

PROCEDURE FOR CALIBRATING, STANDARDIZING OR CHECKING EQUIPMENT

Revised 07/08, 3/11, 12/15

PROCEDURE #44

Equipment Standardized:

THERMOMETERS (General Purpose, Hi-Lo and Infrared)

T 49, T 51, T 100, T 104, T 166, T 202, T 209, T 228, T 245, SD 102, SD 304, SD 310, SD 312, SD 313, SD 408

Purpose:

To provide instructions for standardizing the accuracy of general purpose thermometers.

Inspection Equipment Required:

1. NIST Certified or calibrated thermometer
2. Oil or water bath
3. Furnace or oven capable of 200-400°C

Tolerance:

Thermometers shall meet the temperature range requirements found in the appropriate test methods listed above.

Procedure:

1. Obtain a thermometer that is NIST certified or calibrated for the temperature ranges that will be used during standardization procedure.
2. Determine the required accuracy, thermometer identification number, immersion depth and the calibration points needed over the range of use. For liquid-in-glass thermometers, verify that the condition of the liquid column has no gaps in the column or filled chamber.
3. Place NIST certified or calibrated thermometer in the oil or water bath and adjust the bath to the temperature range of the thermometer to be tested.

NOTE: If thermometer reaches temperatures exceeding 200°C, utilize an oven or furnace capable of higher temperatures. Place sand in container suitable for 1.5 inches of immersion. Heat the oven to required temperature. Place NIST certified thermometers and thermometers to be calibrated in a visible area and proceed with the next steps.

4. After the temperature has stabilized, place the thermometer being tested next to the NIST certified or calibrated thermometer.
5. Record the reading from the thermometer being tested and the temperature of the NIST certified or calibrated thermometer.
6. Repeat steps 3-5 for a minimum of three separate temperature points over the range of use.
7. If needed, adjust thermometer to correct temperature and retest. A correction factor may be applied to non adjustable thermometers up to $\pm 5.0^{\circ}\text{F}$ or $\pm 2.8^{\circ}\text{C}$.

Purpose:

To provide instruction for standardizing accuracy of Hi-Lo thermometers.

Inspection Equipment Required:

1. Standardized fluke thermometer or equivalent.
2. Plastic or cardboard container

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Tolerances:

Thermometers shall meet the temperature range requirements found in the appropriate test methods listed above.

Note: Hi-Lo thermometers are to be used for information only.

Procedure:

1. Place the fluke and Hi-Lo thermometers next to each other to determine accuracy at room temp, and let stabilize.
2. Record the temperatures of both thermometers.
3. Place fluke probe and Hi-Lo in a freezer. The fluke probe and the Hi-Lo need to be in an empty plastic or cardboard container so that the temperature readings are not affected by air movement in the freezer.
4. Record the temperatures of both thermometers.
5. A correction may be applied to Hi-Lo thermometers up to $\pm 5.0^{\circ}\text{F}$ or $\pm 2.8^{\circ}\text{C}$.

THERMOMETERS (General Purpose, Hi-Lo and Infrared)

Purpose:

To provide instruction for standardizing accuracy of Infrared thermometers.

Inspection Equipment Required:

1. Calibrated fluke thermometer or equivalent.
2. Steel bar that has the approximate dimensions of 3" x 4" x 1". Bar must have a longitudinal drilled hole so that the fluke probe tip can be inserted to the midpoint of bar.
3. Electric hot plate.
4. New batteries.

Tolerances:

Thermometers shall meet the temperature range requirements found in the appropriate test methods listed above.

Note: Infrared thermometers are to be used for information only.

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Procedure:

1. Place steel bar with fluke probe inserted on the hot plate.
2. Turn on hot plate and allow one hour for steel bar to reach the testing temperature of $285^{\circ} \pm 10^{\circ}\text{F}$. Allow $\frac{1}{2}$ hour for temperature of steel bar to stabilize if hot plate temperature is adjusted.
3. Install new batteries in infrared thermometer.
4. Take three temperature readings by holding the infrared thermometer approximately 12" above and perpendicular to the steel bar surface. For best results, shoot towards the end of the steel bar opposite of the end where the probe was inserted. Allow a couple of minutes between readings for the gun to cool.
5. Record the average reading from the infrared thermometer and temperature from the fluke.
6. A correction factor may be applied to the Infrared thermometer up to $\pm 15.0^{\circ}\text{F}$ or $\pm 9.4^{\circ}\text{C}$.