HART SCIENTIFIC

A Fluke Company

Thermometry

Hart Scientific,
The World Leader in Temperature Measurement

Hart Scientific, a Fluke Company, is the world's leading manufacturer of temperature calibration and measurement equipment. Hart's full product offering includes everything from fixed-point cells and maintenance furnaces, SPRTs with precision readouts, and ultra stable calibration baths, to portable dry-block calibrators and data logging thermometers.

Hart Scientific's thermometry product line offers world-class accuracy and function in readouts for SPRTs, PRTs, thermistors, and thermocouple probes. Choose from Industrial to Primary Standard level readouts (0.001°C) and measure temperatures from –200°C to 1450°C!

Handheld Thermometers

Model 1521 and 1522

- Read PRTs/RTDs to ±0.025°C and thermistors to ±0.005°C
- Model 1522 stores multiple data sets totaling 10,000 readings
- INFO-CON connector allows interchangeable use of calibrated probes
- INFO-CON eliminates errors from programming probe data

The Models 1521 and 1522 are the first standards thermometers to fit into a battery powered handheld package. They're as accurate as ±0.005°C! It's no wonder we call the 1521 the Little Lord Kelvin of thermometry. The 1522 has all the features and power of the 1521 Little Lord Kelvin plus the ability to log measurement data. Its memory holds up to 10,000 readings.

The 1521 and 1522 read both Pt-25 and Pt-100 RTDs as well as thermistors. PRTs and RTDs, with their wide temperature ranges and stabilities, have long been favored as temperature standards.

From –200°C to 100°C, they read PRTs accurately to ±0.025°C. Even at 800°C these are high-precision readouts, accurate to ±0.1°C. Ultra-stable thermistors offer excellent stability and even greater accuracies over a more narrow range—typically from about –10°C to 110°C. At temperatures below 50°C, these Handheld Thermometers read thermistors to ±0.005°C. Accuracy at 100°C is ±0.02°C.

Probes attach to the 1521 and 1522 using Hart's own "INFO-CON" connector. The INFO-CON technology allows you to change the probes you use without requiring you to program your readout. It also checks the recall date stored in the INFO-CON to verify it has not expired.

Model 5577

- Intrinsically Safe to ATEX directive EX II 2G EEx ib IIB T4
- System Accuracy to 0.05°C (Readout + Probe!)
- Battery Powered
- Dual Channel Inputs

We're excited to offer the 5577 which combines an ATEX IS rating with high accuracy (±0.05°C over the entire range –100°C to 135°C for the readout and probe together). It doesn't get any better than this!

The 5577 uses Pt100 probes and a calibration procedure that uses system calibration data to marry the probe and the readout, ensuring high-accuracy measurements across a complete temperature range. System calibrations done by Hart are NIST-traceable and NVLAP accredited.

Since the 5577 is battery powered, the thermometer is lightweight and extremely portable—perfect for measurements in those hard-to-get-to places out on the pipeline. A standard IS-rated 9V "D" cell powers the thermometer for up to 20 hours. If you're making critical temperature measurements and need an IS-rated thermometer, the 5577 is an essential part of your tool-kit. You shouldn't leave the safety of your home without one!

