Temperature calibration

Temperature calibration refers to the calibration of any device used in a system that measures temperature. Most importantly, this usually means the temperature sensor, itself, which is typically a platinum resistance thermometer (PRT or PT-100), thermistor, or thermocouple. Readings from these thermometers are made by “thermometer readout” devices which measure their electrical outputs and convert them to temperature according to the International Temperature Scale of 1990 (ITS-90).

Thermometers are typically calibrated by placing them in a stable temperature environment (heat source) and comparing their output to that of a calibrated “reference thermometer” or “standard thermometer.” Fluke Calibration provides three general categories of heat sources: industrial heat sources (dry-well calibrators, Micro-Baths, etc.) for field use; fluid baths and thermocouple furnaces for laboratory use; and fixed-point cells for “primary” calibrations. Fluke Calibration also offers a variety of reference thermometers, including SPRTs, and thermometer readout instruments.

In addition, Fluke Calibration provides laboratory and field solutions for calibrating the electronics used in temperature measurement circuits.

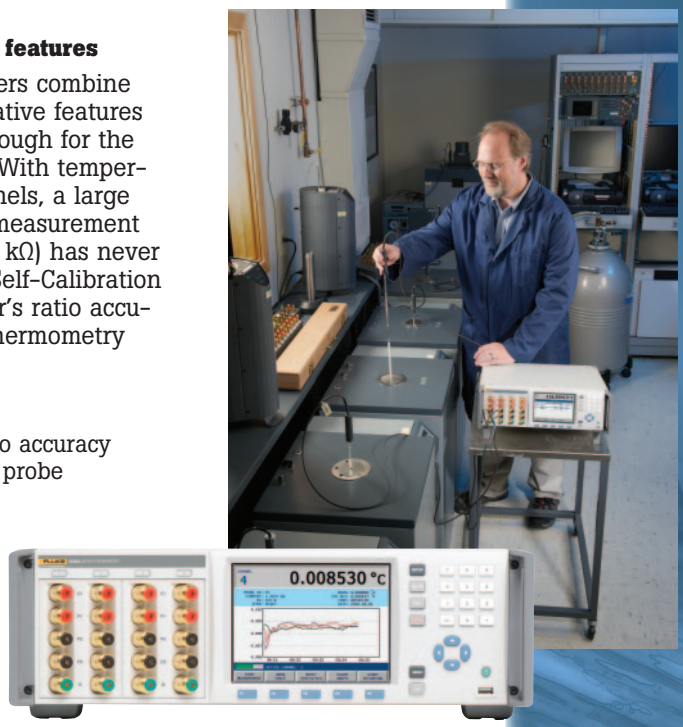
Product highlights

1594A/1595A Super-Thermometers

Thermometry bridge accuracy combined with time-saving features

The Fluke Calibration 1594A and 1595A Super-Thermometers combine the accuracy of complex and expensive bridges with innovative features that simplify measurement processes. They are accurate enough for the primary lab and economical enough for the secondary lab. With temperature-controlled internal reference resistors, six input channels, a large graphical display, and a multitude of temperature-specific measurement functions, PRT, thermistor and SPRT calibration (0 Ω to 500 kΩ) has never been so easy and economical. And with the built-in Ratio Self-Calibration function, you can verify or calibrate the Super-Thermometer's ratio accuracy in-house with the press of a button—no other single thermometry bridge can do so much.

- Calibrate SPRTs, PRTs, RTDs and thermistors (0 Ω to 500 kΩ)
- Accuracy as good as 0.06 ppm (0.000015 °C)
- "Ratio Self-Calibration" verifies and calibrates resistance ratio accuracy
- Automatic zero-power measurements calculate thermometer probe self-heating
- Temperature-controlled internal reference resistors
- Calibrated sensing current lowers overall instrument uncertainty
- Four input channels on the front panel accept sensors under test or external references
- Two dedicated external reference input channels on the rear panel



9142/9143/9144 Field Metrology Wells

Small temperature sources for big field applications

The 914X Series Field Metrology Wells extend high performance to the industrial process environment by maximizing portability, speed, and functionality with little compromise to metrology performance.

