



4500 High Accuracy Smart Probe Thermometer

Model 4500 Series Ultra-High Accuracy Thermometers take metrology-level temperature measurement to the laboratory, the production floor and the field.

Ultra-high system accuracy ($\pm 0.015^{\circ}\text{C}$) is achieved because the thermometer and probe function as if they were calibrated together as a system, even though they can be purchased separately. The 4500 System uses coefficients stored in each probe with the Steinhart-Hart algorithm to calculate the exact temperature reading every time you plug in a probe to take a measurement.

The 4500 series thermometers accept a wide range of plug-in probes equipped with proprietary Smart Probe system. The probes utilize super stable thermistors capable of providing high resolution, fast response and ultra high accuracy.



4500 High Accuracy Smart Probe

System Features

- High system accuracy
- NIST traceable calibration included
- Interchangeable temperature probes
- Hand-held flexibility
- Hold reading button
- $^{\circ}\text{C}/^{\circ}\text{F}$ display
- Auto shut off
- Three decimal place mode
- Delta T
- Function keys
- Min/Max reading
- RS-232 serial port

Applications

- Calibrate/verify your PCR Thermal Cycler
- Reference thermometer for your liquid bath
- Clinical laboratory quality control
- Chemical & petroleum regulatory/safety
- Metrology
- Thermal cycler plate uniformity
- Autoclave integrity

Technical Specifications

Resolution:	0.01 $^{\circ}\text{C}$ or 0.001 $^{\circ}\text{C}$ selectable 0.001 $^{\circ}\text{C}$ when using serial output
Display:	LCD 4 1/2 digit 0.6" high. Function icons.
Maximum Meter Range:	-40 to +150 $^{\circ}\text{C}$ (-40 to +299 $^{\circ}\text{F}$)
Power:	9 volt Alkaline battery or external 12 VDC. Battery life 25 hours, typical; 15 with RS-232.
Reading Rate:	2 per second (update every 524 milliseconds)
Over Range Indication	Displays LO or HI
Operating conditions	Temperature 0 $^{\circ}\text{C}$ to 45 $^{\circ}\text{C}$ Humidity 0 to 85%

Smart Probes

Stainless Steel Tube Probes for waterbaths, block calibrators & other general purpose use. Designed for use with the 4500 Thermometer; simply plug & play into the 4500 Thermometer.

Technical Specifications

Sheath Size:	0.156"(5/32")dia. x 12.0"L
Temperature Range:	-40 $^{\circ}\text{C}$ to +150 $^{\circ}\text{C}$
Accuracy*:	0 to 100 $^{\circ}\text{C}$ $\pm 0.025^{\circ}\text{C}$ -25 to 125 $^{\circ}\text{C}$ $\pm 0.05^{\circ}\text{C}$ -40 to 150 $^{\circ}\text{C}$ $\pm 0.15^{\circ}\text{C}$

*(accuracy specification includes 4500 thermometer)

Ordering Information

Product Code	Model Number
7012743	4500 High Accuracy Thermometer (excludes probe)
7002746	4500 5/32" Probe 1*
7002744	4500 0.2ml Probe 2*
7002745	4500 0.5ml Probe 3*

1* Temperature range: -40 $^{\circ}\text{C}$ to 150 $^{\circ}\text{C}$, general purpose

2* Temperature range: 0 $^{\circ}\text{C}$ to 100 $^{\circ}\text{C}$, thermal cyclers

3* Temperature range: 0 $^{\circ}\text{C}$ to 100 $^{\circ}\text{C}$, thermal cyclers





Accu-Temp Precision RTD Thermometer

The Tecal Accu-Temp RTD thermometer is an excellent choice for use as a laboratory grade reference thermometer.

It offers the flexibility of one or two RTD input channels, along with direct temperature readout in degrees °F, °C and ohms. Combine the Tecal Accu-Temp with one of our PRT's for a high accuracy temperature measurement system.

- User programmable linearization (ITS90)
- Accepts either 10, 25.5 or 100 ohm platinum RTD's
- Direct readout in °C, °F, and ohms
- Temperature accuracy of $\pm 0.015^{\circ}\text{C}$ up to 500°C
- Temperature and ohm meter resolution of 0.001
- Wide temperature range -200 to $+660^{\circ}\text{C}$
- Accepts probe alphas of either 0.00385 or 0.003925
- Single or dual RTD input channels
- Switchable 230 or 120V operation
- Includes NIST traceable calibration certificate



Accu-Temp Precision RTD Thermometer

Technical Specifications

Temperature accuracy of thermometer					
	-100°C	0°C	200°C	400°C	500°C
+/-	0.005(0.009°F)	0.005(0.009°F)	0.007(0.013°F)	0.011(0.020°F)	0.013(0.023°F)
	Ohmmeter uncertainty		+/-0.002 ohms or 15 ppm		

