Calibration of Rosemount® Model 3051 Smart Series Differential Pressure Transmitters

Tank Farm Maintenance Procedure

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

Change History (≤ Last 5 Rev-Mods)

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides a safe, uniform method for performing calibrations of Rosemount® 3051 series smart differential pressure transmitters.

1.2 Scope

This procedure provides instructions for calibrating Rosemount 3051 series smart differential pressure transmitters.

2.0 INFORMATION

2.1 General Information

2.1.1 Figure 1 shows transmitter details.

2.1.2 Figure 2 shows indicator option.

2.1.3 Figure 3 provides information on test equipment hook up.

2.1.4 Figure 4 gives additional details on setup and calibration.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Equipment Safety

CAUTION - If Rosemount Model 268 Smart Family interface is connected to “test” connections inside transmitter wire side cover, it may result in damage to the transmitter.

3.1.1 Differential pressure transmitter valve operations must be performed in a manner that prevents over-ranging the transmitter.
3.2 Radiation and Contamination Control

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

3.2.2 The opening of any system or component within a Radiological Area requires presence of a Health Physics Technician to verify contamination control.

3.2.3 When disconnecting, breaching, or opening systems or system components that are currently or previously connected to waste tanks or waste transfer systems:

- Follow the RWP for radiological control requirements
- Pre-job and post-job surveys are required
- Follow Calibration Instructions (Attachment 2)

3.3 Environmental Compliance

3.3.1 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

NOTE - Measuring and Test Equipment used to collect acceptance criteria data during performance of this procedure shall meet the following requirements:
- Be within its current calibration cycle as evidenced by an affixed calibration label
- Be capable of desired range
- Accuracy is equal to or greater than M&TE tolerance specified on PM/S data sheet or is at least four times greater than specified device tolerance.

The following supplies may be needed to perform this procedure:
- Rosemount Model 268 smart family interface
- CMD capable of measuring 24 mA with an accuracy that meets the requirements of the PM/S data sheet
- Pressure source with a range and accuracy similar to that of transmitter under test specified by the PM/S data sheet
- A separate gauge may be used to monitor an uncalibrated pressure source. In this case, range and accuracy requirements of the PM/S data sheet apply to monitoring gauge.
- Water trap device Figure 5

4.2 Performance Documents

The following documents may be needed to perform this procedure:
- DOE-0336, Hanford Site Logout/Tagout Procedure.
- Radiological survey plan
- Waste planning checklist
- Pressure M&TE vendor manual.

4.3 Field Preparations

4.3.1 OBTAIN SOM approval before beginning work.

4.3.2 ENSURE system has been isolated, hazardous energy released, and authorized worker requirements are complete in accordance with DOE-0336.
5.0 PROCEDURE

Special Instructions

If equalizing valve or LO side isolation valve does not exist, valve lineups pertaining to those valves are not applicable throughout procedure.

5.1 Setup and Calibration Check

5.1.1 **IF** performing this procedure on a system that has the potential for free liquids or moisture to enter the Pressure M&TE, **USE** a water trap device.

5.1.1.1 **ENSURE** the Water Trap is installed in a vertical position to operate correctly Figure 5

5.1.1.2 **IF** liquids or moisture gets into the Water Trap or Pressure M&TE **REFER** to Attachment 1

5.1.1.3 **IF** performing this procedure on a system that is potentially contaminated, **FOLLOW** Calibration Instructions (Attachment 2).

5.1.2 **CONFIRM** transmitter identification tag and transmitter identification match on calibration data sheet.

5.1.3 **WHEN** installed valve configuration permits, **REMOVE** transmitter from service using the following valving sequence:

5.1.3.1 **CLOSE** HI side isolation valve.

5.1.3.2 **IF** installed, **OPEN** EQUALIZING valve.

5.1.3.3 **IF** installed, **CLOSE** LO side isolation valve.

5.1.3.4 **DRAIN** transmitter.

5.1.3.5 **CONNECT** CMD in series with transmitter output observing proper polarity.

5.1.3.6 **IF** installed, **OPEN** LO side vent valve.

5.1.3.7 **CONNECT** pressure source to HI side of transmitter.

5.1.3.8 **IF** installed, **CLOSE** EQUALIZING valve.

**NOTE** - Input pressures should be allowed to stabilize for at least ten seconds prior to recording transmitter output values.
5.1 Setup and Calibration Check (Cont.)

5.1.3.9 APPLY input pressures as indicated on calibration data sheet AND RECORD CMD and MCS as-found values on data sheet.

5.1.3.10 REDUCE input pressure to zero.

5.1.3.11 IF installed, OPEN EQUALIZING valve.

5.1.3.12 IF as-found values are within tolerances specified on calibration data sheet, RECORD as-left values on data sheet AND GO TO Section 5.4, Return Transmitter to Service. (MCS values on data sheet are for information only.)
5.2 Perform Zero Trim

CAUTION

If Rosemount Model 268 Smart Family interface is connected to “test” connections inside transmitter wire side cover, it may result in damage to transmitter.

5.2.1 CONNECT Rosemount Model 268 smart family interface at any point in transmitter output loop in parallel with the transmitter.

5.2.2 PRESS ON key.

5.2.3 PRESS SAVE key after initial interface diagnostics are complete.

5.2.4 PRESS FORMAT key.

5.2.5 PRESS PROCEED key.

5.2.6 PRESS DGTL TRIM key.

5.2.7 PRESS SNSR TRIM key.

5.2.8 PRESS ZERO TRIM key.

5.2.9 ENSURE no pressure is being applied to the transmitter.

NOTE - While interface is either receiving or sending data, the “4” appears in lower right corner of interface display. The interface will not accept any further keystrokes until the data transfer is complete and the “4” symbol disappears.

