TECHNICAL DATA

Fluke Calibration 9142 Field Metrology Well

Key features

- Lightweight, portable, and fast
- 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

Built-in features to address large workloads and common applications

Whether you need to calibrate 4-20 mA transmitters or a simple thermostatic switch, a Field Metrology Well is the right tool for the job. With three models covering the range of –25 °C to 660 °C, this family of Metrology Wells calibrates a wide range of sensor types. The optional process version (models 914X-X-P) provides a built-in two-channel thermometer readout that measures PRTs, RTDs, thermocouples, and 4-20 mA transmitters which includes the 24 V loop supply to power the transmitter.

Each process version accepts an ITS-90 reference PRT. The built-in readout accuracy ranges from ±0.01 °C to ±0.07 °C depending on the measured temperature. Reference PRTs for Field Metrology Wells contain individual calibration constants that reside in a memory chip located inside the sensor housing, so sensors may be used interchangeably. The second channel is user-selectable for 2-, 3-, or 4-wire RTDs, thermocouples, or 4-20 mA transmitters. For comparison calibration, don't hassle with carrying multiple instruments to the field. Field Metrology Wells do it all as a single instrument.

Traditionally, calibrations of temperature transmitters have been performed on the measurement electronics, while the sensor remained uncalibrated. Studies have shown, however, that typically 75% of the error in the transmitter system (transmitter electronics and temperature sensor) is in the sensing element. Thus, it becomes important to calibrate the whole loop—both electronics and sensor.

The process option of Field Metrology Wells makes transmitter loop calibrations easy. The transmitter sensor is placed in the well with the reference PRT and the transmitter electronics are connected to the front panel of the instrument. With 24 V loop power, you are able to power and measure the transmitter current while sourcing and measuring temperature in the Field Metrology Well. This allows for the measurement of as-found and as-left data in one self-contained calibration tool.

All Field Metrology Wells allow for two types of automated thermostatic switch test procedures—auto or manual setup. Auto setup requires the entry of only the nominal switch temperature. With this entry, it will run a 3-cycle calibration procedure and provide final results for the dead band temperature via the display. If you need to customize the ramp rate or run additional cycles, the manual setup allows you to program and run the procedure exactly how you would like. Both methods are fast and easy and make testing temperature switches a virtual joy!

Metrology performance for high-accuracy measurements

Unlike traditional dry-wells, Field Metrology Wells maximize speed and portability without compromising the six key metrology performance criteria laid out by the EA: accuracy, stability, axial (vertical) uniformity, radial (well-to-well) uniformity, loading, and hysteresis. All criteria are important in ensuring accurate measurements in all calibration applications. Field Metrology Well displays are calibrated with highquality traceable and accredited PRTs. Each device (process and non-process versions) comes with an IEC-17025 NVLAP-accredited calibration certificate, which is backed by a robust uncertainty analysis that considers temperature gradients, loading effects, and hysteresis. The 9142 and 9143 have a display accuracy of ±0.2 °C over their full range, and the 9144 display accuracy ranges from ±0.35 °C at 420 °C to ±0.5 °C at ±660 °C. Each calibration is backed with a 4:1 test uncertainty ratio.

New control technology guarantees excellent performance in extreme environmental conditions. The 9142 is stable to ±0.01 °C over its full range and the mid-range 9143 is stable from ±0.02 °C at 33 °C and ±0.03 °C at 350 °C. Even at 660 °C, the 9144 is stable to ±0.05 °C. But this is not all! Thermal block characteristics provide radial (well-towell) uniformity performance to ±0.01 °C. Dual-zone control helps these tools achieve axial uniformity to ±0.05 °C at 40 mm (1.6 in).

Automation and documentation make each unit a turnkey solution

So you now have a precision calibration instrument that has field-ready characteristics, accredited metrology performance, built-in two-channel thermometry, and automation— what else could you ask for? How about all this and a turnkey solution that will automate and document the results?

The process versions of Field Metrology Wells have onboard non-volatile memory for documentation of up to 20 tests. Each test can be given a unique alphanumeric ID and will record block temperature, reference temperature, UUT values, error, date, and time. Each test can be easily viewed via the front panel. Use the 1586A Super-DAQ to automate temperature sensor calibration with these Field Metrology Wells.

