



YSI Precision™ Thermistors and Probes
The Temperature Standard, Planetwide™

Y S I P r e c i s i o n [™] T e m p e r a t u r e P r o d u c t s

C O N T E N T S

Y S I P r e c i s i o n [™] T e m p e r a t u r e P r o d u c t s

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See the YSI Precision[™] Temperature Handbook for detailed specifications and how-to sections that make engineering with thermistors easy.

From a small partnership started at Ohio's Antioch College in 1948, YSI has become an international organization with the mission of providing sensing solutions to ensure ecological sustainability. The YSI Precision Temperature Group specializes in temperature measurement technology and, with the recent acquisition of Victory Engineering, the Group now offers an expanded product line to better assist customers with critical temperature measurement applications.



YSI Precision™ thermistors offer super stability and interchangeability tolerances as tight as $\pm 0.05^{\circ}\text{C}$. They are recognized as the premier choice for accurate, stable measurements in critical, demanding applications in diverse markets such as telecommunications, patient temperature, biomedical research, industrial controls, and aerospace. With the addition of YSI VECO® brand products, customers now have greater design choices for applications where stability, extremely small size, or high reliability are required.

YSI maintains a world-class temperature calibration laboratory to ensure traceability of measurements to the U.S. National Institute of Standards and Technology (NIST). YSI's facility was the first outside Germany with Deutscher Kalibrierdienst (DKD) accreditation from the PTB, Germany's equivalent of the U.S. NIST. Find out how a YSI Precision or YSI VECO brand temperature product can meet the needs of your next temperature project by calling the YSI Technical and Customer Service team.

THERMISTOR COMPONENTS

Thermistors from YSI provide highly accurate and stable temperature sensing for measurement, control, indication, and compensation. Tight interchangeability of our precision components allows precise measurement without calibration of circuitry to match individual components.

YSI Precision Thermistors are offered in six series that differ from each other by:

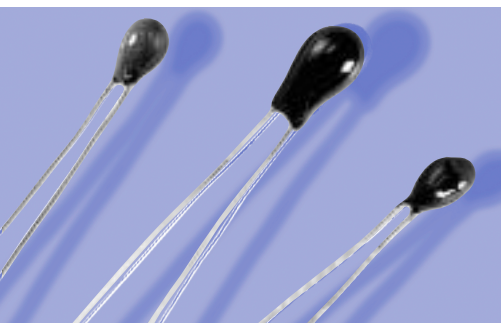
- the encapsulated material around the component,
- component leads,
- working temperature range, and
- interchangeability tolerances.

YSI thermistors are fabricated using proprietary processes to achieve highly accurate stable thermistors with each production lot. Comparing stability and accuracy specifications will highlight the advantages of the YSI process. When accuracy is important, there is only one choice - YSI.

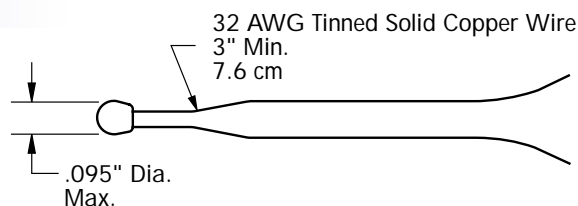
YSI 44000 Series
Epoxy-Encapsulated for
General Use

YSI 44100 Series
with Teflon Sheath for
Harsh Environments

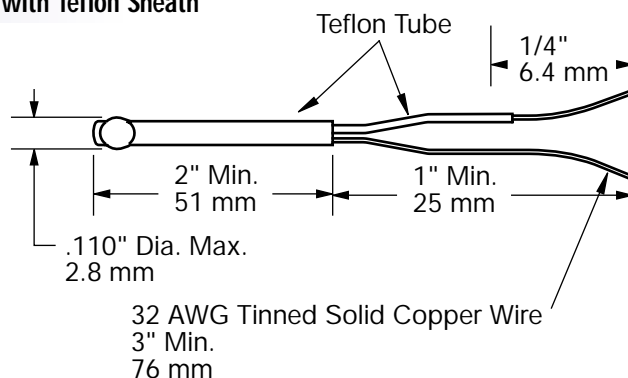
The YSI 44000 Series are epoxy encapsulated and designed for applications where cost, flexibility, and a wide range of resistance values are important. They are available in both $\pm 0.2^{\circ}\text{C}$ and $\pm 0.1^{\circ}\text{C}$ interchangeability tolerances. The YSI 44100 Series teflon-sheathed thermistors allow exposure to hostile environments such as conductive or corrosive liquids and particulate suspensions. 44100 Series is available with various resistances in $\pm 0.2^{\circ}\text{C}$ tolerances.



YSI 44000 Series Thermistors



YSI 44100 Series Thermistors with Teflon Sheath



Specifications

Time Constant: 1 sec. max for standard thermistors, 2.5 sec. max for Teflon-sheathed thermistors, when suspended by their leads in a well-stirred oil bath. In still air, 10 sec. max for standard thermistors, 25 sec. max for Teflon-sheathed thermistors.

Dissipation Constant: 8 mW/°C min when suspended by their leads in a well-stirred oil bath, or 1 mW/°C in still air.

Stability: YSI thermistors are chemically stable and not significantly affected by aging or exposure to strong nuclear radiation. The table below shows typical stability for a representative thermistor, the YSI 44005.

Operating Temperature	Typical Thermometric Drift	
	10 months	100 months
0°C	< 0.01°C	< 0.01°C
25°C	< 0.01°C	< 0.02°C
100°C	0.20°C	0.32°C
150°C	1.5°C	not recommended

Resistance/Temperature Data: A °C/°F resistance versus temperature table in 1°C increments is in the *YSI Precision™ Temperature Handbook*, or visit www.YSI.com.

Interchangeability Tolerance Data: Tables in the *Handbook* show nominal resistance values, ohms per degree, and tolerance at select temperatures over the operating range.

Temperature Probe Assemblies: YSI 44000 Series Thermistors may be installed in many of the probes described in the Configure-to-Order Probe section of this catalog.

Maximum Power: 30 mW at 25°C to 1 mW at 125°C short-term.

	Ordering Part Numbers		Zero Power Resistance Ω at 25°C	Beta 0-50°C (K)	Ratio Ω 25/125°C	Maximum Working Temperature	Best Storage & Working Temperature	Mix	
	Standard	Teflon							
±0.2°C Interchangeability Tolerance 0 to 70°C	44001A	44101A	100	2854	11.49	100°C	-80-+50°C	L	
	44002A	44102A	300	3118	15.15	100°C	-80-+50°C	L	
	44003A	44103A	1000	3271	17.33	100°C	-80-+50°C	L	
	44004	44104	2252	3891	29.26	150°C	-80-+120°C	B	
	44005	44105	3000	3891	29.26	150°C	-80-+120°C	B	
	44007	44107	5000	3891	29.26	150°C	-80-+120°C	B	
	44017	44117	6000	3891	29.26	150°C	-80-+120°C	B	
	44016	44116	10K	3891	29.26	150°C	-80-+120°C	B	
	44006	44106	10K	3574	23.51	150°C	-80-+120°C	H	
	44008	44108	30K	3810	29.15	150°C	-80-+120°C	H	
	44011	44111	100K	3988	34.82	150°C	-80-+120°C	H	
	44014	44114	300K	4276	46.02	150°C	-80-+120°C	H	
	44015	44115	1 meg	4582	61.96	150°C	-80-+120°C	H	
	±0.1°C Interchangeability Tolerance 0 to 70°	44035	-	1000	3271	17.33	100°C	-80-+50°C	L
		44033	-	2252	3891	29.26	150°C	-80-+75°C	B
44030		-	3000	3891	29.26	150°C	-80-+75°C	B	
44034		-	5000	3891	29.26	150°C	-80-+75°C	B	
44037		-	6K	3891	29.26	150°C	-80-+75°C	B	
44036		-	10K	3891	29.26	150°C	-80-+75°C	B	
44031		-	10K	3574	23.51	150°C	-80-+75°C	H	
44032		-	30K	3810	29.15	150°C	-80-+75°C	H	

Temperature Tip

What is Meant by Interchangeability?

The term interchangeability refers to how accurately thermistors track a nominal resistance curve. In the case of a ±0.2°C part, through all portions of the interchangeable range, the part is within ±0.2°C of the nominal value for that part. This term is sometimes confused with accuracy. Keep in mind the ±0.2°C figure only refers to the nominal curve; absolute accuracy for thermistor at a measured temperature is significantly better. Refer to the *YSI Precision™ Temperature Handbook* or visit www.YSI.com for more information.

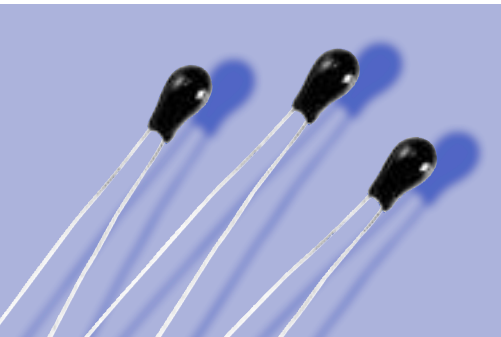
How to Order

Please order from your YSI representative or YSI Customer Service.

Call 937 427-1231 ext. 770

THERMISTOR COMPONENTS

YSI 45000 Series High Temperature Hermetic Thermistors



YSI 45000 Series Thermistors are manufactured with glass hermetic encapsulation, providing stability over a wide range of operating temperatures. Designed for elevated temperatures or for high humidity applications (95% or above), you can substitute these thermistors for the YSI 44000 Series with no circuit changes.