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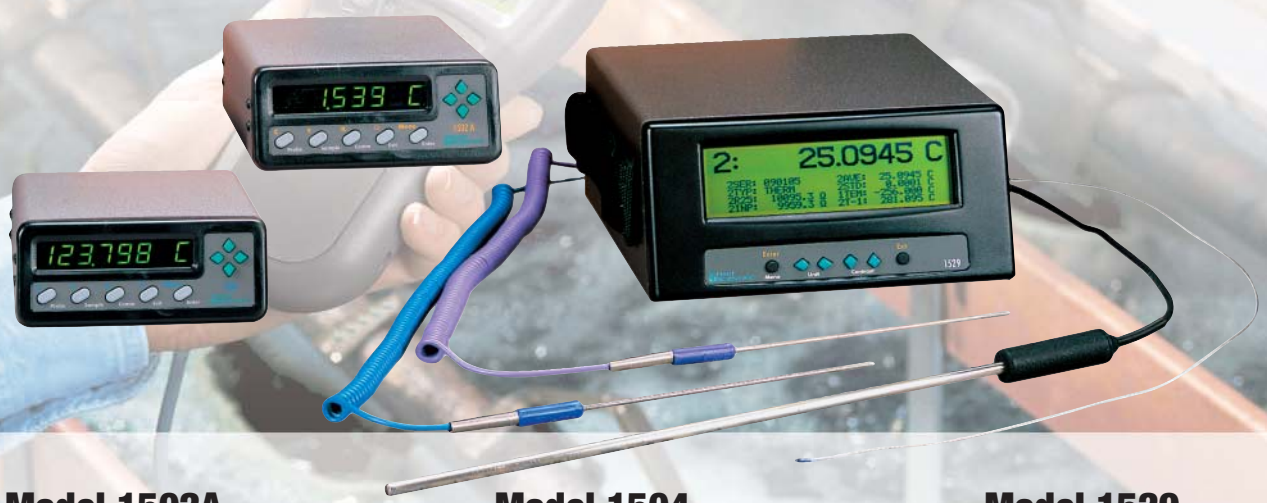
Thermometers

- **Two Tweener models to choose from**
- **Three Chub-E4 models available**
- **Optional Battery Packs available**
- **Best price/performance packages**

Two of the industry's best-selling products are Hart Tweener and Chub-E4 thermometers. Here is the reason. No other brand of thermometers comes close to the performance and features of the Tweener and Chub-E4 for anywhere near the price! You can select your Tweener and Chub-E4 from different models or with different input configurations to match your probe types. All probe constants and coefficients are programmed through simple, front panel keystrokes. Temperature is displayed in °C, °F, or K or resistance in ohms, or mV (Chub-E4 TC input only). Simply select any display with a single stroke.

Each of these thermometer readouts comes complete with an RS-232 interface for remote temperature data logging, process monitoring, or for automating calibrations. An IEEE-488 interface is optionally available.

All Tweener and Chub-E4 readouts can be used as reference thermometers with Hart's MET/TEMP II software. And with our optional Log*Ware* or Log*Ware* II data acquisition software your Tweener or Chub-E4 is converted into a temperature data logger for logging temperature measurements to your PC, downloading live or previously logged (1529 only) data to your PC, or for graphical representation and statistical analysis. This great software displays temperature in several formats, including bar graphs, strip charts, or digital displays. It also lets you set low and high-temperature alarms.



Model 1502A

The Model 1502A Tweener PRT Readout features NIST-traceable accuracy to ±0.006°C. In addition, this PRT Readout reads both 100-ohm and 25-ohm probes, has a resolution of 0.001°C across its entire range, and is one of the smallest reference-grade thermometer in the industry. It also has an optional battery pack for portable operation. Each Tweener is programmable to match any probe's constants for maximum linearity and accuracy. Each 1502A is calibrated using standard resistors and comes with a NIST-traceable certificate from Hart's world-class temperature laboratory.

Model 1504

If you need more accuracy over a limited temperature range, the Model 1504 Tweener PRT Readout gives it to you as a thermistor readout. Thermistors are more rugged than PRTs and less likely to be impacted by mechanical shock. They are more sensitive to changes for faster response times, and they come in many shapes for different applications. Accuracy of the 1504 is ±0.002°C over the range of 0°C to 50°C and has a resolution of 0.0001°C.

Model 1529

Hart's Model 1529 Chub-E4 Readout offers four input channels for reading four different sensors simultaneously. These channels are configured at the factory and three configurations are available: four PRT/Thermistor inputs, four TC inputs or two TC and two PRT/Thermistor inputs. The 100-ohm and 25-ohm PRT and RTD inputs provide typical accuracies of ±0.004°C at -100°C and ±0.009°C at 100°C. Thermistor readings are accurate to ±0.0025°C at 25°C with a resolution of 0.0001°C. Thermocouple inputs read all common thermocouple types and allow you to choose between internal and external reference junction compensation. Typical accuracy for a type J Thermocouple is ±0.35°C at 600°C, using internal reference junction compensation and excluding thermocouple accuracy. The Chub-E4 runs on AC Power (115/230V), DC power (from 12 to 16V), or from its internal NiMH battery (for 8 hours).