Operation is as easy as 1-2-3

You'll find Field Metrology Wells intuitive and easy to use. Each unit is equipped with a large, easy-to-read LCD display, function keys, and menu navigation buttons. Its "SET PT." button makes it straightforward and simple to set the block temperature. Each product has a stability indicator that visually and audibly tells you the Field Metrology Wells is stable to the selectable criteria. Each unit offers preprogrammed calibration routines stored in memory for easy recall, and all inputs are easily accessible via the front panel of the instrument. Never buy a temperature calibration tool from a company that only dabbles in metrology (or doesn't even know the word). Metrology Wells from Fluke are designed and manufactured by the same people who equip the calibration laboratories of the world's leading temperature scientists. These are the people around the world who decide what a Kelvin is! We know a thing or two more about temperature calibration than the vast majority of the world's dry-well suppliers. Yes, they can connect a piece of metal to a heater and a control sensor. But we invite you to compare all our specs against the few that they publish. (And by the way, we meet our specs!).

Product overview: Fluke Calibration 9142 Field Metrology Well

Small dry wells for big field applications

The 9142, 9143, 9144 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 the wide range of –25 °C to 660 °C.

High performance for the industrial environment

Field Metrology Wells are designed for the industrial process environment and fast speed to temperature. They weigh less than 8.2 kg (18 lb) and have a small footprint, which makes them easy to transport.

Field environment conditions are typically unstable, having wide temperature variations. Each Field Metrology Well has a built-in gradient-temperature compensation (patent pending) that adjusts control characteristics to ensure stable performance in unstable environments. In fact, all specifications are guaranteed over the environmental range of 13 °C to 33 °C.

Specifications: Fluke Calibration 9142 Field Metrology Well

Base Unit Specifications	
Temperature range at 23°C	–25°C to 150°C (–13°F to 302°F)
Display accuracy	±0.2°C full range
Stability	±0.01°C full range
Axial uniformity at 40 mm (1.6 in)	±0.05°C full range
Radial uniformity	±0.01°C full range
Loading effect (with a 6.35 mm reference probe and three 6.35 mm probes)	±0.006°C full range
Hysteresis	0.025
Operating conditions	0°C to 50°C, 0% to 90% RH (non-condensing)
Environmental conditions (for all specifications except temperature range)	13°C to 33°C
Immersion (well) Depth	150 mm (5.9 in)
Insert OD	30 mm (1.18 in)
Heating time	16 min: 23°C to 140°C 23 min: 23°C to 150°C 25 min: –25°C to 150°C
Cooling time	15 min: 23°C to –25°C 25 min: 150°C to –23°C
Resolution	0.01°
Display	LCD, °C or °F user-selectable
Size (H x W x D)	290 x 185 x 295 mm (11.4 x 7.3 x 11.6 in)

Weight	8.16 kg (18 lb)
Power requirements	100 V to 115 V (±10%) 50/60 Hz, 635 W 230 V (±10%) 50/60 Hz, 575 W
Computer interface	RS-232 interface
Calibration	NVLAP accredited calibration included
Automation	Use the 1586A Super-DAQ to automate temperature sensor calibration
-P Specifications	
Built-in reference thermometer readout accuracy (4-Wire Reference Probe)[1]	±0.010°C at -25°C ±0.015°C at 0°C ±0.020°C at 50°C ±0.025°C at 150°C ±0.030°C at 200°C ±0.040°C at 350°C ±0.050°C at 420°C ±0.070°C at 660°C
Reference resistance range	0 ohms to 400 ohms
Reference resistance accuracy[2]	0 ohms to 42 ohms: ±0.0025 ohms 42 ohms to 400 ohms: ±60 ppm of reading
Reference characterizations	ITS-90, CVD, IEC-751, Resistance
Reference measurement capability	4-wire
Reference probe connection	6-pin Din with Infocon Technology
Built-in RTD thermometer readout accuracy	NI-120: ±0.015°C at 0°C PT-100 (385): ±0.02°C at 0°C PT-100 (3926): ±0.02°C at 0°C PT-100 (JIS): ±0.02°C at 0°C
RTD resistance range	0 ohms to 400 ohms
RTD resistance accuracy[2]	0 ohms to 25 ohms: ±0.002 ohms 25 ohms to 400 ohms: ±80 ppm of reading
RTD characterizations	PT-100 (385),(JIS),(3926), NI-120, Resistance
RTD measurement capability	4-wire RTD (2-,3-wire RTD w/ Jumpers only)
RTD connection	4 terminal input
Built-in TC thermometer readout accuracy	Type J: ±0.7°C at 660°C Type K: ±0.8°C at 660°C Type T: ±0.8°C at 400°C Type E: ±0.7°C at 660°C Type R: ±1.4°C at 660°C Type S: ±1.5°C at 660°C Type M: ±1.4°C at 660°C Type L: ±0.7°C at 660°C Type U: ±0.75°C at 600°C Type N: ±0.9°C at 660°C Type C: ±1.1°C at 660°C
TC millivolt range	−10 mV to 75 mV
Voltage accuracy	0.025% of reading + 0.01 mV
Internal cold junction compensation accuracy	±0.35°C (ambient of 13°C to 33°C)
TC connection	Small connectors