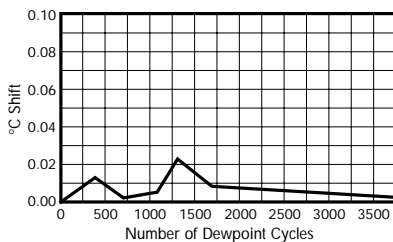
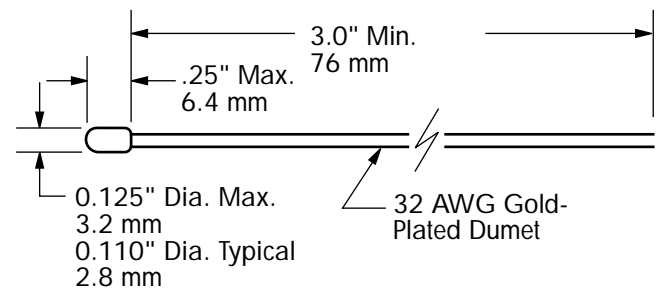
Replacement of the standard epoxy coating with glass hermetic encapsulation provides significant advantages.

- Improved resistance to humid environments
- Excellent high-temperature stability
- Interchangeability at high temperature
- Wide operating range: -80 to +250°C
- Higher power handling capabilities

Tests Show Thermistor Stability

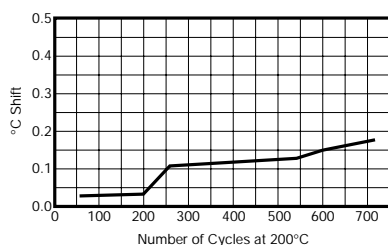
YSI 45000 and 46000 Series Thermistors offer unparalleled stability and moisture resistance in thermistor components. The data from the tests shown below demonstrate that YSI Precision™ glass thermistors are the device of choice in extreme environments. See High-Temperature Testing on page 8.

YSI 45000 Series Thermistors



Differential Dew Point Cycling

Moisture is a major cause of failure in standard non-hermetic thermistors. This test exposed the thermistors to multiple cycles with 11 minutes below the dew point and 11 minutes at ambient. After over 3,500 cycles, there was no appreciable shift.



High-Temperature Cycling

Thermal cycling, the most rigorous test, consisted of 11 minutes at ambient and 11 minutes at 200°C. Several hundred cycles were run. Shifts after 700 cycles averaged less than 0.2°C.

Specifications

Time Constant: 2.5 sec. max when suspended by its leads in a well-stirred oil bath, 20 sec. max in still air.

Dissipation Constant: 10 mW/°C min when suspended by its leads in a well-stirred oil bath, or 4 mW/°C in still air.

Stability: Typical thermistor stability at 100°C is 0.05°C for 10 months.

Resistance/Temperature Data: A °C/°F resistance versus temperature table is in the *YSI Precision™ Temperature Handbook*, or visit www.YSI.com.

Temperature Probe Assemblies: YSI 45000 Series Thermistors may be installed in many of the probes described in the Configure-to-Order Probe section of this catalog.

Interchangeability Tolerance Data: See the *Handbook* for nominal resistance values, ohms per degree, and tolerance at select temperatures over the operating range.

Maximum Power: 50 mW at 25°C derated to 2 mW at 125°C, 1 mW at 250°C.

	Ordering Part Numbers	Zero Power Resistance Ω at 25°C	Beta 0-50°C (K)	Ratio Ω 25/125°C	Maximum Working Temperature	Mix
±0.2°C Interchangeability Tolerance 0 to 70°C	45004	2252	3891	29.26	200°C	B
	45005	3000	3891	29.26	200°C	B
	45007	5000	3891	29.26	250°C	B
	45017	6K	3891	29.26	250°C	B
	45016	10K	3891	29.26	250°C	B
	45006	10K	3574	23.51	250°C	H
	45008	30K	3810	29.15	250°C	H

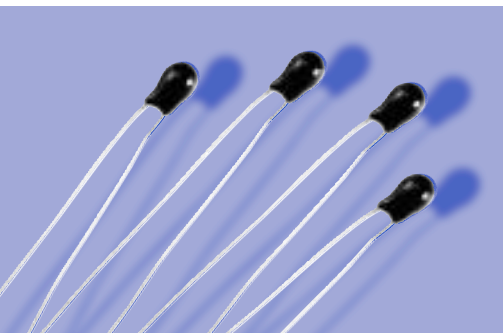
Temperature Tip

Why do Thermistors Fail?

Moisture is the most common cause of failure. Water reacts with internal electrode material resulting in a downward shift in resistance. YSI 45000, 46000, and 55000 Series glass-coated thermistors, as well as VECO® brand glass beads, virtually eliminate this type of failure. Customer-induced failures, resulting from mishandling during lead splicing or potting, can be eliminated by allowing YSI to perform your assembly work. Refer to the Configure-to-Order or OEM Probe sections of this catalog for more information. Refer to the *YSI Precision™ Temperature Handbook* for more information on failure modes.

THERMISTOR COMPONENTS

YSI 46000 Series for long-term stability

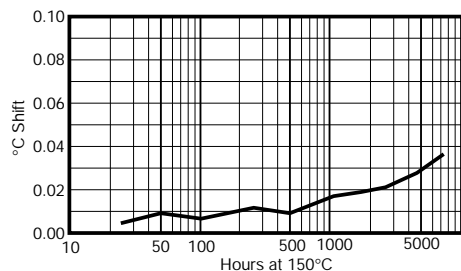
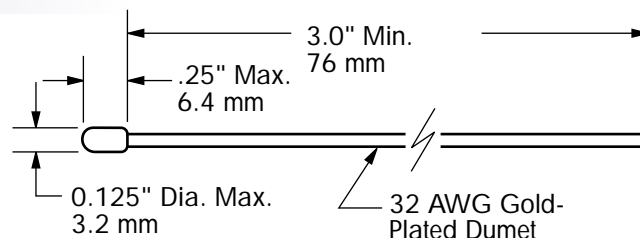


YSI 46000 Series components represent the state-of-the-art in long-term stability performance. By coupling glass hermetic encapsulation with 100% resistance shift screening, we offer stability never before realized with thermistor components.

YSI 46000 Thermistors are available with interchangeability tolerances as tight as $\pm 0.05^{\circ}\text{C}$, as well as $\pm 0.1^{\circ}\text{C}$ and $\pm 0.2^{\circ}\text{C}$. Many leading aerospace companies have recognized the advantages of these parts, developing their own specifications for qualifying, screening, and using these thermistors in high-reliability applications. YSI welcomes your inquiry on special measurement points and special test services.

Use of these parts in tubular probes offer reasonably priced “secondary transfer standard” performance. When matched with the YSI 4600S Precision Thermometer, the result is a highly accurate ($\pm 0.025^{\circ}\text{C}$) measurement system.

YSI 46000 Series Thermistors



High-Temperature Testing

All thermistors show some increase in resistance over time; the higher the temperature, the greater the shift. YSI glass thermistors were tested in an isothermal 150°C environment for an extended time. On average, they shifted less than 0.040°C in 5,000 hours.

Specifications

Time Constant: 2.5 sec. max when suspended by its leads in a well-stirred oil bath, 20 sec. max in still air.

Dissipation Constant: 10 mW/°C min when suspended by its leads in a well-stirred oil bath, or 4 mW/°C in still air.

Resistance/Temperature Data: A °C/°F resistance versus temperature table is located in the *YSI Precision™ Temperature Handbook*, or visit www.YSI.com.

Interchangeability Tolerance Data: Tables in the *Handbook* show nominal resistance values, ohms per degree, and tolerance at select temperatures over the operating range.

Temperature Probe Assemblies: YSI 46000 Series Thermistors may be installed in many probes described in the Configure-to-Order Probe section of this catalog.

Typical Thermometric Drift

Operating Temperature	Typical Thermometric Drift	
	10 months	100 months
25°C	< 0.01°C	< 0.01°C
70°C	< 0.01°C	< 0.01°C
100°C	0.02°C	0.03°C
150°C	0.05°C	0.08°C
200°C	0.22°C	0.60°C

	Ordering Part Numbers	Zero Power Resistance Ω at 25°C	Beta 0-50°C (K)	Ratio Ω 25/125°C	Maximum Working Temperature	Mix
±0.2°C Interchangeability Tolerance 0 to 70°C	46004	2252	3891	29.26	200°C	B
	46005	3000	3891	29.26	200°C	B
	46007	5000	3891	29.26	200°C	B
	46017	6K	3891	29.26	200°C	B
	46016	10K	3891	29.26	200°C	B
	46006	10K	3574	23.51	200°C	H
	46008	30K	3810	29.15	200°C	H
±0.1°C Interchangeability Tolerance 0 to 70°C	46033	2252	3891	29.26	200°C	B
	46030	3000	3891	29.26	200°C	B
	46034	5000	3891	29.26	200°C	B
	46037	6K	3891	29.26	200°C	B
	46036	10K	3891	29.26	200°C	B
	46031	10K	3574	23.51	200°C	H
	46032	30K	3810	29.15	200°C	H
±0.05°C Interchangeability Tolerance 0 to 70°C	46043	2252	3891	29.26	200°C	B
	46040	3000	3891	29.26	200°C	B
	46044	5000	3891	29.26	200°C	B
	46047	6000	3891	29.26	200°C	B
	46046	10K	3891	29.26	200°C	B
	46041	10K	3574	23.51	200°C	H

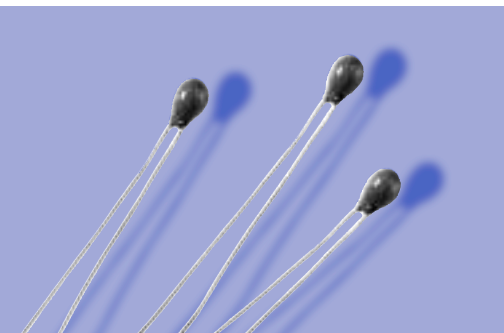
Temperature Tip

What is Self-heat?

