

QAM-I-115

## Operation and Calibration of the IR Thermometer

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**1. Applicability and Purpose**

This procedure applies to the operation and calibration of the infrared (IR) thermometer. The purpose for this procedure is to provide a method for operation and calibration of a gun type infrared thermometer. These guidelines assure quality of data and uniformity of techniques between analysts.

**2. Definitions**

- i. Field of view refers to the area the thermometer “sees.” The field of view is one eighth of the distance between the instrument and the surface being measured. For example if the target area is 200 mm away from the front of the thermometer the area being measured is 25 mm.
- ii. Type II ASTM water: deionized water that meets the criteria set by the American Society for Testing and Materials. Type II water has a maximum specific conductivity of 1.0  $\mu\text{mho}/\text{cm}^2$ .

**3. Equipment, Reagents and Standards**

- i. Equipment
  - a. Infrared Thermometer with at least a 1 decimal point reading, a calibrated tolerance of  $\pm 1^\circ\text{C}$ , and calibrated for accuracy from about  $-5^\circ\text{C}$  up to at least  $40^\circ\text{C}$  as compared to an NIST thermometer.
  - b. Hot plate, standard laboratory type
  - c. Laboratory glassware
  - d. Freezer, household or standard laboratory type
  - e. Laboratory oven
  - f. Refrigerator, household or standard laboratory type.
- ii. Reagents
  - a. Water, oil, sand or other medium which can maintain a temperature for an extended period better than air
- iii. Standards
  - a. A precision thermometer certified by the National Institute of Standards and Technology (NIST). This thermometer is kept and maintained by the Laboratory Manager. The NIST thermometer is calibrated by a vendor. All vendor NIST traceability certificates will bracket the range of use for calibration standards (ex.  $-5^\circ\text{C}$  to  $40^\circ\text{C}$  for sample receipt).

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**4. Procedure**

- i. Instrument Set Up
  - a. Turn on the IR thermometer by pressing and releasing the ON/HOLD trigger key.
  - b. Ensure that measurements are in Celsius.
- ii. Calibration
  - a. Thermometer calibration is verified annually. More frequent verification may be needed if the thermometer is jarred or other conditions arise which compromise accuracy.
  - b. Choose two temperatures for calibration at points which bracket the working range, normally between -5 and 40°C. The temperature chosen is within reasonable proximity to the upper and lower limits of the scale of the IR thermometer in any case.
  - c. Suspend the NIST traceable thermometer in a glass container of water, oil, sand or other media and alternately place the container in a temperature controlled climate (freezer, refrigerator, oven or at room temperature) to achieve the desired temperatures for calibration. Allow the media and container to adjust to the desired temperature.
  - d. Read the temperature with the NIST thermometer and the IR thermometer and record values in the Thermometer Calibration Verification Log (E-log).
  - e. Record the correction factor (CF), which is the difference between the NIST and IR thermometers. The CF, observed temperature and corrected temperature are recorded for each measurement to be written, including a CF of zero.
  - f. If the temperature agrees with the NIST traceable thermometer within 1°C, the thermometer is placed into service. If the temperature is not within 1°C, the thermometer is tagged as out of service, and repaired or disposed of properly. Some IR thermometers may not agree within 1°C at low temperatures. In these cases the thermometer may be used with a correction factor.
- iii. Sample Measurement
  - a. Point the thermometer so that the field of view is intersecting the object to be measured.

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- b. Be sure that the target area is larger than the unit's field of view. The smaller the target the closer you should be to it. When accuracy is critical make sure the target is at least twice as large as the field of view.
- c. Press and hold the ON/HOLD trigger key until the temperature stabilizes.
- d. Read the temperature on the display and record.
- iv. Instrument Shut Down
  - a. The thermometer will power off automatically a few seconds after the ON/HOLD trigger key is released.

**5. Quality Control and Safety Aspects**

- i. All data are documented and maintained in accordance with, QAM-A-102, "Document and Data Control". All raw data are recorded in the appropriate logbook or E-log.
- ii. All aspects of this procedure comply with QAM-Q-101, "Laboratory Quality Control" and QAM-S-101, "Laboratory Safety."
- iii. The analyst should be trained prior to performing this procedure on actual samples or data collection.
- iv. Do not let the laser beam enter the eye of a person or animal.
- v. Do not let the beam reflect off of a surface and strike the eye.
- vi. Do not allow the laser beam to impinge on explosive gases.

**6. References**

- i. Operation Manual Infrared Thermometer, Sper Scientific™.
- ii. Standard Methods for the Examination of Water and Wastewater, latest approved Edition, ed. by Arnold E. Greenberg, et al., APHA, AWWA, Washington, D.C.
- iii. The National Environmental Laboratory Accreditation Conference Institute (TNI) standard, 2016.

**7. Attachments**

None