5.2.10 PRESS PROCEED key.

5.2.11 AFTER pressure stabilization period ends, PRESS SEND DATA key.

5.2.12 PRESS OFF key.

5.2.13 DISCONNECT interface from transmitter output loop.

5.2.14 IF transmitter EQUALIZING valve is installed, CLOSE valve.
5.3 Obtain As-Left Data

5.3.1 WAIT at least ten seconds for input pressures to stabilize AND RECORD transmitter output values.

5.3.2 APPLY input pressures as indicated on calibration data sheet AND RECORD CMD and MCS as-left values on data sheet.

5.3.3 REDUCE input pressure to zero.

5.3.4 IF as-left values do not meet specified acceptance criteria listed on data sheet, CONTACT FWS/cognizant engineer for evaluation and instruction AND RECORD any additional instructions in the work package.

5.3.5 IF EQUALIZING valve is installed, OPEN valve.

5.4 Return Transmitter to Service

5.4.1 DISCONNECT CMD from transmitter output loop.

5.4.2 RESTORE transmitter wiring.

5.4.3 REMOVE pressure source.

5.4.4 RESTORE process connection.

5.4.5 IF process liquid was used, BACKFILL transmitter using clean supply of process liquid.

5.4.6 IF LO side vent valve is installed, CLOSE valve.

5.4.7 CONFIRM HI side vent valve is closed.

5.4.8 RETURN transmitter to service.
5.5 Restoration

5.5.1 RESTORE to as-found conditions.

5.5.2 INFORM SOM that test is complete and instrument/equipment/system be returned to service.

5.5.3 IF lock and tag was installed, REQUEST its removal.

5.5.4 ENSURE instrument, equipment, or system restoration by observing indications, alarms, or computer points are consistent with expected conditions.

5.6 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).

5.7 Review

5.7.1 INFORM FWS test is complete.

5.7.2 (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.

5.8 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.
Attachment 1 - Water Trap/Pressure M&TE

Water Trap with Potentially Contaminated Liquid

1. If potentially contaminated liquid gets into Water Trap, Suspend the work.
2. Notify the FWS.
3. When provided approval from the FWS proceed as follows.
4. Return to a RMA.
5. Disassemble the Water Trap.
6. Allow trap to dry overnight.
7. Survey disassembled trap components in accordance with Radcon survey plan.
8. If the Water Trap can be released return it to tool crib.
9. If the Water Trap cannot be released, dispose of it per waste planning checklist.

Water Trap with Clean Liquid (NOT Contaminated)

1. If clean liquid gets into Water Trap, disassemble the Water Trap.
2. Allow Water Trap to dry overnight.
3. Re-assemble the Water Trap.
4. Return the Water Trap to the tool crib.
M&TE with Potentially Contaminated Liquid

1. If potentially contaminated liquid gets past water trap and inside Pressure M&TE, Suspend the work.
2. Notify FWS.
3. Wait for further directions.

M&TE with Clean Liquid (NOT Contaminated)

1. If clean liquid gets past the water trap disassemble and dry out Pressure M&TE per manufactures direction.
2. Return the M&TE to the tool crib.
3. Request the M&TE to be returned to NIST calibration lab for recalibration.
Attachment 2 – Calibration Instructions

Positive pressure calibrations:

Note: Vent Valve assembly is required on all positive pressure calibrations to ensure M&TE is not contaminated by venting potential process air back through M&TE.

Install vent valve assembly Per Figure 7

Ensure IV is open and VV is closed

Proceed with calibration per work package

> Whenever venting is required during calibration steps, vent stored pressure as follows.

NOTE – Valve IV can remain open when reading is required via M&TE.

Ensure IV valve is closed
Ensure VV valve is opened
Repeat sequence as necessary to complete the calibration.
After all steps are completed for the calibration, perform RCT survey release plan XXX

Negative pressure calibrations:

Note: use of surrogate filter is required for negative pressure calibrations to ensure M&TE is not contaminated by pulling process air into M&TE while drawing Vacuum.

Negative calibrations should be performed as Follows.

Ensure surrogate filter holder has media installed.
Connect filter in-line per Figure 6
Ensure IV is open.
Pull a representative vacuum into M&TE through filter
Ensure IV is closed.
Vent through VV
RCT to perform survey of the media.
IF no contamination found remove surrogate filter holder/manifo ld and proceed with calibration.
Calibration of Rosemount® Model 3051 Smart Series Differential Pressure Transmitters

Figure 1 – Rosemount 3051 Smart Exploded View

1. Cover
2. Cover O-ring
3. Terminal Block
4. Housing
5. Span and Zero Adjustment
6. Electronics Board
7. Module O-ring
8. Sensor Module
9. Drain/Vent Valve
10. Flange O-ring
11. Process Flange
12. Adapter O-ring
13. Flange Alignment Screw (Not pressure retaining)
14. Bolts
15. Flange Adapters
Figure 2 – Rosemount 3051 Smart Indicator Exploded View
Figure 3 – Rosemount 3051 Field Hook-up

Field Hook-up
(4–20 mA Transmitters).

CAUTION
Do not use inductive-based transient protectors.

Signal point may be grounded at any point or left ungrounded.
Calibration of Rosemount® Model 3051 Smart Series
Differential Pressure Transmitters

Figure 4 - Command Map
1. Gas/Air enters through the top slot which goes into the chamber.
2. Dirt and Moisture particles are collected in the chamber, which is visible through the clear transparent glass window.
3. Then Gas/Dry Air goes into the centre slot where it enters the instrument.
Figure 6 – Negative Pressure Connection
Figure 7 – Positive Pressure Connection