The resistance of a thermistor may be affected by power application. This is "self-heat." If this change unintentionally alters the measurement it is called self-heat "error," and should be avoided. See the *YSI Precision™ Temperature Handbook* for tips on calculating and eliminating self-heat error. In some applications such as fluid-flow detection, self-heating is a design requirement. VECO® brand micro-beads, included in this catalog, are a popular component choice in these applications.

THERMISTOR COMPONENTS

YSI 55000 Series Glass-Encapsulated Material (GEM) thermistors for cost-effective performance



The newest thermistor product line from YSI combines the benefits of our high accuracy and super-stable thermistors with low-cost automated assembly technology. The result is a unique product line that defines a new cost versus performance model – the YSI 55000 Series Glass-Encapsulated Material (GEM) Thermistor.

YSI GEM Thermistors use a specially formulated glass material which provides a hermetic package rugged enough for most industrial applications. The product has high-temperature capability, to 200°C, and improved stability compared to epoxy- or plastic-encapsulated thermistors. Automated manufacturing allows us unprecedented process control in thermistor calibration and glass encapsulation.

A Variety of Types

- Interchangeability tolerance levels – $\pm 0.2^{\circ}\text{C}$, $\pm 0.1^{\circ}\text{C}$
- Standard resistances – 2252Ω to $30\text{ K}\Omega$ at 25°C
- 3 standard slopes – “B” mix and 2 “H” mixes

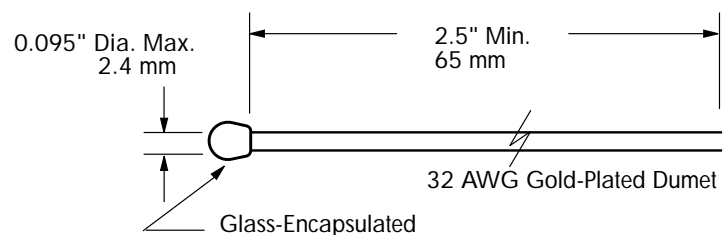
Performance Advantages

- Excellent long-term stability
- Broad temperature range to 200°C
- Hermetically sealed in glass
- Price/performance leader

Applications

YSI GEM Thermistors are ideal for applications requiring high stability up to 200°C , or high-moisture environments. Temperature compensation for sensitive electronic circuits such as precision crystal oscillators, communications devices, and medical and scientific instruments achieve improved results with the YSI GEM Thermistor.

YSI 55000 Series Thermistors



Specifications

Time Constant: 1.5 sec. max for GEM Thermistors, in a well-stirred oil bath. In still air, 15 sec. max for GEM Thermistors.

Dissipation Constant: 6 mW/°C min when suspended by their leads in a well-stirred oil bath, or 1.5 mW/°C in still air.

Stability: YSI thermistors are chemically stable and not significantly affected by aging or exposure to strong nuclear radiation. The table below shows typical stability for a YSI 55016. Visit www.YSI.com for more information on stability.

Operating Temperature	Typical Thermometric Drift 10 months
0°C	< 0.01°C
25°C	< 0.01°C
100°C	0.12°C
150°C	0.15°C
200°C	0.20°C

Resistance/Temperature Data: A °C/°F resistance versus temperature table is in the *YSI Precision™ Temperature Handbook*, or visit www.YSI.com.

Interchangeability Tolerance Data: Tables in the *Handbook* show nominal resistance values, ohms per degree, and tolerance at select temperatures over the operating range.

Temperature Probe Assemblies: YSI 55000 Thermistors can be installed in many of the probes described in the Configure-to-Order Probe section of this catalog.

Maximum Power: 30 mW at 25°C to 1 mW at 125°C short-term.

	Ordering Part Numbers	Zero Power Resistance Ω at 25°C	Beta 0-50°C (K)	Ratio Ω 25/125°C	Short Term Temperature	Best Working Temperature	Mix
±0.2°C Interchangeability Tolerance 0 to 70°C	55004	2252	3891	29.26	250°C	-80-+200°C	B
	55005	3000	3891	29.26	250°C	-80-+200°C	B
	55007	5000	3891	29.26	250°C	-80-+200°C	B
	55017	6000	3891	29.26	250°C	-80-+200°C	B
	55016	10K	3891	29.26	250°C	-80-+200°C	B
	55006	10K	3574	23.51	200°C	-80-+150°C	H
	55008	30K	3810	29.15	200°C	-80-+150°C	H
±0.1°C Interchangeability Tolerance 0 to 70°C	55033	2252	3891	29.26	250°C	-80-+125°C	B
	55030	3000	3891	29.26	250°C	-80-+125°C	B
	55034	5000	3891	29.26	250°C	-80-+125°C	B
	55037	6000	3891	29.26	250°C	-80-+125°C	B
	55036	10K	3891	29.26	250°C	-80-+125°C	B
	55031	10K	3574	23.51	200°C	-80-+100°C	H
	55032	30K	3810	29.15	200°C	-80-+100°C	H

Temperature TIP

YSI Precision™ GEM

Thermistors have the performance characteristics that directly compete with thin-film platinum RTDs.

The thermistor's superior resolution, high resistance values, and ruggedness

are available in a low-cost package, making the YSI GEM the obvious choice for many applications.

The YSI GEM Thermistor is effective when combined with our Configure-to-Order (CTO) probe offerings.

The high stability and temperature characteristics can be packaged in all CTO probe styles, providing the flexibility to purchase a solution to the most

demanding temperature measurement needs. See the Configure-to-Order Probes section in this manual for more information.

THERMISTOR COMPONENTS

YSI 44900 Series
Goddard Space Flight Center
GSFC S-311-P-18



NASA has qualified YSI epoxy-encapsulated thermistors for use in extended space flight. The Goddard Space Flight Center issued GSFC S-311-P-18 in 1974 specifying the performance requirements for these thermistors. YSI re-qualifies the product line each year and screens every thermistor before stocking.

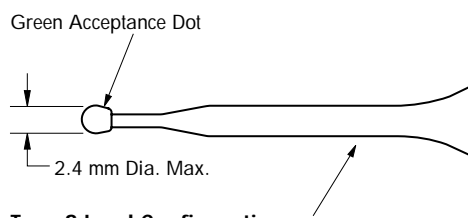
Re-qualification includes the following tests referenced in MIL-PRF-23648.

- Short time load
- Thermal shock
- Insulation resistance
- Resistance to soldering heat
- Low-temperature storage
- High-temperature storage
- Dissipation constant
- Thermal time constant
- Terminal strength
- Moisture resistance
- High-temperature exposure
- High-frequency vibration
- Medium-impact shock
- Immersion

Screening includes visual and mechanical requirements, thermal shock, high-temperature storage, insulation resistance, and additional resistance versus temperature analysis, giving you confidence that the component will perform to the rigorous requirements of space flight or other high-reliability applications. Customers often submit their own specifications that use YSI's testing capabilities in combinations not included in the Goddard specification.

Thermistors procured in compliance with GSFC S-311-P-18 are identified by a specific Goddard part number with a 311P18 prefix, dash number for resistance and range, lead code, and lead length code. Components with S-style leads 7.6 cm long are stocked.

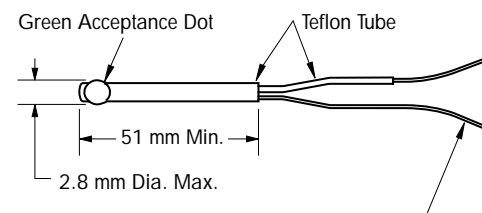
Bare Lead Thermistors



Type S Lead Configuration
32 AWG Tinned Solid Copper Wire—7.6 cm Min.

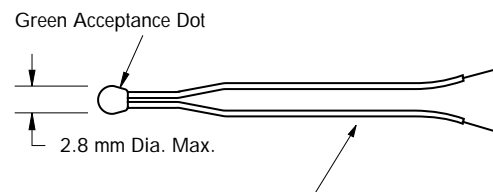
Type N Lead Configuration
32 AWG Solid Nickel Insulated Wire—7.6 cm Min.

Teflon Covered Thermistors



Type E Lead Configuration
32 AWG Tinned Solid Copper Wire—7.6 cm Min.

Insulated Lead Thermistors



Type A Lead Configuration
28 AWG Stranded Tefzel-Insulated Wire—7.6 cm Min.

Type T Lead Configuration
28 AWG Stranded Teflon-Insulated Wire—7.6 cm Min.

Specifications

Standard Configuration: YSI 44900 Series Thermistors are provided to the specifications shown on the drawings. Each unit is color-coded to indicate resistance value and marked with a green dot between the leads to indicate successful acceptance testing.