Field Metrology Wells are packed with functionality and are remarkably easy to use. They are lightweight, small, and quick to reach temperature set points, yet they are stable, uniform, and accurate. These industrial temperature loop calibrators are perfect for performing transmitter loop calibrations, comparison calibrations, or simple checks of thermocouple sensors. With the "process" option, there is no need to carry additional tools into the field. This optional built-in two-channel readout reads resistance, voltage, and 4–20 mA current with 24 volt loop power. It also has on-board automation and documentation. Combined, the three models (9142, 9143, and 9144—each with a "process" option) cover a wide temperature range of –25 °C to 660 °C.

- Lightweight, portable, and fast
- Cool to –25 °C in 15 minutes and heat to 660 °C in 15 minutes
- Built-in two-channel readout for PRT, RTD, thermocouple, 4–20 mA current
- True reference thermometry with accuracy to ± 0.01 °C
- On-board automation and documentation
- Metrology performance in accuracy, stability, uniformity, and loading

Temperature calibration

Standard Platinum Resistance Thermometers (SPRTs)

5681, 5683, 5684, and 5685 Quartz-Sheath SPRTs

The performance you expect from world-class SPRTs.

- Drift rates as low as 0.0005 K
- Proprietary gas mixtures ensures high stability
- Most experienced SPRT design team in the business

5698-25 Working Standard SPRT

High performance-to-price ratio.

- Conforms to ITS-90 SPRT Guidelines
- Drift rate typically 0.003 °C
- Calibration options by fixed point

5686-B Glass Capsule SPRT

Designed for metrology work requiring small SPRTs.

- Temperatures from -260 °C (13 K) to 232 °C
- Stability typically 0.001 °C over 100 °C range
- Miniature capsule package eliminates stem conduction

5699 High-Temperature Metal-Sheath SPRT

Affordable working standard SPRT.

- Range to aluminum point (660 °C)
- Inconel™ sheaths guard against contamination of sensor
- Drift rates less than 8 mK/year

ITS-90 Fixed-Point Cells

5901 Triple Point of Water Cells

Must-have, primary temperature standards.

- Easy-to-use, inexpensive standard with uncertainty better than ± 0.0001 °C
- Four sizes and two shells (glass and quartz) to choose from
- Isotopic composition of Vienna Standard Mean Ocean Water

ITS-90 Fixed-Point Cells

Best cell uncertainties commercially available.

- Every ITS-90 fixed point available from mercury to copper
- Plateaus last days (gallium for weeks and TPW for months)
- Manufactured and tested by Fluke Calibration's primary standards scientists

Mini Fixed-Point Cells

Least expensive, easiest-to-use fixed-point standards.

- Lower uncertainties than comparison calibrations
- All ITS-90 fixed points from TPW to copper
- Reduced equipment and annual recalibration costs

Cell Maintenance Apparatus

9114, 9115A, 9116A Freeze-Point Furnaces

Designed for maximum-length plateaus.

- Designed to extend plateaus
- High-stability OEM controllers, RS-232 included
- External cooling coils

9210 Mini Triple Point of Water Maintenance Apparatus

Simple supercool-and-shake realization and maintenance of the 5901B Mini TPW Cell.

- Easy preprogrammed realization
- Inexpensive fixed-point solution
- Training complete in less than an hour

9230 Gallium Cell Maintenance Apparatus

Realize and maintain the melting point of the 5943 Gallium Cell.

- One week plateau duration
- No hassle automatic realizations
- Used daily in our Primary Lab

9260 Mini Fixed-Point Cell Furnace

Inexpensive, easy-to-use fixed-point maintenance apparatus.

- Realize and maintain In, Sn, Zn and Al fixed-point cells
- Good introduction to fixed-point calibration
- User friendly and inexpensive

7012/7312 Triple Point of Water Maintenance Baths

Keep your cells up and running reliably for weeks at a time.