Super-Thermometers

- **Bridge level performance at less than half of the cost**
- **Accuracy levels to 4 ppm (±0.001°C) or 1 ppm (±0.00025°C)**
- **Accepts 0.25-ohm through 100-ohm SPRTS and Thermistors**
- **Superior performance and convenient operation**

Hart's Super-Thermometers are a major breakthrough in thermometer readout design. They are the most popular high-accuracy thermometers made. They're easy to use, so consistent in their measurements, and so cost effective that no other instrument in its class even comes close. With the Hart Scientific Super-Thermometers, your readings can be accurate as 1 ppm. They are so easy to use you can learn in one afternoon!

Each Super-Thermometer comes with RS-232 and IEEE-488 interfaces, allowing you to record data to a PC or automate temperature calibrations from your desk. Both Model 1575A and Model 1590 work with Hart's leading MET/TEMP II calibration automation software. These units even have a floppy disc drive built in for direct data storage.

Why buy a bridge when you can buy a Super-Thermometer for half the price and get many more times the power? Once you use a Super-Thermometer, you won't want to use anything else! These units are used by numerous national labs, and they all agree that these thermometers do exactly what we say they will do and more!

Model 1575A

Hart's Model 1575A Super-Thermometer offers accuracies as good as ±0.001°C or even ±0.00025°C, plus a long list of features that make it user-friendly. Its readings are plotted on the graphic display, which also shows any of 19 different statistical functions. In addition, measurements can be read in K, °C, or °F or as resistance in ohms or resistance ratios. The graphic display also provides a menu-driven interface for easy access to all of the functions found on the 1575A.

For high-precision temperature work, the 1575A Super-Thermometer reads both SPRTs and thermistors. It converts to temperature using ITS-90, IPTS-68, Calendar-Van Dusen, or polynomial functions. If you're calibrating SPRTs, the 1575A Super-Thermometer will even calculate ITS-90 coefficients from your fixed-point readings to save you time. Up to 16 sets of probe characterizations can be stored in memory, and the current source to your thermometers can be set from 0.001 mA to 15 mA. Measurements can be taken with full accuracy every two seconds.

Model 1590

The 1590 Super-Thermometer II includes all the same features as the 1575A, but at 1ppm, its accuracy is four times better. At 0°C an SPRT can be read to ±0.00025°C and a thermistor to ±0.000125°C. In addition, the graphic display of the 1590 is full color and tilts for improved viewing angles. With just a push of a button you can connect probe leads terminated with bare-wires, spade-lugs, or banana-plugs to your Super-Thermometer—no binding-post screw turning is necessary (these innovative connectors are now also used on the 1575A). The 1590 Super-Thermometer II represents superior measurement performance and premium convenience at an affordable cost.

Multiplexers

Ten-channel multiplexers are available for both Super-Thermometers. Both the 2575 (used with a 1575) and the 2590 (used with a 1590) use shielded, low thermal EMF relays with contact resistance less than 0.1 ohm. The 2590 provides cascading ability so you can read up to 50 channels. The 2590 also allows constant current to each channel to help eliminate self-heating effects.

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The *Black Stack*

- **Reads SPRTs, RTDs, Thermistors and Thermocouples**
- **High Accuracy Reference Thermometer (to 0.0013°C)**
- **Maximum flexibility in temperature measurement**

For precision thermometry and temperature data acquisition, Hart's Model 1560 *Black Stack* thermometer sets the standard for versatility and flexibility. Whether you are monitoring a process, calibrating temperature sensors, data-logging from multiple sensors, performing critical research, or doing virtually anything else requiring exceptionally accurate temperature measurement, the *Black Stack* can meet your needs—it's that adaptable.