Configuration Options: On special order, YSI 44900 Series Thermistors are available with a wide variety of options, including leads of various lengths, special lead materials, insulated leads, and as fully-encased units. Space-qualified thermistors also may be installed in many of the probes described in the Configure-to-Order Probe section of this catalog.

Time Constant: 1 sec max when suspended by its leads in a well-stirred oil bath, or 10 sec. max in still air.

Dissipation Constant: 8 mW/°C min when suspended by its leads in a well-stirred oil bath, or 1 mW/°C in still air.

Resistance/Temperature Data: A °C/°F resistance versus temperature table is in the *YSI Precision™ Temperature Handbook*, or visit www.YSI.com.

Interchangeability Tolerance Data: Tables in the *Handbook* show nominal resistance values, ohms per degree, and tolerance at select temperatures over the operating range.

Outgas: YSI 44900 Series Thermistors, when tested per ASTM E-595-90, exhibit the following characteristics: 0.66% TML, 0.01% CVCM, 0.10% WVR.

Cage Code: 1L9U5

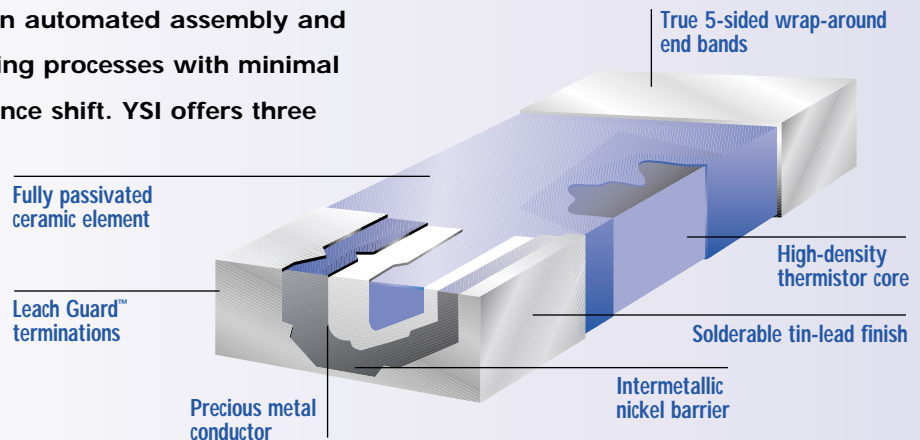
	Ordering Part Number	GSFC S311P18 Number	Basic YSI Thermistor	Zero Power Resistance Ω at 25°C	Beta 0-50°C (K)	Operating & Storage Temperature*	Color Code Body	End	Mix
$\pm 0.2^\circ\text{C}$ Interchangeability Tolerance 0 to 70°C	44901	-01S7R6	44004	2252	3891	-55-+90°C	black	yellow	B
	44903	-03S7R6	44005	3000	3891	-55-+90°C	black	green	B
	44905	-05S7R6	44007	5000	3891	-55-+90°C	black	violet	B
	44907	-07S7R6	44006	10K	3574	-55-+90°C	black	blue	H
	44909	-09S7R6	44008	30K	3810	-55-+90°C	black	gray	H
$\pm 0.1^\circ\text{C}$ Interchangeability Tolerance 0 to 70°C	44902	-02S7R6	44033	2252	3891	-55-+70°C	orange	orange	B
	44904	-04S7R6	44030	3000	3891	-55-+70°C	orange	black	B
	44906	-06S7R6	44034	5000	3891	-55-+70°C	orange	yellow	B
	44908	-08S7R6	44031	10K	3574	-55-+70°C	orange	brown	H
	44910	-10S7R6	44032	30K	3810	-55-+70°C	orange	red	H

*Thermistors with $\pm 0.2^\circ\text{C}$ interchangeability tolerance may have short-term operating temperature excursions to 150°C; thermistors with $\pm 0.1^\circ\text{C}$ interchangeability tolerance may have short-term operating temperature excursions to 100°C.

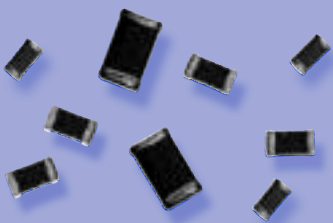
SURFACE MOUNT THERMISTORS

Surface Mount Thermistors from YSI are the ideal solution for temperature sensing functions found in temperature compensation networks. The patented design features Leach Guard™ terminations and a fully glass-passivated ceramic element. These features enable the parts to withstand many of today's modern automated assembly and soldering processes with minimal resistance shift. YSI offers three

standard EIA sizes and $\pm 3\%$, $\pm 2\%$, and $\pm 1\%$ tolerances for flexibility in application. All parts are available with tape and reel packaging for use with automated placement equipment. Reference YSI Series SP20711 for 0603 style, SP20627 for 0805 style, and SP20710 for 1206 style parts.



YSI 0603
YSI 0805
YSI 1206
Precision Surface-Mount
Thermistors



Features	Advantage/Benefit
■ Hi-density thermistor element	■ Reduced solder shift/improved stability
■ Fully glass-passivated ceramic element	■ Reduced solder shift/improved stability/physical protection of part
■ Five-sided wraparound endbands	■ Additional mounting surface/better electrical and mechanical contact
■ “Leach Guard” terminations with solderable SN-Pb finish, intermetallic Nickel barrier, and precious metal conductor	■ Increased resistance to soldering heat/improved physical bonding/reduced part stress

Part Style	Resistance @ 25°C (Ohms)	Resistance Code	R-T Curve	Beta (β) 75/25
0805 or 1206	50,000	-503	B	3966
0603, 0805, or 1206	100,000	-104	B	3966
0805	200,000	-204	H	3679

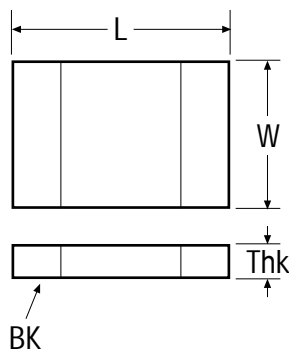
Parts are point matched at 25°C to $\pm 3\%$, $\pm 2\%$, and $\pm 1\%$ tolerance. Specify by Tolerance Suffix. Not all resistances and tolerances are available in all sizes. Consult YSI for availability of any tolerances or resistance values not listed.

Physical Dimensions

YSI 0603 Style (SP20711 Series)		
Dimension	Nominal	Tolerance
L	0.063"	±0.004"
W	0.031"	±0.004"
Thk	0.020"	Maximum
BW	0.008"	±0.004"

YSI 0805 Style (SP20627 Series)		
Dimension	Nominal	Tolerance
L	0.078"	±0.008"
W	0.049"	±0.008"
Thk	0.055"	Maximum
BW	0.016"	±0.010"

YSI 1206 Style (SP20710 Series)		
Dimension	Nominal	Tolerance
L	0.126"	±0.008"
W	0.060"	±0.008"
Thk	0.059"	Maximum
BW	0.016"	±0.010"



Electrical Characteristics

	YSI 0603 Style	YSI 0805 Style	YSI 1206 Style
Time Constant (typical—mounting dependent)	5 sec.	8 sec.	8 sec.
Dissipation Constant (typical—mounting dependent)	2 mW/°C	2 mW/°C	2 mW/°C
Power Rating	62.5 mW @ 25°	1/8 W	1/4 W
Operating Range	-65° to +150°C	-65° to +150°C	-65° to +150°C

Resistance Code

Resistance @ 25°C	Resistance Code	Availability		
		Style 0603	Style 0805	Style 1206
50,000	-503		•	•
100,000	-104	•	•	•
200,000	-204		•	

Tolerance Suffix

Tolerance @ 25°C	Tolerance Suffix	Availability		
		Style 0603	Style 0805	Style 1206
±3%	H	•	•	•
±2%	G		•	•
±1%	F		•	•

Temperature Tip

Why Surface Mount Thermistors (SMT)?

Most engineers choose surface mount components to utilize the convenience of machine assembly. YSI offers two series of surface mount parts. VECO® brand parts, described in this catalog, are designed for attachment using wire-bond connections to the upper electrode. These parts are widely used in applications where small size is critical. YSI Precision™ SMTs with end-band electrodes and glass passivation offer the convenience of standard surface mount sizes and attachment methods with accuracy as tight as ±1%.

How to Order

Please order from your YSI representative or YSI Customer Service.

Call 937 427-1231 ext. 770

THERMISTOR LINEARIZING CIRCUITS

Simplify the use of thermistors for temperature measurement applications with YSI's linearizing circuitry.

The YSI 4800LC converts the non-linear resistive response of thermistors to a linear output. A TTL and RS-232 serial digital data stream is the standard output. An optional 4-20mA analog output is also available. Now engineers can reduce the design cycle while taking advantage of highly-accurate and stable YSI Precision™ thermistors.

- 50 years of YSI analog design expertise in a single package
- Automatically calculates a linear output
- Simplifies design and reduces the design cycle
- Uses minimal board real estate
- Relieves microprocessor demand
- Includes serial TTL and RS-232 output

YSI 4800LC Thermistor Linearizing Circuit



Utilize the high sensitivity and tight accuracy of the YSI thermistor

The YSI 4800LC Thermistor Linearizing Circuit offers the design engineer new options in precision temperature measurement. No more cold junction compensation, no more low sensitivity, no more settling for less accuracy than you need, no more concern for non-linear output. YSI engineers, with years of experience designing circuits for thermistor applications, have designed one package that allows the use of highly sensitive thermistors with minimal design effort. The YSI 4800LC requires no calibration and can match with a variety of thermistors to meet specific temperature measurement applications.

