# AP Farm Endress-Hauser Seal Pot Level Indicating Transmitter Calibration

## Tank Farm Maintenance Procedure

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<td>A-2</td>
<td>06/13/2018</td>
<td>Periodic Review</td>
<td>Update to signature lines to match standard.</td>
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<td>Maintenance Requested Change</td>
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<tr>
<td>A-0</td>
<td>06/29/2016</td>
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## Purpose and Scope

### Purpose

The purpose of this procedure is to provide a detailed process for the calibration of the Endress-Hauser Seal Pot Level Indicating Transmitter, specifically for the AP Farm. This procedure aims to ensure the accuracy and reliability of the transmitter readings, which are crucial for the effective operation of the tank farm.

### Scope

This procedure applies to the Endress-Hauser Seal Pot Level Indicating Transmitter used in the AP Farm. It is intended for personnel responsible for performing the calibration according to the outlined steps.

## Information

### Terms and Definitions

- **Calibration**: The process of adjusting the transmitter to ensure it accurately measures and displays the level of the fluid in the seal pot.
- **Bench Calibration**: The calibration performed in a controlled environment to ensure the accuracy of the transmitter.
- **First Signature**: Signature of the person responsible for the initial calibration.
- **Last Signature**: Signature of the person responsible for the final verification of the calibration.

### General Information

- The transmitter is calibrated against a standard reference to ensure its accuracy.
- Proper calibration is essential for maintaining the integrity of the level measurement system.

## Precautions and Limitations

### Personnel Safety

- Wear appropriate personal protective equipment (PPE) such as gloves, safety glasses, and hard hat.
- Follow site-specific safety rules and procedures.

### Radiation and Contamination Control

- Follow radiation safety guidelines to protect personnel from radiation exposure.
- Use proper containment and disposal procedures for any contaminated materials.

### Environmental Compliance

- Ensure compliance with environmental regulations and standards.
- Minimize the impact on the environment during calibration activities.

### Limits

- The calibration accuracy is within ±0.5% of the span.
- The transmitter is tested under conditions that simulate real-world use.

## Prerequisites

### Special Tools, Equipment, and Supplies

- Bench calibration equipment
- Calibration certificate
- Measuring tools

### Performance Documents

- Previous calibration reports
- Manufacturer’s manuals
- Quality control records

### Field Preparation

- Clean access areas for easy servicing.
- Ensure proper electrical and safety connection.

### Field Preparation (Cont.)

- Verify that all necessary tools and equipment are available.
- Confirm that all safety checks have been completed.

## Procedure

### Fill Seal Pot

1. Prepare the equipment and ensure it is connected properly.
2. Start the calibration process by filling the seal pot with the correct fluid.
3. Follow the calibration protocol as outlined in the manufacturer’s documentation.

### Transmitter As-Found values

1. Record the initial values as measured by the transmitter.
2. Compare these values with the expected readings from the calibration.
3. Adjust the transmitter if necessary to match the expected values.

### Adjust Empty Calibr. And Full Calibr. Settings

1. Perform adjustments to the transmitter settings to match the expected performance under various fluid levels.
2. Verify the settings by comparing against the manufacturer’s specifications.
3. Document all adjustments made.

### Install LIT-270 to Seal Pot Flange and Perform Mapping

1. Mount the LIT-270 device on the seal pot flange.
2. Perform mapping to ensure the device is correctly positioned.
3. Record the mapping data for future reference.

### Restoration

1. Revert all systems to their pre-calibration state.
2. Document the final state of the system.
3. Sign off the calibration process.

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**Type**: CONTINUOUS  
**Document No.**: 6-LCD-919  
**Rev/Mod**: A-2  
**Release Date**: 06/13/2018  
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1.0 PURPOSE AND SCOPE

1.1 Purpose

To provide instructions for calibrating Endress-Hauser FMR51 Level Transmitter.

1.2 Scope

This procedure applies to Endress-Hauser FMR51 Level Indicating Transmitters with HART communication protocol, in AP Farm Exhauster seal pots. They communicate to MCS (Monitoring & Control System) and AP Primary Ventilation PLCs and HMI via HART communication protocol.