The *Black Stack* can accommodate up to eight different scanner modules. Add eight of one type, or mix and match different types at the same time. You can change the "stacked" configuration anytime you want. Each module is simply attached behind the preceding one. When a module is added, the *Black Stack* automatically reconfigures itself to include all of the new functions supplied by that module. There are no boards to install, no software to load, and nothing has to be calibrated. Each individual module is factory calibrated independently of every other module.

The *Stack* starts with a base module Model 1560, consisting of a display with the main processor and a power supply module. The base module supplies power, communication management, and software coordination for the other modules. It has the display, control buttons, and RS-232 port built-in. The LCD screen has multiple methods of displaying data, including a graphical strip chart recorder. Its memory stores the mostrecent 1000 readings, or you can send your data to your PC through the RS-232 port. Data may be read in ohms, millivolts, or in temperature, and of course the *Black Stack* is completely compatible with Hart's MET/TEMP II Automation software.

Complete your *Black Stack* system with one or more of the following thermometer modules:

- **SPRT Module 2560**, has two inputs and reads 25-ohm and 100-ohm, four-wire RTDs, PRTs, and SPRTs with accuracy to ±0.005°C.
- **High-Temp PRT Module 2561** reads 2.5-ohm and 0.25-ohm four-wire HTPRTs and RTDs and measures up to 5-ohm sensors with applications as high as 1200°C.
- **PRT Scanner 2562** reads eight channels of two-, three- or four-wire 100-ohm (or 25-ohm) PRTs or RTDs. Accuracy is ±0.01°C at 0°C.
- **Standards Thermistor Module 2563** offers two input channels with superior temperature accuracy of ±0.0013°C at 0°C with a resolution of 0.0001°C.
- **Thermistor Scanner Module 2564** works with any type of thermistor and has eight channels making it an excellent data acquisition tool. Accuracy is ±0.0025°C at 0°C.
- **Precision Thermocouple Module 2565** offers two input channels, reads any type of thermocouple and has internal cold junction compensation. You can use an external junction for greater accuracy (as good as ±0.05°C).
- **Thermocouple Scanner Module 2566** offers 12 input channels. Each one can be set to read a different type of thermocouple. With eight modules connected to the *Stack*, you can read up to 96 thermocouples.
- **1000-Ohm PRT Modules 2567 and 2568** provide all the same great features as the 2560 and 2562 Modules. The two-channel 2567 Module has a resistance range of 0 to 4000 ohms and is accurate to ±0.006°C at 0°C. The 2568 Module reads up to eight 1000-ohm PRTs and at 0°C is accurate to ±0.01°C.
- **Extended Communications Module 3560** adding an IEEE-488 (GPIB) interface, a Centronics printer interface, and analog output via a DC signal (±1.25 VDC) to your *Black Stack* System.

The "DewK" Thermo-Hygrometer

- **Measures ambient temperature to ±0.125°C and % RH to ±1.5%**
- **One large LCD screen for displaying measured data**
- **Visual and audio alarms**
- **On-board memory holds up to 400,000 time/date-stamped readings**
- **Optional software logs in real-time or shows graphical/statistical data from PC Card**

The DewK, Hart Scientific Model 1620 offers you accurate display and recording of area temperature and humidity, rates of change for both temperature and humidity as well as calculation of dew point and heat index. Summary statistics, including min, max, and maximum rates of change can be stored and shown on the large LCD screen. Plus visual and audio alarms can be set based on temperature and humidity limits or instrument fault conditions. The DewK holds up to 400.000 data points while millions more can be captured with the optional 64 MB memory card.

The DewK has two inputs for detachable local or remote sensing probes (containing their own calibration data for easy recalibrations and minimal downtime of the main unit) and comes with one temperature/relative humidity probe, reading temperature to ±0.125°C over a calibrated range of 16°C to 24°C and relative humidity to ±1.5% RH from 20% to 70% RH. Additional probes are optionally available.

The DewK interfaces seamless with our newest optional software package Log*Ware* III, a Windows® application that retrieves, stores, and analyzes data from the DewK. The DewK is also compatible with Fluke's MET/CAL® *Plus* calibration and asset management software, allowing you to directly import the DewK's temperature and humidity readings into calibration records at the beginning and ending of any calibration.

