,

OR

REMOVE sensor from process.

5.1.9 CONFIRM relay changes state AND RECORD as-found data.

5.1.10 IF as-found data is within tolerance per data sheet and need no adjustments, RECORD as-found data in as-left column AND GO TO Section 5.6.
5.2 Calibration of Bare Metal Probes in Conducting Material (Horizontal or Vertical)

**Special Instructions**

For Sections 5.2, 5.3, and 5.4:

- Insulated adjusting tool is to be used for all operating point adjustments
- This procedure refers to operating point adjustment as “OP ADJUST”
- Sections 5.2, 5.3, and 5.4 are for different applications of the probe. Only the calibration section appropriate for the individual probe is to be performed.

**Low-Level Fail Safe (element covered in process)**

- 5.2.1 TURN time delay adjustment full CCW.
- 5.2.2 VARY “OP ADJUST” to determine operating point with element covered.
- 5.2.3 TURN OP “OP ADJUST” one-half turn CCW from operating point.
- 5.2.4 ADJUST time delay per data sheet.
- 5.2.5 GO TO Section 5.5, As-Left Data (if Calibration Performed).

**High-Level Fail Safe or Low-Level Fail Safe (element uncovered)**

- 5.2.6 TURN time delay adjustment full CCW.
- 5.2.7 VARY “OP ADJUST” to determine operating point with element uncovered (in air).
- 5.2.8 TURN “OP ADJUST” one-half turn CW from operating point.
- 5.2.9 ADJUST time delay per data sheet.
- 5.2.10 GO TO Section 5.5.
5.3 Calibration of Horizontal Controls in Insulating Materials

5.3.1 TURN time delay adjustment full CCW.

5.3.2 ENSURE process level is well below sensing element.

5.3.3 TURN “OP ADJUST” full CCW.

5.3.4 SLOWLY TURN “OP ADJUST” CW until LED changes state.

5.3.5 IF PRELOAD is indicated on data sheet, PERFORM the following:

5.3.5.1 TURN “OP ADJUST” further CW the number of PRELOAD turns on data sheet.

5.3.5.2 GO TO Step 5.3.12.

5.3.6 RAISE level until process is well above sensing element.

5.3.7 NOTE position of adjustment tool pointer.

NOTE - The goal of Steps 5.3.8 and 5.3.9 is to set adjustment halfway between covered and uncovered operating points. If there is only one-half or one turn, then setting would be one-quarter or one-half turn back (CCW.)

5.3.8 WHILE counting turns, SLOWLY TURN “OP ADJUST” CW until LED changes state or to end of travel, whichever comes first.

5.3.9 TURN “OP ADJUST” CCW one half the number of counted turns from Step 5.3.8.

5.3.10 IF there is less than one-half turn adjustment between covered and uncovered settings, NOTIFY Design Authority. (Manufacturer must be contacted.)

5.3.11 RECORD number of CCW turns from Step 5.3.8 as PRELOAD on data sheet.

5.3.12 ADJUST time delay per data sheet.

5.3.13 GO TO Section 5.5.
5.4 Calibration of Vertical Controls in Insulating Materials (or Vertical Insulated Controls in Conducting Materials)

NOTE - If conductivity of process changes, point of operation may change.

5.4.1 TURN time delay adjustment full CCW.

5.4.2 SET process level to point on sensing element where control is desired (three to six inches minimum.)

5.4.3 TURN “OP ADJUST” full CCW.

5.4.4 IF PRELOAD is indicated on data sheet, PERFORM the following:

5.4.4.1 TURN “OP ADJUST” CW the number of PRELOAD turns on data sheet.

5.4.4.2 GO TO Step 5.4.6.

5.4.5 WHILE counting turns, SLOWLY TURN “OP ADJUST” CW until LED just changes state AND RECORD number of CW turns as PRELOAD on data sheet.

5.4.6 ADJUST time delay per data sheet.

5.4.7 GO TO Section 5.5.

5.5 As-Left Data (if Calibration Performed)

5.5.1 IF data sheet specifies time delay, TIME following actuations AND RECORD delay time.

5.5.2 INCREASE/DECREASE process level per data sheet:

5.5.2.1 CONFIRM relay changes state.

5.5.2.2 RECORD as-left data.

5.5.3 CHANGE process level in opposite direction from Step 5.5.2:

5.5.3.1 CONFIRM relay changes state.

5.5.3.2 RECORD as-left data.
5.6 Restoration

5.6.1 **RESTORE** to as-found conditions.

5.6.2 **INFORM** SOM test is complete and instrument/equipment/system may be returned to service.

5.7 Acceptance Criteria

Acceptance criteria has been met when steps in this procedure have been satisfactorily performed and results are recorded on the data sheet(s).

5.8 Review

5.8.1 **INFORM** FWS test is complete.

5.8.2 (FWS) **REVIEW AND ENSURE** the following:

- Completed data sheets meet the acceptance criteria
- Comments sections are filled out appropriately
- Work requests needed as a result of this procedure are identified and generated
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the data sheet.

5.9 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.
Figure 1 - Sensor Mounting

VERTICAL MOUNT

HORIZONTAL MOUNT
(Level Below Sensing Element)
Figure 2 - Calibration Adjustments

Operating Point Adjustment with Calibration Adjustment Tool

TIME DELAY
(SIDE VIEW)
Figure 3 - Fail Safe Settings

Relay Contact Chart