- Maintains TPW cells for up to six weeks
- Optional immersion freezer for simple cell freezing
- Up to 496 mm (19.5 in) of immersion depth

9117 Annealing Furnace

Keeps SPRTs and PRTs performing at their highest levels

- Relieves mechanical strain
- Guards against contamination
- Anneals both SPRTs and HTSPRTs

7196 LN_2 Comparison Calibrator

Lowest-cost calibration to -196 °C.

- Simple to use
- Uncertainty less than 2 mK

Temperature calibration

Thermometer Readouts

1594A/1595A Super-Thermometers

Thermometry bridge accuracy combined with time-saving features.

- Calibrate SPRTs, PRTs, RTDs and thermistors (0 Ω to 500 kΩ)
- Accuracy as good as 0.06 ppm (0.000015 °C)
- "Ratio Self-Calibration" verifies and calibrates resistance ratio accuracy

5430 Standard AC/DC Resistor

Best performance available in an ac/dc resistor.

- Long-term stability better than 2 ppm/year (< 1 ppm typical)
- Traceable ac and dc calibrations available
- National lab design proven for more than 25 years

1560 Black Stack Thermometer Readout

Accurate, expandable and configurable readout.

- Reads SPRTs, RTDs, thermistors, and thermocouples
- Any configuration you like up to eight modules
- High-accuracy reference thermometer (to ± 0.0013 °C)

1529 Chub-E4 Standards Thermometer

Lab-quality accuracy on four channels for PRTs, thermistors and thermocouples.

- Four channels for PRTs, thermistors, and thermocouples
- Displays eight user-selected data fields from any channel
- Logs up to 8,000 readings with date and time stamps

1502A/1504 Thermometer Readouts

Best performance thermometers in their price range.

- Single-channel reference thermometers
- Two models to choose from—reading PRTs or thermistors
- Best price/performance package

1523/1524 Reference Thermometers

Measure, graph and record three sensor types with one tool.

- High accuracy: PRTs: ± 0.011 °C; Thermocouples: ± 0.24 °C; Thermistors: ± 0.002 °C
- A simple user interface to see trends quickly
- Smart connectors to load probe information automatically

1551A Ex and 1552A Ex "Stik" Thermometer

The best substitute for precision mercury-filled glass thermometers.

- Accuracy of ± 0.05 °C (± 0.09 °F) over full range
- Intrinsically safe (ATEX and IECEx compliant)
- Two models to choose from (-50 °C to 160 °C or -80 °C to 300 °C)

1620A Digital Thermometer-Hygrometer

The most accurate temperature and humidity graphical data logger on the market.

- Superior accuracy
- Network enabled
- Powerful logging and analysis tools

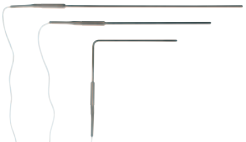
Secondary Standard PRTs

5626/5628 Secondary SPRT, PRT, Temperature Sensors

High-temperature secondary standards.

- -200 °C to 661 °C
- Meets all ITS-90 requirements for resistance ratios
- Rtp drift < 20 mK after 500 hours at 661°C

5608/5609 Secondary PRTs



Very stable thermometer from –200 °C to 670 °C.

- 5608: –200 °C to 500 °C (80 mm minimum immersion)
- 5609: –200 °C to 670 °C (100 mm minimum immersion)
- Calibration not included, NVLAP-accredited calibration optional, lab code 200348-0

Secondary Reference PRTs

5615 Secondary Reference Temperature Standards

- –200 °C to 420 °C
- Calibrated accuracy ± 0.010 °C at 0 °C
- NVLAP-accredited calibration included, lab code 200706-0

5616 Secondary Reference PRT

- –200 °C to 420 °C
- Excellent stability: ± 0.007 °C
- Calibrated accuracy ± 0.011 °C at 0 °C

Thermistor Standards

5640 Series Thermistor Standards Probes

- Accuracy to ± 0.001 °C
- Affordable system accuracy to ± 0.004 °C or better
- NIST-traceable calibration included from manufacturer

High Temperature PRT

5624 Platinum Resistance Thermometer

- Temperature range of 0 °C to 1000 °C
- Accuracy of ± 0.05 °C to 962 °C (includes short-term stability and calibration uncertainty)
- Long-term drift of 0.01 °C at 0°C after 100 hours at 1000 °C