Automation Software

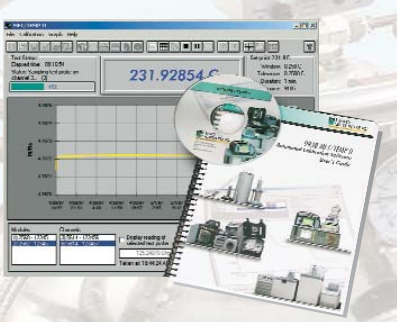
- **Full automation for RTD, thermocouple, thermistor and heat source calibration**
- **Calibrates up to 100 sensors at up to 40 points each**
- **Coefficient calculations and table and report generation**
- **Optional Integration with MET/CAL® *Plus*, the industry standard in automated calibration and asset management software**

All Hart thermometry readouts have been optimized for use with our MET/TEMP II software. MET/TEMP II is a Windows®-driven system that totally automates your temperature measurements and calibrations of PRT, thermistor, or thermocouple temperature sensors. Run your calibrations overnight - while you sleep!

MET/TEMP II controls Hart thermometer readouts and heat sources (such as our drywells and RS232-controlled baths). It will read your reference thermometer (i.e. a *Black Stack* with a reference PRT) read your sensors under test, and record the value of each unit. It then adjusts the temperature of your heat source to move it through the sequence of temperatures you've specified in your set-up.

Setting up your MET/TEMP II system takes just a few minutes. You identify the equipment you're using and the units you're testing. Then specify the temperatures at which you want readings taken and the conditions under which they're taken. (For example, you decide how stable your heat source must be before a reading is taken.)

After the calibration is done, you'll have all the data you'll need for printing calibration reports including ITS-90 coefficients and temperature vs. resistance tables. There is no other temperature calibration software in the world with this combination of user control and ease of use!



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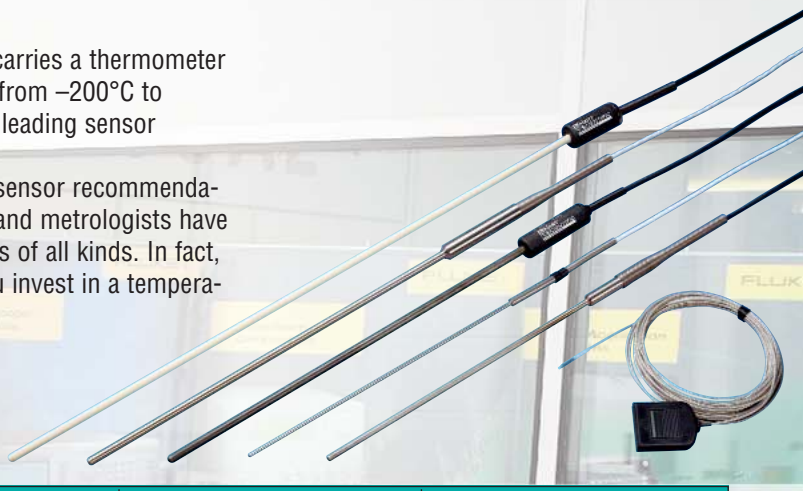
PRTs, Thermistors and Thermocouples

Whatever your temperature measurement need, Hart Scientific carries a thermometer to match it. With accuracies to ±0.001°C and a temperature range from –200°C to 1450°C, we offer only world-class thermometers manufactured by leading sensor companies, including ourselves.

Few companies have the appropriate expertise to make correct sensor recommendations to customers. At Hart Scientific, our engineers, researchers, and metrologists have a wealth of experience with SPRTs, thermistors, and thermocouples of all kinds. In fact, they use them and calibrate them every day. Be sure that when you invest in a temperature standard you also get the expertise to back it up.



