

|                                 |                                                    |                         |                  |
|---------------------------------|----------------------------------------------------|-------------------------|------------------|
| <b>Your Company Name / Logo</b> | <b>TEMPERATURE TRANSMITTER<br/>CALIBRATION SOP</b> | Doc no: SOP<br>INST 003 | Rev: 0           |
| Department: Instrumentation     | Standard operating procedure                       | Date:                   | Page: see footer |

## 1. Purpose

To verify that temperature transmitters convert the sensor signal to the correct 4 to 20 mA output within tolerance.

## 2. Scope

Temperature transmitters with Pt100 (2, 3 or 4 wire) or thermocouple inputs and 4 to 20 mA or HART output. Sensor checks are covered in a separate SOP.

## 3. References

- IEC 60751 (Pt100 tables)
- IEC 60584-1 (thermocouple tables)
- Transmitter manual and data sheet

## 4. Responsibilities

- Instrument technician: carries out the work and records results.
- Instrument engineer or supervisor: reviews and approves the records.
- Operations: grants the permit, isolates the process and returns the equipment to service.

## 5. Safety precautions

- Work only under a valid permit to work and follow the site isolation (lockout tagout) procedure.
- Wear the PPE required for the area: safety helmet, glasses, gloves and safety shoes as a minimum.
- In hazardous areas use certified or intrinsically safe test equipment, or obtain a gas free certificate and hot work permit.
- Inform the control room before starting, and before returning the instrument to service.
- Open transmitter heads in hazardous areas only when the area is gas free or the circuit is intrinsically safe and the permit allows it.

## 6. Tools and equipment

- RTD and thermocouple simulator / calibrator with cold junction compensation
- mA meter or documenting calibrator
- HART communicator
- Correct thermocouple extension or compensating wire for the simulator connection

## 7. Prerequisites

- Loop in manual and trips bypassed as approved.
- Sensor type, wiring and range confirmed from the data sheet.

## 8. Procedure

### 8.1 Preparation

- 8.1.1 Disconnect the sensor wires from the transmitter and label them.
- 8.1.2 Connect the calibrator to the input terminals using the same wiring (3 wire for a 3 wire RTD; thermocouple wire of the same type for thermocouples).
- 8.1.3 For thermocouples, use the calibrator's internal cold junction compensation, or simulate the mV value directly with the transmitter's CJC disabled as per the manual.

### 8.2 As found test

- 8.2.1 Simulate 0, 25, 50, 75 and 100 % of the calibrated range and record the output.
- 8.2.2 Record the simulated value ( $\Omega$  or mV) and the expected mA.

8.2.3 Calculate errors in % of span.

### 8.3 Adjustment and as left

8.3.1 If out of tolerance, perform the input (sensor) trim and/or output trim as described in the manual.

8.3.2 Repeat the test and record the as left values.

### 8.4 Return to service

8.4.1 Reconnect the sensor wires exactly as before; check terminal tightness.

8.4.2 Close the head cover with its seal in place.

8.4.3 Confirm a sensible temperature reading in the DCS.

## 9. Acceptance criteria

- As left errors within tolerance (typically  $\pm 0.25$  % of span).
- Sensor reconnected and reading correct.

## 10. Records

- Temperature transmitter calibration report (free template: [instrumentationblog.in/downloads/templates/temperature-transmitter-calibration-report/](http://instrumentationblog.in/downloads/templates/temperature-transmitter-calibration-report/))

## 11. Approval

|           | Prepared by | Reviewed by | Approved by |
|-----------|-------------|-------------|-------------|
| Name      |             |             |             |
| Signature |             |             |             |
| Date      |             |             |             |

*This procedure is a generic template. Adapt it to your site permit system, the manufacturer instructions and your quality system before use.*