Dimensions (h x w x d)	22 x 29.5 x 9 cm
Weight	8.8 lbs (12 lbs shipping)
Option	RS-232 interface

Ordering Information

Product Code	Model	Voltage
7002618	Accu-Temp RTD Thermometer	230/120V Dual Channel
7002797	Accu-Temp RTD Thermometer	230/120V Single Channel
7032893	RS-232 Interface & Cable	n/a



Accu-Temp Precision RTD Thermometer and PRT probe



See page 33 and 34 for RTD probes for use with the Accu-Temp and Accu-Temp II



Tecal Accu-Temp II

Tecal Accu-Temp II Laboratory Grade Reference Thermometer

The Tecal Accu-Temp II is a high accuracy multi purpose digital thermometer for both platinum resistance thermometers and thermocouples. Dual Channel input allows a probe on Channel B to be calibrated against a standard on Channel A - directly compare any combination of PRT and Thermocouple. The Tecal Accu-Temp II supports 13 thermocouple types: B, E, J, K, N, R, S, T, D, C, I, U, Au/Pt and both 3 and 4 wire 100 ohm Platinum resistance thermometers and RTDs.

- Accuracy of RTD and PRT measurement ± 0.010 °C
- Accuracy of T/C measurement, better than ± 0.1 °C
- 0.001 resolution for RTDs/PRTs and thermocouples
- 2 measuring inputs
- 13 thermocouples: B, E, J, K, N, R, S, T, D, C, I, U, Au/Pt
- T/C CJC internal or external
- Input of RTD coefficients: Calendar Van Dusen & ITS90
- Probe self-heat check
- Automatic current reversal for RTDs/PRTs
- Suitable for 3 and 4 wire RTDs/PRTs
- Units °C, °F, K, mV, ohms
- Math functions max/min, std. deviation & mean
- Data logging 4000 values
- Expandable by plugging in optional 4 input RTD or thermocouple scanner cards to 1 of 2 rear panel slots available.
- RS232 talk/listen - included
- Rechargeable sealed lead acid battery: 8 hrs operation continuous

The powerful math function enables statistical analysis of the captured data, mean, max, min, peak and standard deviation. The Tecal Accu-Temp II can be expanded by adding either a 4 input Thermocouple or 4 input PRT card into one of the two available slots in the rear of the unit. Ultimately, two cards of the same type could be added to allow the measurement of up to 10 sensors of the same type or one PRT as a reference and nine thermocouples. Each unit includes an RS232 cable, NIST traceable calibration, instruction manual and mains cable. Combine the Tecal Accu-Temp II with one of Techne's secondary standard PRTs, a Techne Dri-Block calibrator, liquid calibration bath and TechneWorks software to create a thermometer and sensor calibration system with high overall accuracy.

Thermocouple Accuracy

Type	Range °C	Resolution °C, °F or K	Display Resolution mV	Uncertainty @20 °C °C 5 ± 1 year	Uncertainty @20 °C °C 5 ± 1 60 days	Temperature Coefficient /°C
B	+250 to +1820	0.001	1.0	$\pm(0.025\% \text{ Rdg} + 0.006\% \text{ FS})^*$	$\pm(0.02\% \text{ Rdg} + 0.006\% \text{ FS})^*$	7 ppm Rdg + 6 ppm FS
C	0 to +2315	0.001	1.0	$\pm(0.075\% \text{ Rdg} + 0.005\% \text{ FS})$	$\pm(0.05\% \text{ Rdg} + 0.005\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
D	0 to +2315	0.001	1.0	$\pm(0.75\% \text{ Rdg} + 0.005\% \text{ FS})$	$\pm(0.05\% \text{ Rdg} + 0.005\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
E	-200 to +1000	0.001	1.0	$\pm(0.026\% \text{ Rdg} + 0.004\% \text{ FS})$	$\pm(0.01\% \text{ Rdg} + 0.004\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
J	-210 to +1200	0.001	1.0	$\pm(0.03\% \text{ Rdg} + 0.005\% \text{ FS})$	$\pm(0.008\% \text{ Rdg} + 0.005\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
K	-200 to +1372	0.001	1.0	$\pm(0.035\% \text{ Rdg} + 0.006\% \text{ FS})$	$\pm(0.01\% \text{ Rdg} + 0.006\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
N	-200 to +1300	0.001	1.0	$\pm(0.035\% \text{ Rdg} + 0.005\% \text{ FS})$	$\pm(0.01\% \text{ Rdg} + 0.005\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
R	-50 to +1768	0.001	1.0	$\pm(0.02\% \text{ Rdg} + 0.015\% \text{ FS})$	$\pm(0.005\% \text{ Rdg} + 0.015\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
S	-50 to +1768	0.001	1.0	$\pm(0.02\% \text{ Rdg} + 0.015\% \text{ FS})$	$\pm(0.005\% \text{ Rdg} + 0.015\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
T	-200 to +400	0.001	1.0	$\pm(0.025\% \text{ Rdg} + 0.015\% \text{ FS})$	$\pm(0.005\% \text{ Rdg} + 0.015\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
U	-200 to +600	0.001	1.0	$\pm(0.025\% \text{ Rdg} + 0.015\% \text{ FS})$	$\pm(0.005\% \text{ Rdg} + 0.015\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
L	-200 to +600	0.001	1.0	$\pm(0.03\% \text{ Rdg} + 0.005\% \text{ FS})$	$\pm(0.008\% \text{ Rdg} + 0.005\% \text{ FS})$	7 ppm Rdg + 6 ppm FS
Au/Pt	0 to +1000	0.001	1.0	$\pm(0.02\% \text{ Rdg} + 0.015\% \text{ FS})$	$\pm(0.005\% \text{ Rdg} + 0.015\% \text{ FS})$	7 ppm Rdg + 6 ppm FS