2.0 INFORMATION

2.1 Terms and Definitions

- HMI - Human Machine Interface
- MPSS – Master Pump Shutdown System
- LIT - Level Indicating Transmitter.

2.2 General Information

NOTE- Endress-Hauser Level Indicating Transmitter, AP241-VTP-LIT-270 will be referred to as LIT-270 throughout procedure.

Anytime LIT-270 is moved to the stand-pipe for calibration, and adjustments are made, Mapping (Section 5.4) must be performed after being returned to the Seal Pot.
3.0  PRECAUTIONS AND LIMITATIONS

3.1  Personnel Safety

3.1.1  Industrial Hygiene monitoring requirements will be specified in the Industrial Hygiene Sample Plan (IHSP).

3.1.2  Contact the facility Industrial Hygienist for the appropriate IHSP.

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 TFC-ESHQ-RP_RWP-C-03, ALARA Work Planning.

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

3.3  Environmental Compliance

3.3.1  Environmental requirements for work conducted on potentially contaminated ventilation systems shall be accomplished in accordance with the following:

3.3.1.1  Radiological controls and monitoring shall be in accordance with the latest revision of HNF-5183.

3.3.1.2  Equipment with removable contamination and/or work with removable contamination will be contained per the latest revision of the Containment Selection guide, Attachment A, in TFC-ESHQ-RP_RWP-C-02.

3.3.1.3  Pre- and post-job surveys (smears) shall be taken.

3.3.1.4  A maximum of sixty (60) gallons of raw water per discharge is allowed in a Contamination Area in accordance with TFC-ESHQ-ENV_RM-C-04, Water Discharge In Tank Farm Facilities. No pooling of liquids is allowed and avoid soil erosion. Captured liquid SHALL be dispersed/disposed of in a controlled manner.

3.4  Limits

ALARACT 16, Tank Farm ALARACT Demonstration for Work on Potentially Contaminated Ventilation System Components
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:
- HMI Exhauster Engineering level password, from Shift Manager
- Fluke 741 Process Calibrator (set to loop excitation)
- HART 475 hand held controller (optional)
- Calibrated DMM
- Power Supply, that can provide 10.4 to 48 Vdc (optional for use with HART)
- 250 ohm precision resistor (optional for use with HART)
- Tape Measure ≈ 10 feet
- Stand-Pipe designed for testing Seal Pot transmitter, LIT-270
- Extension Cable/Wire (for testing transmitter on Stand-Pipe)
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following document may be needed to perform this procedure:
- Endress-Hauser Micro Pilot FMR51 Level manual BA01049F/00/EN/04.16
- H-14-020103, Sh.11 A-Train Exhauster for AP Farm
- H-14-020103, Sh.12 B-Train Exhauster for AP Farm.
- H-14-020103, Sh.15 Seal Pot AP241-VTP-SP-270 and LIT-270
- H-14-040103 Sh. 37 Instrument Loop Diagram, Enclosure 102

4.3 Field Preparation

4.3.1 REPORT all discrepancies to OE immediately upon completion of this procedure AND

   RECORD in comment section of Work Package.

4.3.2 IF equipment is found out of service, NOTIFY Shift Manager and OE immediately.
4.3 Field Preparation (Cont.)

4.3.3 OBTAIN Shift Manager Approval to perform this procedure.

____________________  /  __________________________  /  
Signature                          Print (First & Last)                       Date
Shift Manager /OE

4.3.4 IF system will be shut-down or modified, VERIFY Shift Manager/OE has been informed of planned maintenance and possible impact on MPS waste transfer equipment and there are no ongoing waste transfers associated with this equipment.

____________________  /  __________________________  /  
Signature                          Print (First & Last)                       Date
Shift Manager /OE

4.3.5 IF system will be shut-down or modified, VERIFY Shift Manager has been notified of possible expected alarms which may be caused by performance of this procedure.

