To perform the test:

STEP 1 Isolate the sensor from the process.

STEP 2 Fully immerse the sensor into a precision temperature source such as a dry-well or bath capable of covering the required temperature range.

STEP 3 To check the calibration of the thermocouple separately from control system temperature indicator, disconnect the thermocouple from the electronics.

STEP 4 Connect the thermocouple to a precision instrument capable of measuring millivolts. (The process version of Field Metrology Wells have the required electronics built in.)

STEP 5 If the thermocouple has a reference junction (most do not), then ensure that the reference junction is also immersed at the required reference temperature. Usually, this is 0 °C.

STEP 6 Typically, the thermocouple will not have a reference junction. In that case, ensure that the precision voltage measurement device has reference junction compensation (may be identified as RJC or CJC) turned on.

STEP 7 Adjust the temperature of the bath or dry-well to each of the test points. (With Field Metrology Wells these test points can be preprogrammed and automated.)

STEP 8 At each test point record the readings of the temperature standard and thermocouple.

STEP 9 If measuring the thermocouple separate from its measurement electronics, compare the measured voltage to the expected voltage from the applicable temperature table. Otherwise, compare the reading on the instrument display to the reading of the temperature standard (which may be the dry-well).

TECH TIPS

- Depending on the thermocouple, incorrectly setting reference junction compensation may result in a temperature error of around 23 °C. Also, the reference junction compensation accuracy of the meter may be the largest contributor to the error.
- Thermocouple wire generates a voltage whenever two adjacent points along the wire are at different temperatures.
- The whole length of the wire (not just the probe tip) generates the voltage. This means the whole wire needs to be treated carefully and considered during the calibration.

Additional resources

For more in depth information about this application check out these videos and application notes from Fluke.

Thermocouple Fundamentals application note