Thermocouple Standards

5649/5650 Type R and Type S Thermocouple Standards

- 0 °C to 1450 °C
- Two sizes available, each with or without reference junction
- Optional fixed-point calibration, uncalibrated accuracy is the greater of ± 0.6 °C or ± 0.1 % of reading

Precision Industrial PRTs

5627A Precision Industrial PRTs

- Vibration and shock resistant
- NVLAP-accredited calibration included, lab code 200706-0

Fast Response PRTs

5622 Fast Response PRTs

- Time constants as fast as 0.4 seconds
- Available as DIN/IEC Class A PRTs or with NVLAP-accredited calibration, lab code 200348-0
- Small probe diameters ranging from 0.5 mm to 3.2 mm

Small Diameter Indust. PRTs

5618B Small Diameter Industrial RTD

- Small diameter sheath, 3.2 mm (0.125 in)
- Excellent stability
- Includes ITS-90 coefficients

Full Immersion PRTs

5606 and 5607 Full Immersion PRTs

- Transition junction designed to withstand full temperature range of probe
- 5606: -200 °C to 160 °C
- 5607: 0 °C to 450 °C
- Calibration accuracy of ± 0.05 °C

Secondary Thermistor Probes

5610/5611/5611T/5665 Secondary Reference Thermistor Probes

- Short-term accuracy to ± 0.01 °C; one-year drift < ± 0.01 °C
- Accredited NVLAP calibration optional
- Flexible Teflon and silicone coated fast-response models

Temperature calibration

Compact Calibration Baths

6330/7320/7340/7380 Compact Temperature Calibration Baths

Compact baths with the stability and uniformity required for thermometer calibration.

- Stability and uniformity each better than ± 0.008 °C
- Metrology-level performance in lab-friendly sizes
- Convenient use on benchtops or on matching carts

6331/7321/7341/7381 Deep-Well Compact Baths

Ample immersion depth and great stability, in a high value compact bath.

- 457 mm (18 in) of depth with just 15.9 liters (4.2 gal) of fluid
- Perfect for liquid-in-glass thermometers with optional LIG kit
- Fast, quiet, compact (yet deep), and economical

7312 Triple Point of Water Maintenance Bath

Keep your cells up and running reliably for weeks at a time.

- Maintains TPW cells for up to six weeks
- Optional immersion freezer for simple cell freezing
- Independent cutout circuit protects cells from breaking

Standard Calibration Baths

6020/6022/6024 High Temperature Calibration Oil Baths

Stable, uniform heat sources for calibrations up to 300 °C.

- Stability as good as 0.001°C
- Large-capacity tanks for higher productivity
- Built-in cooling coils for external cooling sources

6050H Extremely High Temperature Calibration Salt Bath

Designed for high-temperature calibration—up to 550 °C.

- Eliminates messy sand baths
- Electronically adjustable temperature cutouts
- Stability of ± 0.008 °C at 550 °C

7008/7040/7037/7012/7011 Cold Temperature Calibration Baths

High stability means low calibration uncertainties—no other bath performs this well.

- Stability to ± 0.0007 °C
- Best digital temperature controller available
- "Super Tweak" function provides set-point resolution to 0.00003 °C

7060/7080 Really Cold Temperature Calibration Baths

Chill to –40, –60, or –80 °C without external coolants.

- Self-contained refrigeration—no LN2 or chiller required
- Temperatures as low as –80 °C in real metrology baths
- Stability of ± 0.0025 °C at –80 °C

Special Application Baths

6054/6055/7007 Deep-Well Baths

Extra-deep wells for thermometry work requiring extra tank depth and ultimate stability.

- Constant liquid levels through concentric-tube design
- Special design for sighting LIG thermometers
- Depth up to 60 cm (24 in)

7009/7108/7015 Resistor Baths

Three size options for any quantity of resistors.