____________________  /  __________________________  /  
Signature                          Print (First & Last)                       Date
Shift Manager /OE
5.0 PROCEDURE

5.1 Fill Seal Pot

5.1.1 FILL primary exhauster seal pot of the train that is not currently running.

5.1.2 ENSURE appropriate overflow Valve/Train identified below, is OPEN AND PLACE check (✓) mark in the appropriate box

<table>
<thead>
<tr>
<th>AP Farm Overflow Valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhauster Train</td>
</tr>
<tr>
<td>A-Train</td>
</tr>
<tr>
<td>B-Train</td>
</tr>
</tbody>
</table>

5.1.3 REQUEST HPT pre-job survey of fill valve area (ALARACT 16).

5.1.4 REMOVE plug from appropriate Fill Valve/Train identified below, AND PLACE check (✓) mark in the appropriate box

<table>
<thead>
<tr>
<th>AP Farm Fill Valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhauster Train</td>
</tr>
<tr>
<td>A-Train</td>
</tr>
<tr>
<td>B-Train</td>
</tr>
</tbody>
</table>

5.1.5 ATTACH funnel or fill hose to Fill Valve, as required.

5.1.6 OPEN fill valve identified in Step 5.1.4.

5.1.7 SLOWLY ADD water to seal pot.

NOTE - Exhauster Seal pots are connected to de-entrainer seal pot. At approximately 84% level, exhauster seal pot will spill over into de-entrainer seal pot. The de-entrainer overflow level is approximately 56.5%.

5.1.8 CONTINUE FILLING exhauster seal pot until de-entrainer seal pot has reached the overflow (the de-entrainer level stops rising).

5.1.8.1 WHEN de-entrainer seal pot level does not increase further, STOP adding water.
5.1 Fill Seal Pot Error! Reference source not found. (Cont.)

5.1.9 CLOSE appropriate fill valve opened in Step 5.1.6.

5.1.10 REMOVE funnel or fill hose, as applicable.

5.1.11 REINSTALL seal pot plug in fill valve identified from Step 5.1.4.

5.1.12 REQUEST HPT to perform post-job survey of fill valve area (ALARACT 16).
5.2 Transmitter As-Found values

Special Instructions

The De-Entrainer Seal Pot must be filled to the “Overflow” pipe level to set the baseline “L”; this is the normal Seal Pot level, and is used as a reference point when performing mapping on the stand-pipe and Seal Pot. The level can be less than normal (±13”) due to evaporation (see Figure 1).

5.2.1 FILL seal pot per Section 5.1 PRIOR to taking initial level reading.

5.2.2 AFTER LIT-270 is stabilized, READ seal-pot level from Level Indicating Transmitter, LIT-270 AND

RECORD Seal Pot level on PM Data Sheet.

5.2.3 USING a sharpie permanent marker or equivalent, MARK transmitter orientation on transmitter base to flange for re-installation purposes.

5.2.4 DE-ENERGIZE power to LIT-270 by removing Fuse FU3, from Terminal Block 2, at AP241-VTP-ENCL-102.

5.2.5 UNPLUG field wiring from LIT-270.

5.2.6 REMOVE LIT-270 from seal pot AND

COVER hole with blind flange.

5.2.7 EXIT farm AND PREPARE for Bench Cal.

5.2.8 LOCATE Stand-Pipe (fabricated specifically for testing LIT-270) in a vertical position with access to the flange for mounting level transmitter and connecting M&TE test setup, AND

5.2.9 SECURE LIT-270 to Stand Pipe.

5.2.10 CONNECT M&TE test hook-up (see Figure 4) to level transmitter, LIT-270 ensuring polarity is correct.

5.2.11 ENERGIZE power to LIT-270 AND allow time for self check.

5.2.12 CONNECT water supply to inlet valve on stand-pipe.
5.2 Transmitter As-Found values (Cont.)

5.2.13 MONITOR Tygon sight tube AND

ADD OR REMOVE water to Stand-Pipe to reach the approximate minimum level per Data Sheet; 4 mA (0% = 87.625” from flange) see Figure 2.