RTD & PRT Accuracy

Type	Range °C	Resistance	Current	Resolution	Resistance °C, °F or K	Accuracy Typically @20°C \pm
Pt100	-200 to 660	18 to 340Ω	0.5mA	0.001	0.001Ω	0.010
Pt100	660 to +800	340 to 450Ω	0.5mA	0.001	0.001Ω	0.020



Technical Specifications

Display

LCD Graphics Panel, 240 x 64 Dot, with LED backlight contrast control via Keyboard.

Inputs

Thermocouples via 4mm sockets in copper block on 19mm pitch adaptor plug for direct connection of thermocouple wire. Reference Junction Compensation - Automatic with external Pt100 probe. PRT's via 6-pin Lemo socket, also used for external RJ measurement.

Calibration

Digital, security code protected.

Working Temperature

0 to 40°C rel humidity.
80% max non condensing.

Storage Temperature

-20 to +50°C.

Mains Supply

100/120/220/240 Volts + 10% - 13% 47 to 63Hz max. 40VA.

Dimensions

21.9 x 11 x 31.5 cm

Weight

12 lbs approx

Data Logging

The Tecal Accutemp II Thermometer comes complete with a data logging function, enabling up to 4000 single channel (2000 dual channel) readings to be stored together with a date and time stamp. The stored values can be recalled to the instrument display and scrolled through using the front panel keyboard, alternatively these values can be downloaded to a PC file or printer.

Battery

Sealed lead acid, rechargeable cell giving approximately 8 hours continuous operation. Internal battery charger.

Maths

Displays max/min values Peak to Peak, mean & standard deviation.

Analog Output - optional

This is a factory fitted option comprising of a single BNC socket fitted to the rear panel. The function is as per the main value display and is scaled 1mV°C. A 12 bit D/A is used and the resolution is 0.5°C.

Expansion cards - optional

There are two expansion slots in the rear panel which will accept a 4 Input thermocouple or RTD plug and play card giving a total of 8 additional channels.

IEEE-488 optional

Conforms to the ANSI-IEEE Std 488.1-1987. The interface performs the following functions: SH1, AH1, T5, TEO, L3, LEO, SR1, RL1, RL1, PPO, DC1, DT1, C0, E2. The interface can also be set to a talk only mode to permit stand alone printer output.

Ordering Information

Product Code	Model	Voltage	Shipping Weight (lbs)
3024400	Tecal Accu-Temp II thermometer	120 & 240 switchable	12
7032840	4 input Thermocouple scanner card	N/A	2
7032841	4 input RTD scanner card	N/A	2
7032842	Front panel RTD Lemo connector	N/A	0.22



See page 40 and 41 for RTD probes for use with the Accu-Temp and Accu-Temp II

RTD Probes

The Techne model WSP425 and SSP660 PRTs are an excellent choice for use as reference sensors in all types of systems, including dry block calibrators, liquid calibration baths, ovens, reactors and other applications where temperature needs to be accurately measured.

Our PRTs offer proven and reliable performance for critical temperature measurements. They can be used with our Tecal Accu-Temp indicator or any comparable unit. Both models include a carrying case and ITS-90 calibration (NIST traceable) certificate with coefficients and resistance vs. temperature table. The SSP660 has excellent performance, specifications and wide temperature range at an affordable price, while the WSP425 is designed for measurements within a narrower temperature range.

The model WSP425 has a calibrated operating range of -50 to +425°C, and the model SSP660 from -80 to +660°C.

425°C Working Standard PRT

The model WSP425 PRT is a great choice when lower temperature range is required.