Features

- Linear output
- Serial and RS-232 output for communication with microprocessor and readout devices
- Optional 4-20mA output available for process applications
- Low power consumption allows battery operation
- Resolution 0.01°C
- Circuit accuracy $\pm 0.1^\circ\text{C}$ from 0 to 100°C (system accuracy depends upon thermistor)
- No calibration required

Specifications

YSI 4800LC Thermistor Linearizing Circuit™

Physical Size: 1.51 inches long by 0.80 inches high by 0.35 inches wide

Thermistor: YSI 44016 (10 k at 25°C); YSI 400 Series; other values upon request

Circuit Accuracy: $\pm 0.1^{\circ}\text{C}$ for all temperature ranges (see below)

System Accuracy: w/44016 $\pm 0.3^{\circ}\text{C}$ (0 to 70°C), w/44036 $\pm 0.2^{\circ}\text{C}$ (0 to 70°C), w/46046 $\pm 0.15^{\circ}\text{C}$ (0 to 70°C). Use the appropriate YSI Precision™ thermistor to meet your system requirements.

Temperature Range: 0 to 100°C / -10 to 50°C / others available upon request

Internal A/D Resolution: 16-bit

RS-232 Output Format: 9600 baud, 8N1 CR/LF, $\pm 4.2\text{VDC}$, 1 mA max

Data Refresh: 1/sec

Serial Output: Serial TTL, 0 to +4.8 VDC, 20 mA max

Analog Output: 4-20 mA (optional)

Power Requirements: +5 VDC $\pm 10\%$, 5 mA
(separate power supply required for 4-20 mA option)

Power Consumption: 25 mW

Calibration: None

Stability: Testing in progress

Operating Temperature: 0 to +60°C

Use ESD procedures when handling the circuit.

YSI 4820LC Developer's kit

Power: Regulated 5 VDC

Display Resolution: 0.01°C

Display Update: 1 second

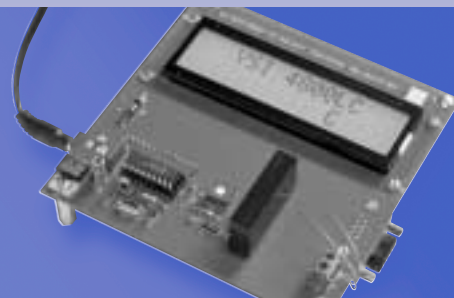
Sampling Rate Selection: 1 reading or greater per second, minute, or hour (1 reading per second fastest)

Temperature Range: 4800LC dependent

Also Available

YSI 4820LC Developer's Kit

Simplify the incorporation of the YSI 4800LC into designs by displaying sensed temperature with the YSI 4820LC Developer's Kit. It features an on-board power supply, an alphanumeric display, and standard RS-232 connectors.



Features

- Alphanumeric display with adjustable background contrast
- Data logging capability
- RS-232 connectors
- No set-up required
- Specify Temperature units in °C, °F, or K
- No set-up required
- COM1 through COM4
- Includes a YSI Precision™ Thermistor

YSI 4810LC Software

The YSI 4810LC Software allows you to convert your PC to a temperature logger and display.

Features

- Read me text file
- Windows 95, Windows 98, or Windows NT compatible
- Temperature units in °C, °F, or K

How to Order

Please order from your YSI representative or YSI Customer Service.

Call 937 427-1231 ext. 770

Thermilinear® Components from YSI are designed for applications requiring linear electrical response to temperature change. Each Thermilinear Network consists of two sub-components – a thermistor component and a resistor set. The benefits of linear response are:

- Easy to design in
- Low-cost electrical circuit
- High-resolution measurement

The active element is the thermistor component, made from two YSI Precision™ thermistors with three leads, epoxy encapsulated, to form the YSI 44018 and 44019A sensors; and three thermistors with four leads to form the YSI 44020 sensor.

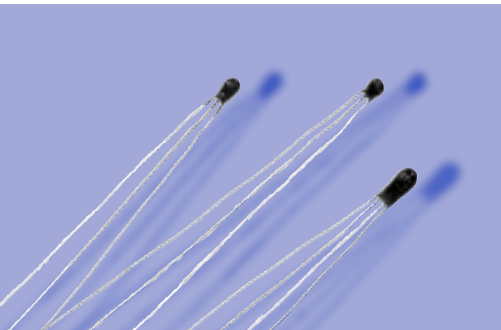
The resistor set consists of two precision metal film resistors for use with the YSI 44018 and 44019A thermistor components, and three resistors for use with YSI 44020 thermistor components.

YSI 44018
Thermilinear Component

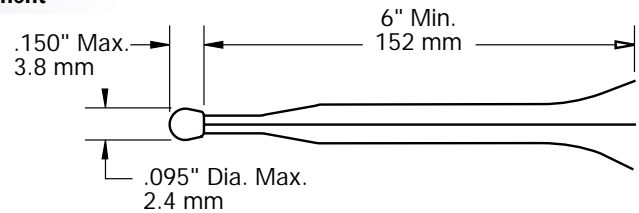
YSI 44019A
Thermilinear Component

YSI 44020
Thermilinear Component

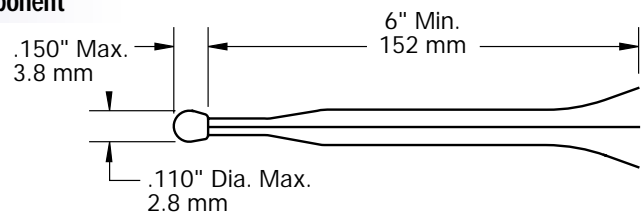
YSI 44300
Series Resistor



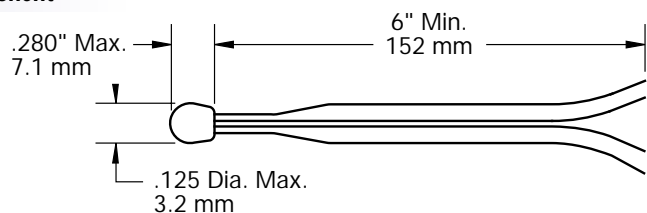
YSI 44018 Thermilinear Component



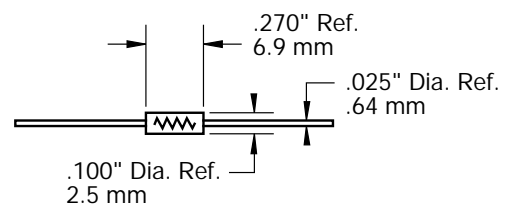
YSI 44019A Thermilinear Component



YSI 44020 Thermilinear Component



YSI 44300 Series Resistor



Specifications

YSI 44018 Thermilinear Composite

Maximum Operating Temperature: 105°C (220°F)

Accuracy and Interchangeability: $\pm 0.15^\circ\text{C}$ when incorporated in a standard YSI Thermilinear Network.

Time Constant, Maximum: 1 sec in well-stirred oil, 10 sec in still air. Time constant is the time required for thermistor to indicate 63% of a newly impressed temperature.

Dissipation Constant, Minimum: 8mW/°C in well stirred oil, 1mW/°C in still air. Dissipation constant is the power in milliwatts required to raise a thermistor 1°C above surrounding temperature.

Color Code: Black epoxy body; red, green, and brown leads.

Storage Temperature: -80 to +105°C (-112 to +221°F).

Resistor Sets: 44301, 0° to +100°C (+32° to +212°F)
 44302, -5° to +45°C (+23° to +113°F)
 44303, -30° to +50°C (-22° to +122°F)
 44304, -2° to +38°C (+28° to +100°F)

YSI 44019A Thermilinear Composite

Maximum Operating Temperature: 85°C (185°F). Not recommended for long-term continuous use above 50°C (122°F).

Accuracy and Interchangeability: $\pm 0.4^\circ\text{C}$ (0 to 85°C); $\pm 0.8^\circ\text{C}$ (0 to -55°C) when incorporated in a YSI Thermilinear Network.

Time Constant Maximum: 1 sec in well-stirred oil, 10 sec in still air. Time constant is the time required for thermistor to indicate 63% of a newly impressed temperature.

Dissipation Constant, Minimum: 8 mW/°C in well-stirred oil, 1 mW/°C in still air. Dissipation constant is the power in milliwatts to raise a thermistor 1°C above surrounding temperature.

Color Code: Black epoxy body; red, green, and brown leads.

Storage Temperature: -80 to +50°C (-112 to +122°F).

Resistor Set: 44311A, -55° to +85°C (-67° to +185°F)

YSI 44020 Thermilinear Composite

Maximum Operating Temperature: 55°C (131°F)

Accuracy and Interchangeability: $\pm 0.1^\circ\text{C}$ when in a YSI Thermilinear Network.

Time Constant, Maximum: 1 sec in well-stirred oil, 10 sec in still air. Time constant is the time required for thermistor to indicate 63% of a newly impressed temperature.

Dissipation Constant, Minimum: 8 mW/°C in well-stirred oil, 1 mW/0°C in still air. Dissipation constant is the power in milliwatts to raise a thermistor 1°C above surrounding temperature.

Color Code: Black epoxy body; red, green, blue, and brown leads.

Storage Temperature: -80 to +120°C (-112 to +250°F).