NOTE - Stand pipe must have correct water level to obtain the correct 0%

5.2.14 REFER to Figure 4, Test Equipment Hook-Up.

5.2.15 PERFORM one of the following:

5.2.15.1 CONNECT Fluke Process Calibrator AND

SET to loop excitation,

OR

5.2.15.2 CONNECT HART Hand Held Communicator and 250Ω load resistor,

OR

5.2.15.3 UNSCREW the transmitter cover for access to the faceplate pushbuttons for operations.

5.2.16 CONNECT DMM for mAdc reading.

5.2.17 APPLY input levels per Data Sheet AND

RECORD mA output values in As-Found section of Data Sheet.

5.2.18 IF As-Found values are not within tolerance per Data Sheet, RE-PERFORM Steps 5.2.13 through 5.2.18 up to two times AND IF unable to bring in tolerance, GO TO Calibration Section 5.3, to Adjust Empty Calibr. and Full Calibr. Settings.

5.2.19 IF As-Found values are within tolerance per Data Sheet, RECORD in As-Left Section of Data Sheet.

5.2.19.1 DRAIN stand pipe AND REMOVE all test equipment

5.2.19.2 REMOVE LIT-270

5.2.19.3 GO TO Section 5.4 to perform Mapping.
5.3 Adjust Empty Calibr. And Full Calibr. Settings

5.3.1 REFER to Figure 1 and Figure 2 for level descriptions and measurements.

5.3.2 RETURN stand-pipe water level to minimum level “E” (0% = 87.625” from flange).

5.3.3 GO TO “SETUP” menu; SCROLL down to “Empty calibr.” AND USE keypad to input “Empty Calibration” measurement “E” per Data Sheet.

5.3.4 RAISE level in stand pipe to maximum level “F”, (100% = 23” from 0% level).

5.3.5 SCROLL down to “Full Calibr.” AND USE keypad to input “Full Calibration” measurement “F” per Data Sheet.

5.3.6 ALLOW time for transmitter to perform self-check and stabilize.

5.3.7 APPLY input water levels per Data Sheet AND CHECK output mA values for tolerance.

5.3.8 IF values are not within tolerance per Data Sheet, REPEAT Steps 5.3.1 thru 5.3.8, AND IF unable to bring to tolerance, NOTIFY FWS for resolution.

5.3.9 IF values are within tolerance RECORD “Empty Calibr.” and “Full Calibr.” mA output values in As-Left section of Data Sheet.

5.3.10 ENSURE all of the water in the stand-pipe has been drained.

5.3.11 REMOVE all test equipment AND DISCONNECT LIT-270

5.3.12 CONTINUE to Section 5.4.
5.4 Install LIT-270 to Seal Pot Flange and Perform Mapping

**Special Instructions**

Anytime LIT-270 is moved to a stand-pipe for calibration, and adjustments are made; mapping must be performed after being returned to the Seal Pot.

5.4.1 **MOVE** LIT-270 to Seal Pot.

5.4.2 **ADJUST** LIT-270 to the alignment marks for proper orientation of the transmitter base to flange.

5.4.3 **SECURE** LIT-270 to Seal Pot mounting Flange.

5.4.4 **RECONNECT** field wiring to LIT-270.

5.4.5 **ENERGIZE** power to LIT-270 by installing Fuse FU3, to Terminal Block 2, at AP241-VTP-ENCL-102 AND **ALLOW** time for transmitter to perform self-check and stabilize.

**Special Instructions**

“Distance OK” to be selected if the measured distance (E – L = D) matches the actual distance (If so, the device performs a mapping automatically).

Seal Pot must be full or at overflow

The actual distance (level) should be \( \geq 13" \) or 56.5\% of Span, which is at the Seal Pot overflow to the De-Entrainers (Figure 1).

5.4.6 **GO TO** Setup menu, **SCROLL** down to “Confirm Distance” AND **SELECT** “Distance OK”.

5.4.7 **ALLOW** time for unit to perform a mapping.

