

## Secondary reference thermistor probes



- Short-term accuracy to  $\pm 0.01\text{ }^{\circ}\text{C}$ ; one-year drift  $< \pm 0.01\text{ }^{\circ}\text{C}$
- Accredited NVLAP calibration optional
- Flexible Teflon and silicone coated fast-response models
- Rugged polished stainless steel sheaths

Hundreds of thousands of thermistors are sold every year, but only a few have the stability necessary for use as high-accuracy thermometry standards. If you're looking for economical lab-grade thermistor probes for accurate work across a narrow temperature range, Hart's Secondary Reference Series thermistor probes are the best you can buy.

These thermistors are available in a variety of sheath materials appropriate for your specific application. In addition to our metal-sheathed probes, we offer flexible Teflon encapsulated and silicone coated thermistors that have smaller tips and can measure those places where even a metal-sheathed thermistor can't reach.

### Teflon encapsulated thermistor

The 5611T is an especially versatile Teflon coated thermistor probe. With a Teflon encapsulated tip that is just 3 mm (0.12 in) in diameter and a Teflon coating that makes it impervious to most liquids, the Teflon Probe is handy for measuring in a wide variety of applications, including biopharmaceuticals. It's even immersible to nearly 20 feet and flexible enough that you could roll it up into a ball in your hand if you wanted to!

The 5611T's thermistor bead is encapsulated in a Mylar sleeve that is encapsulated inside a Teflon sleeve. The Teflon sleeve is

then melted around the Teflon-insulated cable, forming a moisture-proof seal.

### Stainless steel sheathed thermistors

Our stainless steel metal-sheath probes include our 5610-6 and 5610-9 immersion probes, as well as our 5665 fully immersible probe. These probes are great for measuring in air, liquid or soil.

### Silicone coated thermistor

With a diameter at the tip of just 1.5 mm (0.06 in), the 5611A's tip has the smallest diameter of any of our secondary reference thermistors and can fit nearly anywhere. Its faster response time, flexible sheath, and silicone coating make the 5611A great for use in many applications. However, applications involving silicone oil could damage the thermistor and should be avoided.

### Higher performance

All of Hart's secondary reference thermistors have small diameters and very small sensing elements, which means they require far less immersion than a PRT to avoid errors caused by stem effect. Self heating is usually negligible, giving them an advantage when taking measurements in air. Their small size also improves response time, allowing measurements to be taken more quickly.

If your application involves frequent handling, you'll be especially interested to

know thermistors are less susceptible to mechanical shock than PRTs. The bottom line may be better accuracy in fieldwork.

Additionally, higher base resistance and larger resistance coefficients make it easier to achieve precision readings with thermistors, so better resolution and accuracy are possible for a lower cost. All of these thermistors have a negative temperature coefficient of resistance (NTC). For additional information about thermistors, please see "Thermistors: the under-appreciated temperature standards" on page 86.)

### Readouts

These probes come in a complete assembly ready for use, and each works well with the uncertainties of our thermometer readouts: the 1504 Tweener, the 1523 and 1524 Handheld Thermometers, the 1529 Chub-E4, the 1560 *Black Stack*, and the 1575A and 1590 Super-Thermometers.

These probes provide most accurate readings when coupled with a 2563 Standards Thermistor Module or 1590 Super-Thermometer, but they are most portable when used with a handheld Reference Thermometer.

### Calibrated accuracy

What's more, the Secondary Reference Series Thermistors are accurate to  $\pm 0.01\text{ }^{\circ}\text{C}$  and cover the temperature range of  $0\text{ }^{\circ}\text{C}$  to  $100\text{ }^{\circ}\text{C}$ . They come with a NIST-traceable calibration and a resistance-versus-temperature table printed in  $0.1\text{ }^{\circ}\text{C}$  increments that can be interpolated to  $0.0001\text{ }^{\circ}\text{C}$ . NVLAP accredited calibrations as single thermistors or as systems combined with their readouts, are also available.

No other sensors can match the accuracy and price combination of these high-accuracy thermistor probes. Try one and you'll agree.