Primary Reference Probes	Model	Range	Size L (mm) x Ø (mm)	Nominal R_{TPW} (Ohm)
SPRTs				
Quartz Sheath SPRTS	5681	–200°C to 661°C	520 x 7	25.5
	5683	–200°C to 480°C	520 x 7	25.5
	5684	0°C to 1070°C	680 x 7	0.25
	5685	0°C to 1070°C	680 x 7	2.5
Working Standard Metal Sheath	5680	–200°C to 480°C	485 x 6.4	25.5
	5682	–200°C to 480°C	485 x 6.4	100
Working Standard Quartz Sheath	5698	–200°C to 661°C	485 x 7.1	25.5
Extended range Metal Sheath	5699	–200°C to 661°C	483 x 5.6	25.5
Glass Capsule SPRTS	5686	–260°C to 232°C	56 x 5.8	25.5
	5695	–200°C to 500°C	68 x 5.2	25.5
Gold Platinum Thermo Couple	5629	0°C to 1000°C	600 x 7.0	Au-Pt TC
Secondary / Industrial Reference Probes	**Model**	**Range**	**Size L (mm) x Ø (mm)**	**Basic Accuracy***
PRTs				
Secondary Standards PRTs	5626	–200°C to 661°C	305 or 275 x 6.4	±0.007°C at 0°C
	5628	–200°C to 661°C	305 or 275 x 6.4	±0.006°C at 0°C
Secondary Reference PRTs	5612	–200°C to 420°C	229 x 4.7	±0.018°C at 0°C
	5613	–200°C to 300°C	152 x 4.7	±0.018°C at 0°C
	5614	–200°C to 420°C	305 x 6.4	±0.018°C at 0°C
Precision Industrial PRTs	5627-6	–200°C to 300°C	152 x 4.7	±0.05°C at 0°C
	5627-9	–200°C to 420°C	229 x 4.7	±0.05°C at 0°C
	5627-12	–200°C to 420°C	305 x 6.4	±0.05°C at 0°C
Fast Response PRTs	5622-05	–200°C to 350°C	100 x 0.5	±0.04°C at 0°C
	5622-10	–200°C to 350°C	100 x 1.0	±0.04°C at 0°C
	5622-16	–200°C to 350°C	200 x 1.6	±0.04°C at 0°C
	5622-32	–200°C to 350°C	200 x 3.2	±0.04°C at 0°C
Small Diameter Industrial PRTs	5618A-6	–200°C to 300°C	152 x 3.2	±0.05°C
	5618A-9	–200°C to 500°C	229 x 3.2	±0.05°C
	5618A-12	–200°C to 500°C	305 x 3.2	±0.05°C
Thermistors				
Thermistor Standards	5640	0°C to 60°C	229 x 6.4	±0.0015°C
	5641	0°C to 60°C	114 x 3.2	±0.001°C
	5642	0°C to 60°C	229 x 3.2	±0.001°C
	5643	0°C to 100°C	114 x 3.2	±0.0025°C
	5644	0°C to 100°C	229 x 3.2	±0.0025°C
Secondary Thermistor Probes	5665	0°C to 100°C	76 x 2.8	±0.015°C
	5610	0°C to 100°C	152 or 229 x 3.2	±0.015°C
	5611	0°C to 100°C	2.8 or 1.8 dia.	±0.015°C
	5674	0°C to 70°C	229 x 4.8	±0.07°C
Thermocouples				
Type S Thermocouple Standards	5650-20	0°C to 1450°C	508 x 6.4	±0.7°C at 1100°C
	5650-20C	0°C to 1450°C	508 x 6.4	±0.7°C at 1100°C
	5650-25	0°C to 1450°C	635 x 6.4	±0.7°C at 1100°C
	5650-25C	0°C to 1450°C	635 x 6.4	±0.7°C at 1100°C
Other				
Glass Thermometers	62-70C-FC	–38°C to 405°C	381 mm length	0.1°C Divisions
	62-70F-FC	–36°F to 761°F	381 mm length	0.2°F Divisions