Built-in mA readout accuracy	0.02% of reading + 2 mV
mA range	Cal 4-22 mA, Spec 4-24 mA
mA connection	2 terminal input
Loop power function	24 V DC loop power
Built-in electronics temperature coefficient (0°C to 13°C, 33°C to 50°C)	±0.005% of range per °C
1. The temperature range may be limited by the reference probe connected to the readout. The Built-In Reference Thermometer Readout Accuracy does not include the sensor probe accuracy. It does not include the probe uncertainty or probe characterization errors. 2. Measurement accuracy specifications apply within the operating range and assume 4-wires for PRTs. With 3-wire RTDs add 0.05 ohms to the measurement accuracy plus the maximum possible difference between the resistances of the lead wires.	

Ordering information

Fluke 9142-A-156

Fluke Calibration 9142-A-156 Field Metrology Well
Insert “A”, imperial misc. holes
–25°C to 150°C

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Insert removal tool

Fluke 9142-B-156

Fluke Calibration 9142-B-156 Field Metrology Well
Insert “B”, imperial comparison holes
–25°C to 150°C

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Insert removal tool

Fluke 9142-C-156

Fluke Calibration 9142-C-156 Field Metrology Well
Insert “C”, 0.25-inch holes

–25°C to 150°C

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Insert removal tool

Fluke 9142-D-156

Fluke Calibration 9142-D-156 Field Metrology Well
Insert “D”, metric comparison holes
–25°C to 150°C

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Insert removal tool

Fluke 9142-E-156

Fluke Calibration 9142-E-156 Field Metrology Well
Insert “E”, metric misc. holes w/ 0.25-inch hole
–25°C to 150°C

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Insert removal tool

Fluke 9142-F-156

Fluke Calibration 9142-F-156 Field Metrology Well
Insert “F”, metric comparison misc. holes w/ 0.25-inch hole
–25°C to 150°C

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Insert removal tool

Fluke 9142-DW-156

Fluke Calibration 9142-DW-156 Field Metrology Well
Insert “D”, metric comparison holes
–25°C to 150°C

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Insert removal tool

Fluke 9142-A-P-156

Fluke Calibration 9142-A-P-156 Field Metrology Well
Insert “A”, imperial misc. holes
–25°C to 150°C, w/ process electronics

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Test leads
- Insert removal tool
- 6-pin DIN connector for reference probe

Fluke 9142-B-P-156

Fluke Calibration 9142-B-P-156 Field Metrology Well
Insert “B”, Imperial comparison holes
–25°C to 150°C, w/ process electronics

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Test leads
- Insert removal tool
- 6-pin DIN connector for reference probe

Fluke 9142-C-P-156

Fluke Calibration 9142-C-P-156 Field Metrology Well
Insert “C”, 0.25-inch holes
–25°C to 150°C, w/ process electronics

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Test leads
- Insert removal tool
- 6-pin DIN connector for reference probe

Fluke 9142-D-P-156

Fluke Calibration 9142-D-P-156 Field Metrology Well
Insert “D”, metric comparison holes
–25°C to 150°C, w/ process electronics

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Test leads
- Insert removal tool
- 6-pin DIN connector for reference probe

Fluke 9142-E-P-156

Fluke Calibration 9142-E-P-156 Field Metrology Well
Insert “E”, metric misc. holes w/ 0.25-inch hole
–25°C to 150°C, w/ process electronics

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Test leads
- Insert removal tool
- 6-pin DIN connector for reference probe

Fluke 9142-F-P-156

Fluke Calibration 9142-F-P-156 Field Metrology Well
Insert “F”, metric comparison misc. holes w/ 0.25-inch hole
–25°C to 150°C, w/ process electronics

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Test leads
- Insert removal tool

- 6-pin DIN connector for reference probe

Fluke 9142-DW-P-156

Fluke Calibration 9142-DW-P-156 Field Metrology Well
No insert
–25°C to 150°C, w/ process electronics

Includes:

- Users manual
- Technical manual on CD
- Serial cable
- Report of calibration
- Test leads
- Insert removal tool
- 6-pin DIN connector for reference probe

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Fluke Europe B.V.
P.O. Box 1186
5602 BD Eindhoven
The Netherlands
www.fluke.com/en
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For more information call:
In Middle East/Africa
+31 (0)40 267 5100

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