# Secondary reference thermistor probes

FLUKE®

Hart Scientific®

## Specifications

<b>Resistance</b>	Nominal 10,000 $\Omega$ at 25 °C
<b>Range</b>	0 °C to 100 °C
<b>Calibration</b>	R vs. T table with 0.1 °C increments, interpolation equation furnished
<b>Calibration Uncertainty</b>	Table and equation are accurate to $\pm 0.01$ °C Optional accredited <sup>†</sup> calibration uncertainties $\pm 0.006$ °C
<b>Drift</b>	Better than $\pm 0.01$ °C per year ( $k=3$ )
<b>Repeatability</b>	Better than $\pm 0.005$ °C
<b>Size and Construction</b>	See illustrations below.
<b>Termination</b>	Specify when ordering.

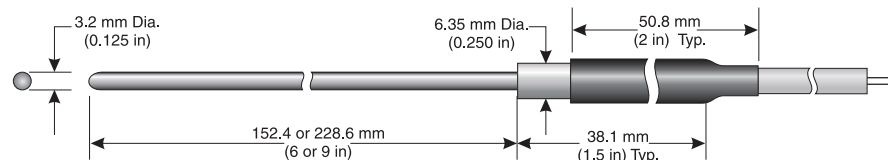
<sup>†</sup>NVLAP Lab Code 200348-0

## Ordering Information

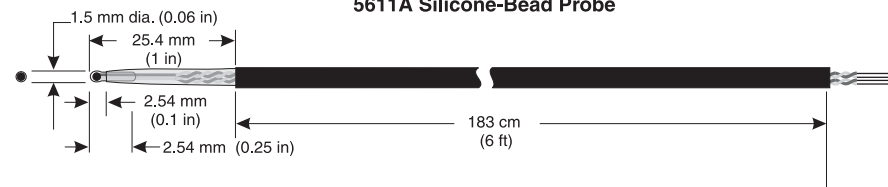
<b>5610-6-X</b>	152 mm (6 in) Immersion Probe
<b>5610-9-X</b>	229 mm (9 in) Immersion Probe
<b>5611A-11X</b>	Silicone-Bead Probe
<b>5611T-X</b>	Teflon Probe
<b>5665-X</b>	Miniature Immersion Probe
<b>1925-A</b>	Calibration, 100 ° span, 6 points over span, NVLAP-accredited
<b>1935-A</b>	System calibration, 100 ° span, 6 points over span, NVLAP-accredited
<b>2601</b>	Probe Carrying Case

*X = termination. Specify "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "I" (INFO-CON for 1521 or 1522), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).*

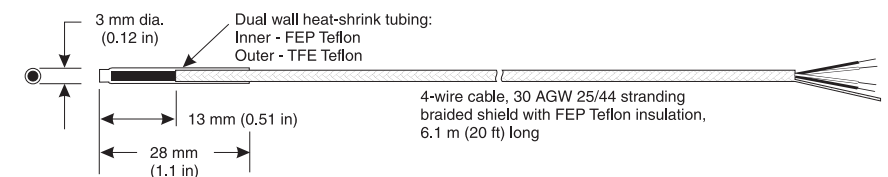
**5610 Stainless Steel Immersion Probe**



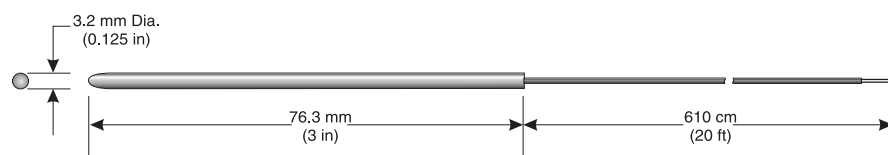
**5611A Silicone-Bead Probe**



**5611T Teflon Probe**



**5665 Stainless Steel Miniature Immersion Probe**



## Handle your probe correctly

Good thermometer handling procedures help maintain calibration accuracy. Here are a few pointers.

### Don't

- Don't subject a PRT to physical shock or vibration.
- Don't bend a probe that is not designed for bending.
- Don't subject a thermometer to sudden extreme temperature changes.
- Don't install compression fittings on a probe sheath.
- Don't subject a thermometer to temperatures outside its range.
- Don't subject a thermometer's transition junction, handle, or lead wires to temperatures outside their ranges (which likely differ from the thermometer's range).
- Don't immerse the probe past the bottom of its handle.

### Do

- Do immerse a probe to at least its minimum immersion depth.
- Do allow the thermometer time to stabilize before taking readings.
- Do use the proper current to prevent self-heating errors.
- Do check your probe's  $R_{TPW}$  value frequently.
- Do test the shunt resistance of your probe periodically. (Shunt resistance is the resistance between the probe sensor and the probe sheath.)

**Cal Power**

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