**"Basic Accuracy" includes calibration uncertainty and short-term repeatability. Does not include long-term drift.*

Readout Table

Model	Description	Temperature / Rel Humidity Range (°C / %R.H.)	Range in Resistance / Voltage	Basic Resistance / Voltage Accuracy	Temperature/Rel. Hum. Accuracy (±°C / ±%R.H.)	Number of Channels
1502A	Tweener, RTD	–200 to 962°C	0 to 400 Ohm	25 ppm	±0.006°C at 0°C	1
1504	Tweener, Thermistor	Any Thermistor	0 to 1 MOhm	100 ppm	±0.002°C at 0°C	1
1521	Handheld Thermometer	–200 to 962°C	0 to 400 Ohm	PRT: ± 80 ppm Thermistor: ± 200 ppm	PRT: ±0.025°C Thermistor: ±0.005°C	1
1522	Handheld Thermometer	–200 to 962°C	0 to 400 Ohm	PRT: ± 80 ppm Thermistor: ± 200 ppm	±0.025°C	1
1529	Chub-E4	PRT:–189 to 960°C Thermistor: –50 to 150°C TC: –270 to 1800°C	PRT: 0 to 400 Ohm Thermistor: 0 to 500 KOhm TC: -10 to 100mV	PRT: ±25ppm Thermistor:±100ppm TC: ±100ppm	PRT: ±0.006°C at 0°C Thermistor: ±0.0025°C at 0°C TC: Ext.RJC ±0.07°C to ±0.5°C dep.on type, Int.RJC ±0.25°C to ±0.6°C dep. on type	4
1575A	4-ppm Super-Thermometer I	N/A	0 to 500 KOhm	4 ppm	±0.001°C	2
1590	1-ppm Super-Thermometer II	N/A	0 to 500 KOhm	1 ppm	±0.00025°C*	2
2560	High-Accuracy PRT Module	–260 to 962°C	0 to 400 Ohm	20 ppm	±0.005°C at 0°C	2
2561	High-Temperature PRT Module	0 to 1200°C	0 to 25 Ohm	50 ppm	±0.013°C at 0°C	2
2562	RTD Scanner	–200 to 850°C	0 to 400 Ohm	40 ppm	±0.01°C at 0°C	8
2563	High-Accuracy Thermistor Module	–60 to 260°C	0 to 1 MOhm	50 ppm	±0.0013°C at 25°C	2
2564	Thermistor Module	–60 to 260°C	0 to 1 MOhm	100 ppm	±0.0025°C at 25°C	8
2565	High-Accuracy Thermocouple Module	N/A	0 to 100 mV	0.002 mV	±0.05°C**	2
2566	Thermocouple Scanner	N/A	0 to 100 mV	0.004 mV	±0.1°C**	12
2567	1000-Ohm SPRT Module	-260 to 962°C	0 to 4 KOhm	25 ppm	±0.006°C at 0°C	2
2568	1000-Ohm PRT Module	-200 to 850°C	0 to 4 KOhm	40 ppm	±0.01°C at 0°C	8
2575	Mighty-Mux Super-Thermometer Scanner***	N/A	N/A	N/A	N/A	10
2590	Mighty-Mux Super-Thermometer Scanner	N/A	N/A	N/A	N/A	10
5577	Intrinsically Safe Thermometer	-100 to 135°C (IS Range)	N/A	N/A	±0.05°C	2
1620	The DewK Thermo Hygrometer	0 to 50°C 0 to 100% R.H	N/A	N/A	±0.125°C at 16 to 24°C 1.5%R.H. at 20 to 70%R.H.	2

** Using a 25-ohm external reference resistor. Readout only.*
*** Accuracy of measuring junction. Internal CJC accuracy is 0.1 and 0.3°C respectively.*
**** Not CE certified.*

More Temperature Instruments from Hart

Hart Scientific not only manufactures first class thermometry instrumentation, it also manufactures everything needed for temperature measurement and calibration. Hart's full product offering includes everything from fixed point cells and their maintenance furnaces, to constant temperature baths, SPRTs, precision readouts and data loggers. Hart is the world's leading manufacturer of temperature and measurement equipment. These leading temperature calibration products are available through your local Hart Scientific distributor. All Hart products are backed by technical support, customer service, and a fully accredited calibration laboratory—also by your local, specially selected distributor.

For more information on the other products from Hart contact your local Hart distributor for any of the following documents:

- **Primary Standards,**
- **Constant Temperature Baths,**
- **Industrial Temperature Calibration,**
- **Full Catalog**

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