Resistor Set: 443012, -50° to +50°C (-58° to +122°F)

Temperature Tip

Linearization of Thermistors

Thermistors have an exponential non-linear resistance curve. Over small ranges of temperature, linearization is achieved with a single resistor. Patented YSI Thermilinear® components use multiple thermistors and fixed resistors to provide a linear output over wider temperature ranges. The new YSI 4800LC (page 16) uses microprocessor technology to provide more accurate linearization than was possible with passive component systems. Refer to the *YSI Precision™ Temperature Handbook* for more information on linearization techniques.

How to Order

Please order from your YSI representative or YSI Customer Service.

Call 937 427-1231 ext. 770

Configure-to-Order probes from YSI offer the flexibility of custom design at the price of standard parts. Match any YSI Precision interchangeable thermistor with cable and sheath options to create a custom probe for your temperature measurement application.

The following pages detail the materials we use, time constants, and explain how to construct a probe to meet your requirements.

YSI Builds OEM Probes

If you don't find a Configure-to-Order probe that suits your application, we can design probes specifically for your application.

How To Order

To configure your own probe, see the instructions on page 27, or call a YSI representative or YSI Customer Service.

About Configure-to-Order Probes

Operating Temperatures

If you plan to use your probe above 100°C, you must select options that can withstand higher temperatures. Probes with glass thermistors, stainless steel sheaths and Teflon cable are rated to 200°C.

Thermistor Components

Choose thermistors from Section 1. You may design probes to use any YSI thermistor.

YSI 44000 Series Thermistors

- Cost-effective
- $\pm 0.2^\circ\text{C}$ or $\pm 0.1^\circ\text{C}$ interchangeability

YSI 44000 Series Thermilinear Components

- Linear outputs

YSI 45000 Series Thermistors

- Stable
- High operating temperature

YSI 46000 Series Thermistors

- Unsurpassed long-term stability
- $\pm 0.2^\circ\text{C}$ to $\pm 0.05^\circ\text{C}$ interchangeability

YSI 55000 GEM Series Thermistors

- Low-cost hermetic
- Up to 200°C

Probe Materials

- **Epoxy** – We match epoxies to design requirements.
- **Stainless Steel** – 316SS. Tubular probes have rolled ends and uniform wall thickness throughout, hermetic tips and a medical-grade polished finish.
- **Glass** – The YSI 036 glass probe is Pyrex. The tip is melted to form a hermetic seal.
- **Teflon** – We use FEP Teflon for the YSI 015.
- **Aluminum** – We use 2024 T4 in the YSI 083 probe.
- **Brass** – Screws and fittings per ASTM B16 and ASTM B453.

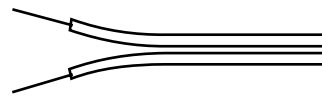
Options

- **Compression Fitting** – A compression fitting sized to fit the tubular probe is available in 1/8, 1/4, 1/2 NPT threads. Specify by thread size.
- **FEP** – Sealed end Teflon tubing over the stainless steel sheath to protect thermistors from caustic materials. FEP is compatible with compression fitting option.

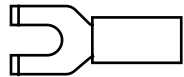
Termination Table

Thermistor	No. of Conductors		
	2	3	4
T1	Blk	Blk	Blk
T2	—	Wht	Wht
T3	—	—	Grn
Com	Wht/Red	Red	Red

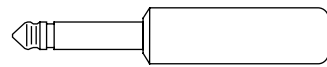
Terminations



Stripped and Tinned Leads (ST)

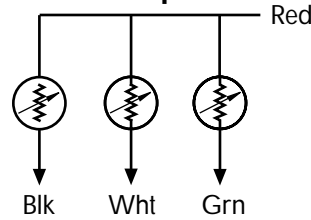


#6 Spade Lugs (SP)

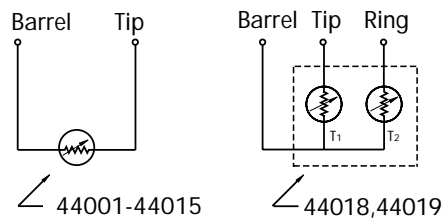


1/4" Phone Plug (PH)

Example



Probe Termination Wiring
(unless otherwise specified)



Phone Plug Termination

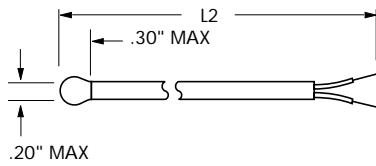
Temperature Tip

Before you purchase YSI components, examine your application. If you are lengthening leads or manufacturing the part into an assembly, consider having YSI perform the work. YSI has years of experience fabricating components into assemblies. You are assured that ISO certified processes are used in the assembly of your part, along with the certainty of 100% process yield. Refer to the Configure-to-Order and OEM Engineered-to-Order Probe sections of this catalog, or contact our application engineers for advice on your current design.

Cable & Lead Styles

Type	Description	Temperature Range	Color Available	Gauge	Conductor/Shield	Typical Outer Diameter			
						1-wire	2-wire	3-wire	4-wire
RP	Round PVC	-40 to +105°C		24 AWG	stranded/-	-	0.147"	0.147"	0.170"
RPS	Round PVC	-55 to +105°C		24 AWG	stranded/foil	-	0.150"	0.160"	0.180"
RPM	Round PVC Mini	-55 to +105°C		28 AWG	stranded/-	-	0.100"	0.115"	0.135"
RT	Round TFE Teflon	-65 to +200°C		26 AWG	stranded/-	-	0.105"	0.125"	0.125"
RTS	Round TFE Teflon	-65 to +200°C		26 AWG	stranded/braid	-	0.120"	0.126"	0.136"
RN	Round SJO Neoprene	+60°C max		18 AWG	stranded/-	-	0.300"	0.330"	0.355"
RNS	Round SJO Neoprene	+60°C max		18 AWG	stranded/braid	-	0.295"	0.340"	0.340"
FPE	Flat PE	-60 to +105°C		28 AWG	stranded/-	-	.035" x .082"	.035" x .125"	-
FP	Flat PVC	-40 to +105°C		24 AWG	stranded/-	-	.058" x .115"	.044" x .150"	-
FT	Flat TFE Teflon	-65 to +200°C		30 AWG	stranded/-	-	.032" x .80"	.032" x .125"	-
IA	Individual Tefzel®	-65 to +150°C		28AWG	stranded/-	0.028"	-	-	-
IP	Individual PVC	-55 to +105°C	•	28 AWG	stranded/-	0.034"	-	-	-
IPL	Individual PVC Large	-40 to +80°C	•	22 AWG	stranded/-	0.057"	-	-	-
IPM	Individual PVC	-55 to +105°C		32 AWG	stranded/-	0.028"	-	-	-
IT	Individual TFE Teflon	-60 to +200°C	•	28 AWG	stranded/-	0.027"	-	-	-
ITL	Individual TFE Teflon Large	-60 to +200°C	•	24 AWG	stranded/-	0.036"	-	-	-
ITM	Individual TFE Teflon Mini	-60 to +200°C		32 AWG	stranded/-	0.021"	-	-	-
IV	Individual varnish-insulated	-40 to +180°C		32 AWG	solid/-	0.008"	-	-	-
IC	Individual tinned copper	NA		32 AWG	solid/-	0.008"	-	-	-
ID	Individual Dumet	NA		32 AWG	solid/-	0.008"	-	-	-

Note: Lead length tolerance is -0 to +10%



YSI 010
YSI 011

YSI 010 Round Epoxy Tip Probe

A good mix of ruggedness, flexibility, and response time. Epoxy encapsulation offers high compression strength and the PVC cable provides abrasion protection.

Application: Excellent design for pot-in-place applications such as analytical instruments and supplying temperature data of test subjects for compensation.

Not designed for long wet immersion; use the YSI 070 and 071 instead.

Typical Time Constant: 5 seconds

Temperature Range: -40 to 105°C

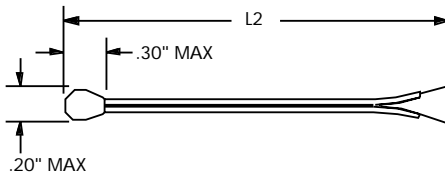
YSI 011 Round PVC Tip Probe

Combines ruggedness and flexibility. The vinyl plastisol encapsulation protects against mechanical shock. The thermistor encapsulant and cable are the same material, which provides moisture resistance. The PVC cable construction provides abrasion protection.

Application: Excellent for applications such as environmental temperatures and supplying temperature data of test subjects for compensation. Tolerates many days of immersion without internal water shunts.

Typical Time Constant: 7 seconds

Temperature Range: -40 to 105°C



YSI 012
YSI 013

YSI 012 Epoxy Tip Probe

Similar to the YSI 010 probe; offers parallel leads and a faster response time. Its shape allows it to be inserted in areas which are an integral part of the sample environment. This style permits more accurate measurements of surfaces than the YSI 010 style because the lead may be placed in contact with the surface more effectively. Since the primary thermal transfer path is through the conductor (lead), it's important to have several inches of the lead at the sample temperature.

Application: Use glass thermistors with FPE cable if long-term immersion is planned.

Typical Time Constant: 3 seconds

Temperature Range: Thermistor and cable dependent

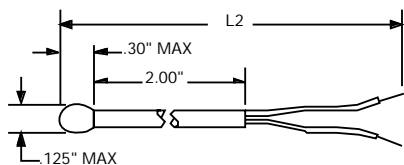
YSI 013 Acrylic Coated Tip Probe

A low-cost probe assembly using an ultraviolet curable acrylic coating material. Low cost is achieved through automation of the thermistor coating process. The acrylic material has good moisture resistance, which allows the probe to be used in high humidity environments and for short-term immersion. The HDPE (high-density polyethylene) cable and acrylic material have been tested for biocompatibility and are resistant to gamma radiation sterilization.