The sheath is of stainless steel construction with a strain free wire wound .3924 alpha sensing element.

The WSP425 PRT can be used as a working standard in calibration baths, furnaces, fluidized baths, dry block calibrators or for any other temperature calibration work.

Combine it with our model Tecal Accu-Temp RTD indicator for a system with high overall accuracy. The WSP425 PRT includes a NIST traceable ITS-90 calibration with coefficients and R vs T table.

Technical Specifications

Resistance at 0° C:	100 ohms
Temperature range:	-200 to 425°C
Calibrated temperature range:	-50 to 425°C
Temperature coefficient:	0.003924 Ω / Ω / ° C minimum
Stability:	Meets IEC stability specifications after 250 hours exposure to extremes of temperature range. Typical drift is less than 0.05°C (0.02Ω) at 0°C.
Repeatability:	Meets IEC requirements. Typical shift less than 0.05°C (0.02Ω) at 0°C after ten cycles over range.
Dimensions:	0.25" dia. x 12" L, custom sizes available
Tolerance at 0° C:	± 0.06%, IEC DIN class A
Lead wires:	4 wire Teflon insulated, stranded 22 AGW copper x 6" Long

Calibration

Each WSP425 PRT includes an ITS-90 NIST traceable calibration with a+, b+, a- and b- coefficients and R vs T table. A padded carrying case is also included.

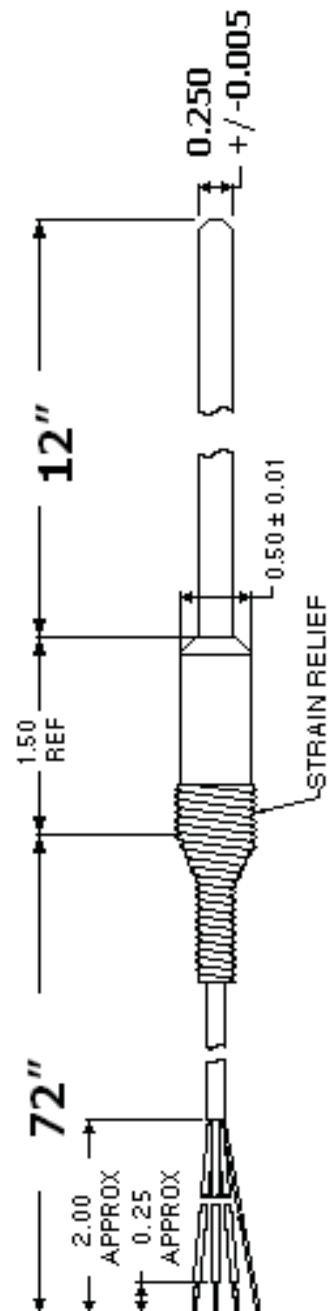
Calibrated uncertainty (K=2)

-50°C ±0.040°C
-20°C ±0.035°C
0°C ±0.030°C
230°C ±0.035°C
420°C ±0.050°C

(Calibrations down to -196°C available upon request.)

Ordering Information

7002617 425°C Working Std 1/4" PRT with carrying case





660°C Secondary Standard PRT

Model SSP660 PRTs are assembled using our special wire wound RTD elements and assembled into inconel sheaths. The SSP660 PRT has the accuracy and long-term stability specifications you would find in much higher priced secondary standard PRTs.

The SSP660 PRT can be used as a secondary standard in calibration baths, furnaces, fluidized baths, dry block calibrators and other any other temperature calibration work requiring a high level of accuracy and repeatability.



SSP660 with case

Technical Specifications

Resistance at 0° C:	100 ohms
Temperature range:	-200 to 660°C
Calibrated temperature range:	-196 to 660°C
Temperature coefficient:	0.003925 Ω /Ω /° C minimum
Stability:	R0 typical drift < 0.01°C after 500 hours at 660° C
Thermal shock:	R0 typical drift < 0.005° C after 100 times from 25 to 660°C
Dimensions:	0.25" dia. x 18" L inconel sheath as standard, custom sizes available
Tolerance at 0° C:	± 0.06%, IEC DIN class A
Lead wires:	4 wire Teflon insulated, stranded 22 AGW copper x 6" long

Calibration

Each SSP660 includes an ITS-90 NIST traceable calibration with a+, b+, c+, a- and b- coefficients and R vs T table. A carrying case is also included.

Calibrated uncertainty (K=2)

-80°C ±0.040°C
-38°C ±0.035°C
0°C ±0.020°C
230°C ±0.030°C
420°C ±0.045°C
660°C ±0.055°C

(Calibrations down to -196°C available upon request.)

Accessories

7002795	660°C Secondary Std 1/4" PRT with carrying case
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