Calibrate Rosemount 3144P Temperature Transmitter

Tank Farm Maintenance Procedure

MAINTENANCE

USQ # GCX-2

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<tr>
<th>Rev-Mod</th>
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<td>A-2</td>
<td>10/29/2018</td>
<td>Periodic Review</td>
<td>The Records Section has been updated.</td>
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<td>A-1</td>
<td>02/14/2018</td>
<td>Clarification</td>
<td>Clarified step 5.1.10 for recording on Data Sheets</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for calibration of a Rosemount 3144P Temperature Transmitter using a HART Communication Device and a thermocouple simulator / Milliamp process calibrator.

1.2 Scope

This procedure applies to calibration of a Rosemount 3144P Temperature Transmitter using a HART Communication Device and a thermocouple simulator / Milliamp process calibrator including a loop check to the TFMCS-HMI in either the 274 AW Central Control Room or alternative TFMCS monitoring locations.

2.0 INFORMATION

2.1 Terms and Definitions

- HART - Highway Addressable Remote Transducer
- HMI - Human Machine Interface
- TFMCS – Tank Farms Main Control System

2.2 General Information

2.2.1 If the transmitter is bench calibrated with external power, a 250 ohm resistor must be placed in series with current loop to enable communication with the HART.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Comply with DOE-0359, Hanford Site Electrical Safety Program. An Energized Electrical Work Permit is not required when working energized parts that operate at less than 50 volts potential. The maximum voltage encountered when connecting and disconnecting from terminal strips is approximately 24 VDC.

3.1.2 If a lock and tag is required during the performance of this procedure, comply with DOE-0336, Hanford Site Lockout/Tagout Procedure.

3.1.3 Contact Industrial Hygienist for appropriate sample plan.

3.2 Radiation and Contamination Control

Work in radiological areas will be performed using a Radiological Work Permit following review by Radiological Control per the ALARA Work Planning procedure TFC-ESHQ-RP_RWP-C-03.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:

- HART Communication Device
- Fluke Model 741B Multifunction Process Calibrator or Equivalent 0.25% accuracy
- 24 VDC power supply and 250 ohm resistor
- Other tools, equipment, and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- Rosemount 3144P Temperature Transmitter Reference Manual 00809-0100-4021, Rev GD

4.3 Field Preparation

4.3.1 NOTIFY Operations prior to performance of this procedure.

4.3.2 ESTABLISH communication with the TFMCS Operator in the 274-AW Central Control Room for the purpose of notification that TFMCS alarms will be generated during calibration.

4.3.3 ESTABLISH communication with a technician or operator at any available TFMCS station for the purpose of obtaining temperature values from the HMI display.
5.0 PROCEDURE

NOTE - When the procedure directs application of inputs or adjustments to temperature transmitter settings, the stated action(s) may be performed using the HART Communication Device or thermocouple simulator / Milliamp process calibrator to perform required tests and adjustments.

Typical HART Menu Options are detailed in Figure 2.

5.1 Obtain As-Found Data

5.1.1 CONNECT Test Equipment as follows:

5.1.1.1 CONNECT HART Communication Device to transmitter.

5.1.1.2 DISCONNECT thermocouple from temperature transmitter (simulating a thermocouple fault) input terminals 2(+) and 3(-).

5.1.1.3 CONNECT Process Calibrator input (mA) in series with negative loop lead at the transmitter, observing proper polarity.

5.1.1.4 SET Process Calibrator input for maDC.

5.1.1.5 VERIFY analog output value of transmitter using Process Calibrator AND RECORD value as specified in Data Sheet.

5.1.1.6 CONNECT Process Calibrator TC output to transmitter input terminals 2(+) and 3(-).

5.1.1.7 SET Process Calibrator output for T Type thermocouple.

5.1.2 USING HART Communicator, READ active alert values for sensor 1 data AND RECORD active alerts on Data Sheet.

5.1.3 USING HART Communication Device, READ transmitter terminal (body) temperature AND RECORD transmitter terminal (body) temperature on Data Sheet.
5.1 Obtain As-Found Data (Cont.)

5.1.4 APPLY inputs using the values given on the Data Sheet.

5.1.5 RECORD observed output values in "As-Found" column of Data Sheet.

5.1.6 RECORD TFMCS HMI Display “As-Found” values for each input value on the Data Sheet.

Special Instructions

Optimization of the output may be performed at the discretion of the technician even if mA values are within tolerance

5.1.7 IF mA output values are not within tolerance specified on Data Sheet, GO TO Section 5.2.

5.1.8 IF TFMCS HMI Output values are not within tolerances specified on Data Sheet, NOTIFY FWS to CONTACT Engineering.

5.1.9 IF output values are within tolerances specified on Data Sheet, RECORD values in "As-Left" column of Data Sheet.

5.1.10 IF Independent Verifier (Second Technician) is required by Data Sheet, VERIFY on the Data Sheet the output values recorded are within tolerance.

5.1.11 FWS VERIFY on Data Sheet completion of Steps 5.1.9 and 5.1.10

5.1.12 GO TO Section 5.3.
5.2  Calibrate Transmitter

5.2.1 CONNECT HART Communication Device in parallel on current loop as applicable.

5.2.2 USE the Menu Tree or, ENTER the following HART Fast Keys 3,4,5,1 (See Figure 2):
   - 3 – Service Tools
   - 4 – Maintenance
   - 5 – Analog Calibration
   - 1 – Analog Trim

5.2.3 ADJUST Process Calibrator TC output to the minimum input value specified on the Data Sheet.

5.2.4 ALLOW input readings to stabilize on transmitter.

5.2.5 ADJUST Process Calibrator TC to the maximum input value specified on the Data Sheet.

5.2.6 ALLOW input readings to stabilize on transmitter.

5.2.7 APPLY inputs using the values given on the Data Sheet.

5.2.8 USING Process Calibrator, RECORD observed output values in “As Left” column of Data Sheet.

5.2.9 IF values are within tolerance GO TO Step 5.1.9.

5.2.10 IF values are not within tolerance, REPEAT Steps 5.2.3 through 5.2.7 until values are within tolerance specified in the Data Sheet.

5.2.11 IF any problems were encountered with calibration, NOTIFY FWS.
5.3 Restoration

5.3.1 REMOVE Process Calibrator.

5.3.2 RECONNECT thermocouple to terminals 2(+) and 3(-) AND RE-LAND Current Loop Lead.

5.3.3 USING HART Communicator, CLEAR Active Alerts AND DISCONNECT HART Communication Device.

5.3.4 RECORD test equipment information and calibration status on Data Sheet.

5.3.5 NOTIFY operations that testing is complete and instrument may be returned to desired configuration.

5.3.6 CHECK equipment restoration by observing indications are consistent with expected conditions.

5.4 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.

5.5 Review

5.5.1 INFORM FWS test is complete.

5.5.2 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.
5.6 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.

The record custodian identified in the Company-level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 2 – Typical HART Menu Options
Figure 2 – Typical HART Menu Options (Cont.)

Figure 3-3. HART Communicator Menu Tree

NOTE
The review menu lists all of the information stored in the Model 3144P. This includes device information, measuring element, output configuration, and software revision.