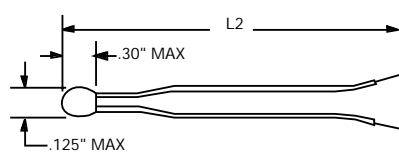
Application: Appropriate for laboratory applications where a moderate temperature range and biocompatibility are required.

Typical Time Constant: 3 seconds

Temperature Range: -60 to 105°C



Glass-Encapsulated Thermistor



Epoxy-Encapsulated Thermistor

YSI 014

YSI 014 Thermistor with Leads Probe

Constructed with individual leads for flexibility of use. The advantage of the YSI 014 probe is the ability to control placement and insulation of the leads to maximize response time and reduce measurement error. Glass thermistors are spliced to insulated leads. This splice is covered with 2" of Teflon shrink tubing.

Application: YSI 014 probes are generally the lowest cost and are used frequently in instrumentation.

Typical Time Constant: 1 to 3 seconds

Temperature Range: Thermistor and cable dependent

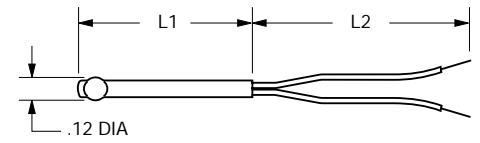
YSI 015 Thermistor in Teflon Probe

The YSI 015 style resists attack from almost all chemicals in the industrial environment. The exceptions are hydrofluoric acid, alkaline metals, and a few other compounds. While Teflon is highly water-vapor-permeable, it's extremely resistant to attack by ionized compounds. The specific heat of Teflon is quite high, making the YSI 015 a poor choice for gas temperature measurement.

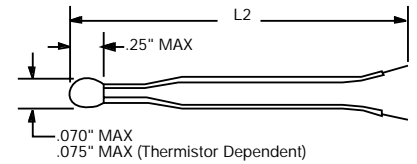
Application: A frequent application of the YSI 015 probe is temperature measurement and control of plating baths. When mounting the YSI 015 probe in a chemically active environment, prevent splashing into the back of the tube.

Typical Time Constant: 2.5 seconds

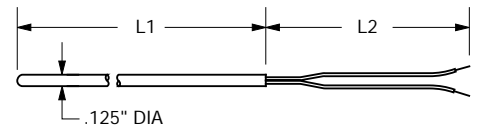
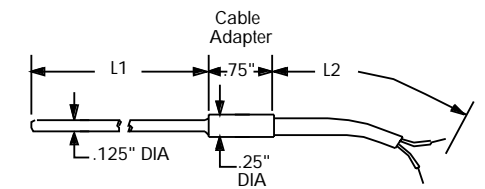
Temperature Range: Thermistor and cable dependent



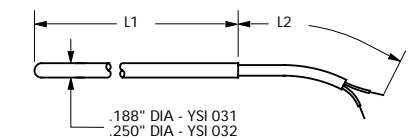
YSI 015



YSI 017

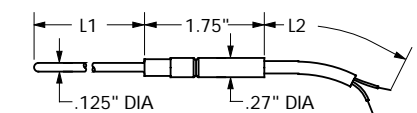


YSI 030

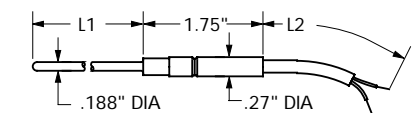


YSI 031

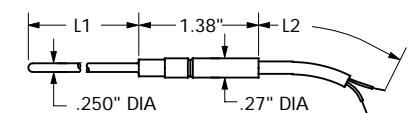
YSI 032



YSI 033



YSI 034



YSI 035

YSI 017 Small Diameter Thermistor

The 017 style thermistor offers YSI pressed disk interchangeable ceramics in their smallest form factor. Compatible with 10k ohm or 30k ohm thermistors in either $\pm 0.2^\circ$ and $\pm 0.1^\circ\text{C}$ tolerance, this style offers excellent response time and minimal stem effect.

Application: Low mass, critical applications requiring the interchangeability and stability offered by pressed disk ceramics.

Typical Time Constant: 0.5 second

Temperature range: Thermistor and cable dependent

YSI 030 – 032 Tubular Probes

The 030 – 032 Series are 316 SS tubular probes in 1/8", 3/16", and 1/4" diameters. Internal construction ensures reduced stem effect and minimal response time. Use of 55000 Series GEM thermistors offers a low-cost option to hermetically sealed probes. Immersion depths can significantly affect measurement accuracy; refer to the *YSI Temperature Handbook* for guidelines to improve measurement accuracy.

Application: Primary application is measurement and control sensing in wet environments. Compression fittings simplify insertion into flow applications. The FEP option places Teflon coating over the tubular to allow use in caustic environments.

YSI 030 Typical Time Constant: 3 seconds

YSI 031 Typical Time Constant: 3.8 seconds

YSI 032 Typical Time Constant: 4.5 seconds

Temperature range: Thermistor and cable dependent

YSI 033 – 035 Hermetic Tubular Probes

The 033 – 035 Series tubular probes are similar to 030 – 032 probes with the added benefit of hermetic seals. The hermetic seal prevents condensation of water at the sensor or internal connections eliminating electrical shunt error. These probes allow the use of epoxy coated thermistors without the risk of moisture induced failure.

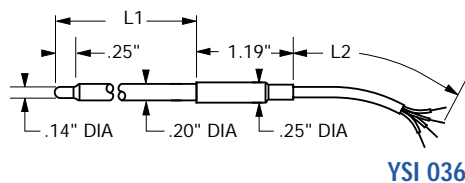
Application: Multiple cycle and life studies (ask for document TD001) demonstrate the value of hermetic probes for stability in long-term cooling fluid applications. Compression fittings enhance the versatility of tubular probe styles. The FEP option places Teflon coating over the tubular to allow use in caustic environments.

YSI 033 Typical Time Constant: 3 seconds

YSI 034 Typical Time Constant: 3.8 seconds

YSI 035 Typical Time Constant: 4.5 seconds

Temperature range: Thermistor and cable dependent



YSI 036

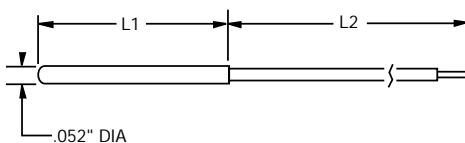
YSI 036 Pyrex Probe

The 036 style uses a Pyrex glass sheath to protect the sensor from caustic materials, while providing an easy to use rigid tubular configuration. Compression fittings may be used for mounting into processes, but Teflon ferrules must be used (not available from YSI). As with all tubular probes, immersion depths can significantly affect measurement accuracy; refer to the *YSI Temperature Handbook* for guidelines to improve measurement accuracy response tubular probes. Pyrex is fragile; YSI stainless steel tubular probes (with FEP option if required for chemical protection) offer more rugged measurement options.

Application: Designed for caustic wet-chemical applications.

Typical Time Constant: 4.2 seconds

Temperature range: Thermistor and cable dependent



YSI 039

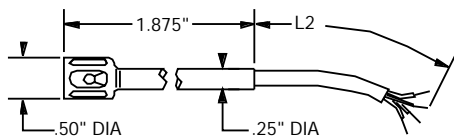
YSI 039 Small Diameter Tubular Probe

The 039 style uses sealed-end 304SS hypodermic tubing in conjunction with small cast ceramic thermistors to offer fast response tubular probes. Compatible with 2252 ohm or 10k ohm interchangeable thermistors, this style offers excellent response time and minimal stem effect for use in small volume samples.

Application: Ideally suited for small volume biological sample measurement, cuvette temperature or similar applications.

Typical Time Constant: 1.5 seconds

Temperature range: Not to exceed 100°C



YSI 050

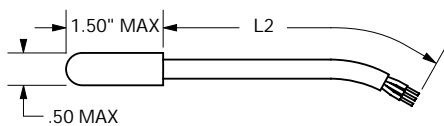
YSI 050 Bird Cage Air Probe

The YSI 050 style is designed to measure temperature in dry gas streams. The 050 has the fastest response time of any standard protected probe. While the thermistor is sealed with an insulating epoxy, the seal is not useful in aqueous solutions and should not be immersed. For exposure to wet or abrasive environments, use either a YSI 030 or YSI 052 probe.

Application: Designed for incubator and low-temperature drying systems.

Typical Time Constant: 1 second

Temperature range: Thermistor and cable dependent



YSI 070

YSI 070 Underwater Probe

The YSI 070 style is designed for long-term burial in soil, concrete or other high-wetness environments. Potted in a polyvinyl cap, it provides a high-integrity seal as well as mechanical protection to the thermistor itself. For best long-term performance we recommend glass-encapsulated thermistors (YSI 45000, 46000, 55000 Series).

Application: While not designed for deepwater immersion, the YSI 070 is frequently used to measure the temperature of bogs, wetlands and wells. It can withstand the pounding punishment of burial in interstate roadways and airport runways.