5.4.8 **AFTER** the mapping is complete and the unit has stabilized, **READ** current seal-pot level from Level Indicating Transmitter, LIT-270 AND **COMPARE** with reading taken in Step 5.2.2.
5.4  **Install LIT-270 to Seal Pot Flange and Perform Mapping (Cont.)**

5.4.9  **IF** the seal pot reading is not within tolerance per Data Sheet **REPEAT** Steps 5.4.6 through 5.4.8  **AND**

**IF** unit is still not in tolerance, **NOTIFY** FWS for resolution.

5.4.10 **IF** the seal pot reading is within tolerance per Data Sheet **RECORD** in the As-Left section of Data Sheet.

5.4.11 **IF** directed by FWS, **FILL** Seal Pot per Section 5.1.

5.4.12 **GO TO** Restoration Section 5.5.
5.5 Restoration

5.5.1 **ENSURE** all test equipment is disconnected and removed.

5.5.2 **RETURN** transmitter to service.

5.5.3 **ENSURE** any/all alarms associated with level transmitter have cleared.

5.5.4 **IF** required, **FORWARD** copy of Device ID to Engineering to update Component Index Form.

5.5.5 **INFORM** Shift Manager and FWS test is complete and exhauster may be returned to operation as desired.

5.5.6 **RECORD** in COMMENTS/REMARKS section of Work Package, work request number(s) of any work documents generated as a result of this procedure, if applicable.

5.6 Records

5.6.1 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 1 – Graphic Illustration for Actual Measurements at De-Trainer Seal Pot

Excerpt from Drawing H-14-109467 Sheet 4

Distance “D” Measurement Varies With the Seal Pot Level (E – L = D)
Figure 2 – Level Calibration Using Stand Pipe

Stand Pipe measurements are same as Seal Pot Measurements

R = Reference
E = Empty Calibration
F = Full Calibration
L = Level Measurement
D = Distance Measurement

E - L = D

Tygon Sight Tube

100%

100% LEVEL = 20.0 mA
D = 64.625"

56.5% (D = 74.625"
Normal Level
(Seal Pot Overflow)

0 % Level = 4.0 mA
D = 87.625"

Drain Valve

Hose Connection

Support Plate

D as shown is = to 74.625"

Stand Pipe measurements are same as Seal Pot Measurements
Figure 3 – Remote Operation via HART Protocol

Via HART protocol

1. PLC (Programmable logic controller)
2. Transmitter power supply unit, e.g. RN221N (with communication resistor)
3. Connection for Commubox FXA191, FXA195 and Field Communicator 375, 475
4. Field Communicator 475
5. Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
6. Commubox FAX191, (RS232) or FXA195 (USB)
7. Field Xpert SFX350/SFX370
8. VIATOR Bluetooth modem with connecting cable
9. Transmitter
10. 250 ohm resistor for HART loading and Bluetooth modem
2-wire: 4–20mA HART

<table>
<thead>
<tr>
<th>10</th>
<th>Terminal assignment 2-wire: 4-20mA HART</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Without integrated overvoltage protection</td>
</tr>
<tr>
<td>B</td>
<td>With integrated overvoltage protection</td>
</tr>
<tr>
<td>1</td>
<td>Active barrier with power supply (e.g. RN121N): Observe terminal voltage</td>
</tr>
<tr>
<td>2</td>
<td>HART communication resistor (±250 Ω): Observe maximum load</td>
</tr>
<tr>
<td>3</td>
<td>Connection for Commubox FXA195 or Fieldxpert SFX350/SFX370 (via VIATOR Bluetooth modem)</td>
</tr>
<tr>
<td>4</td>
<td>Analog display device: Observe maximum load</td>
</tr>
<tr>
<td>5</td>
<td>Cable screen; observe cable specification</td>
</tr>
<tr>
<td>6</td>
<td>4-20mA HART (passive): Terminals 1 and 2</td>
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<tr>
<td>7</td>
<td>Overvoltage protection module</td>
</tr>
<tr>
<td>8</td>
<td>Terminal for potential equalization line</td>
</tr>
<tr>
<td>9</td>
<td>Cable entry</td>
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