- Stability to ±0.0007 °C
- Independent high- and low-temperature cutout circuit

Bath Controllers

2100 and 2200 Benchtop Temperature Controllers

Most stable temperature controllers available

- Resolution as high as 0.00018 °C
- RS-232 interface included for automating applications

7900 Controller for Rosemount-Designed Baths

All the features of the Fluke Calibration 2100 Controller

- Installs easily
- Two independent over-temperature cutout circuits

Temperature calibration

Metrology Wells

9170/9171/9172/9173 Metrology Well Calibrators

Accurate enough for lab use yet rugged and portable.

- Best-performing industrial heat sources (accuracy, stability, uniformity) in the world
- –45 °C to 700 °C
- Immersion depth to 203 mm (8 in)
- Optional ITS-90 reference input reads PRTs to ± 0.006 °C

Field Metrology Wells

9142/9143/9144 Field Metrology Wells

Small dry wells for big field applications.

- Lightweight, portable, and fast
- Cool to –25 °C in 15 minutes and heat to 660 °C in 15 minutes
- Built-in two-channel readout for PRT, RTD, thermocouple, 4-20 mA current

Dual-Block Dry-Well

9011 High-Accuracy Dual-Well Calibrator

Widest temperature range available in a single dry-well.

- Combined range from –30 °C to 670 °C, one unit—two blocks
- Two independent temperature controllers (hot and cold side)
- Stability to ± 0.02 °C

Field Dry-Well Calibrators

9103/9140/9141 Field Dry-Well Calibrators

Great performance in portable instruments.

- Lightweight and very portable
- Accuracy to ± 0.25 °C
- RS-232 and Interface-*it* software included

Micro-Baths

6102/7102/7103 Micro-Bath Thermometer Calibrators

Portable and extremely stable.

- World's smallest portable calibration baths
- Calibrates sensors of any size or shape
- Stability to ± 0.015 °C

Handheld Calibrators

9100S/9102S Handheld Dry-Wells

World's smallest, lightest and most portable dry-wells.

- Smallest dry-wells in the world
- Ranges from –10 °C to 375 °C
- Accuracy to ± 0.25 °C, stability of ± 0.05 °C at 0 °C

9009 Industrial Dual-Block Thermometer Calibrator

Double your productivity or cut your calibration time in half.

- Temperatures from –15 °C to 350 °C in one unit
- Two wells in each block for simultaneous comparison calibrations
- Rugged, lightweight, water-resistant enclosure

Infrared Calibrators

4180/81 Precision Infrared Calibrators

Accredited performance for point-and-shoot calibrations.

- Calibrated radiometrically for meaningful, consistent results.
- Accredited calibration included
- Accurate, reliable performance from –15 °C to 500 °C

9132 and 9133 Portable Infrared Calibrators

Precision when you need it for infrared temperature calibration.

- Certify IR pyrometers from –30 °C to 500 °C (–22 °F to 932 °F)
- Large 57 mm (2.25 in) black-body target
- RTD reference well for contact temperature measurement

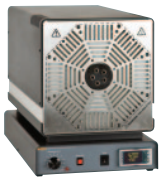
Thermocouple Furnaces

9150 Thermocouple Furnace

Convenient, portable thermocouple furnace.

- 150 °C to 1200 °C
- Stability of ± 0.5 °C over full range
- NIST-traceable calibration included
- RS-232 port standard

9112B Thermocouple Calibration Furnace



Horizontal furnace with unmatched stability and uniformity to 1100 °C.

- Combined stability and uniformity better than ± 0.4 °C
- Five-hole isothermal block included for best stability and uniformity
- RS-232 serial interface standard
- High capacity for simultaneous comparison calibrations

Zero-Point Dry-Well

9101 Series Metrology Well Calibrators

Ice-point reference without the ice.

- ± 0.005 °C stability in a portable ice-point reference
- Easy re-calibration for long-term reliability
- Ready light frees user's time and attention

Surface Probe Calibrator

3125 Surface Probe Calibrator

Milled aluminum for a smooth and true calibration work area with maximum thermal conductivity.

- Calibrates surface sensors up to 400 °C
- Uses Fluke Calibration 2200 Controller for excellent accuracy and stability
- NIST-traceable calibration included