Typical Time Constant: 15 seconds

Temperature Range: 60°C max

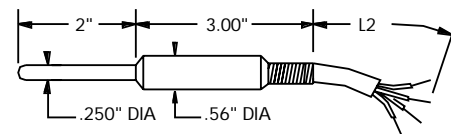
YSI 071 Deepwater Probe

Designed for long-term immersion at considerable depth, this style has a stainless/ neoprene vulcanized seal with a molded external splice protector. This assembly method provides a high-integrity seal as well as mechanical protection to the leads and the thermistor. For best long-term performance we recommend glass-encapsulated thermistors (YSI 45000, 46000, 55000 Series).

Application: It's designed for deepwater immersion and is frequently used to measure the temperature of deepwater reservoirs, wetlands, and wells. Multiple-year immersion at 2,000 feet is feasible. Several such installations are in place for thermal gradient power generation tests. The YSI 071 can withstand the forces of pier mounting in high-wave environments.

Typical Time Constant: 5 seconds

Temperature Range: 60°C max



YSI 071

YSI 081 Surface Probe

YSI 082 Small Surface Probe

The construction of these probes provides fast response and minimal stem effect error when used with relatively lightweight and properly mounted leads. The thermistor is electrically isolated from the case. These probes are not waterproof.

All flat surface sensors require good surface contact while protecting the noncontact surface from high levels of radiant energy. This can be accomplished by placing a reflective surface between the sensor and the source.

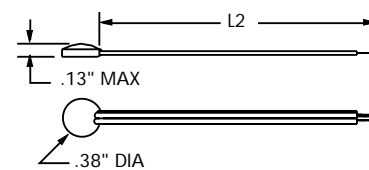
Application: Designed for permanent or temporary fixed-mount surface temperature applications. Also for measuring coil and radiator temperatures in heat exchangers.

Typical Time Constant: 1.1 seconds

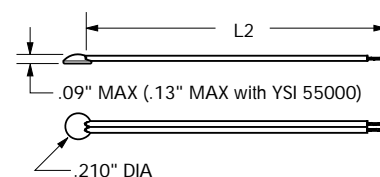
Temperature Range: Thermistor and cable dependent

Typical Time Constant: 0.3 seconds

Temperature Range: Thermistor and cable dependent



YSI 081



YSI 082

YSI 083 – 085 Attachable Surface Temperature Probes

The 083 – 085 series surface probes allow attachment to a surface by use of screw and are differentiated by mounting hole size and housing geometry. The 083 style has the most rugged housing and offers the greatest surface contact. The 084 and 085 styles offer #8 and #6 screw openings, respectively. The 085 style allows offset attachment due to its' flag lug configuration. All flat surface sensors require good surface contact while protecting the non-contact surface from high levels of radiant energy. This can be accomplished by the use of thermal compound between the surface and probe, and by placing a reflective surface between the sensor and any radiant energy source.

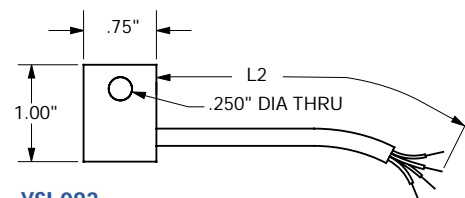
Application: Designed for bolt-in-place applications. Used to measure, compensate and control temperatures of motors, surface plates, heat exchangers, and fluid pumping systems.

YSI 083 Typical Time Constant: 8 seconds

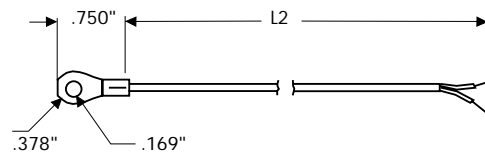
YSI 084 Typical Time Constant: 5 seconds

YSI 085 Typical Time Constant: 3.1 seconds

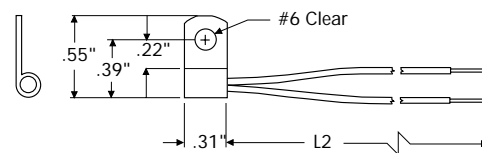
Temperature range (083 – 085): Thermistor and cable dependent



YSI 083

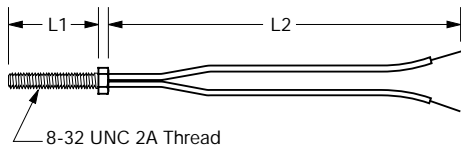


YSI 084



YSI 085

Configure-To-Order Thermistor Probes



YSI 090
YSI 093

YSI 090, 091, 093, 094 Screw Probes

The 090 and 093 styles offer thermistors in 8-32 housings of brass and 316 SS respectively. The 091 and 094 styles offer thermistors in 10-32 housing of brass and 316 SS respectively. Brass provides an excellent thermal pathway. Stainless steel offers superior strength over brass but with increased possibility for measurement error. In all applications, the lead should not be excessively flexed.

Application: Especially useful for measuring relatively thick samples where mass temperature rather than surface temperature is critical.

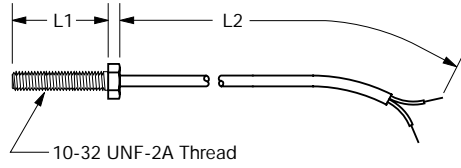
YSI 090 Typical Time Constant: 2 seconds

YSI 093 Typical Time Constant: 2.5 seconds

YSI 091 Typical Time Constant: 3.5 seconds

YSI 094 Typical Time Constant: 4 seconds

Temperature range (090, 091, 093, 094): Thermistor and cable dependent



YSI 092
YSI 094

YSI 100 1/8" Tubular Probe with Fitting

YSI 101 3/16" Tubular Probe with Fitting

YSI 102 1/4" Tubular Probe with Fitting

The YSI 100, 101, 102 are stainless steel tubular probes with 1/8" NPT fittings. This design has a high tolerance for pressure and tolerates high flow rates for short periods. The stainless steel construction provides protection from stress corrosion and cavitation etching.

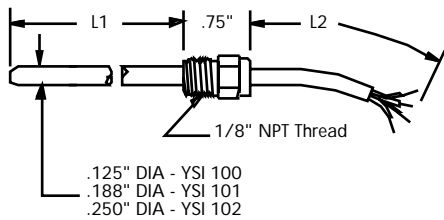
Application: Accurate readings in pipelines.

YSI 100 Typical Time Constant: 3 seconds

YSI 101 Typical Time Constant: 3.4 seconds

YSI 102 Typical Time Constant: 4.5 seconds

Temperature Range: Thermistor and cable dependent



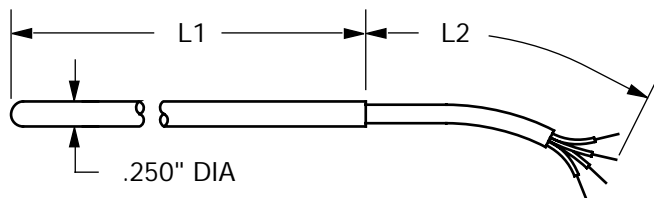
YSI 100
YSI 101
YSI 102

How To Order Configure-To-Order Probes

You can easily configure your own probe from our many thermistor, sheath, and cable options. We've created an example below of how to do it yourself. Use the Configure-to-Order Probe Options Chart on the following pages for the options available for each probe style.

1. Choose the probe style that matches your application. Turn to the page in this section that lists the options for that style. For our example, we've chosen the YSI 032.
2. Select the thermistor that best suits your need from the choices listed for that probe style.
3. Select the probe (sheath) length (L1) in inches.
4. Select a cable or lead type to match your requirements.
5. If you're using individual leads, and color coding is important, enter those colors here. Non-Thermilinear parts are supplied with black individual leads unless specified.
6. Select the length of cable (L2) in inches.
7. Indicate cable termination: ST (Stripped and Tinned), PH (Phone Plug), SP (#6 Spade Lug).
8. Choose an option if required; the options are FEP (Teflon sheath) and/or Compression Fitting (Specify thread).

If you are looking for a probe style that is not shown in this section, please visit our website at www.YSI.com for the latest probe offerings.



Probe Style	Thermistor	Probe Length L ₁	Lead Style	Color Selection Option	Lead Length L ₂	Termination	Options
032	-	-	-	/	-	-	-
	Choose from Components Section	Sheath Length in inches min = 1/2" max = 18"	Cable Style		Cable Length in inches	Specify ST, PH, or SP	Compression Fitting: 1/8", 1/4", 1/2" or FEP

Configure-To-Order Thermistor Probes

Probe Style	Thermistor					Probe Length L ₁	Lead Style			Lead Length L ₂		Termination		
	44000 (except Thermilinear)	45000/ 46000	55000	44018/ 44019A	44020		Cable	Code	Color Available	Minimum Length	Maximum Length	Stripped & Tinned (ST)	Phone Plug (PH)	#6 Spade Lugs (SP)
010 or 011	•	•	•	•	•	NA	Round PVC	RP		3"	1200"	•	•	•
010 or 011	•	•	•	•	•	NA	Round Shielded PVC	RPS		3"	1200"	•	•	•
010 or 011	•	•	•	•	•	NA	Round Miniature PVC	RPM		3"	1200"	•	•	•
012	•	•	•	•	•	NA	Flat PVC	FP		1"	120"	•	•	•
012	•	•	•	•	•	NA	Flat TFE Teflon	FT		1"	120"	•	•	•
012		•	•			NA	Flat FPE	FPE		1"	60"	•	•	•
013	•					NA	Flat FPE	FPE		1"	36"	•	•	•
014	•		•	•	•	NA	Individual PVC	IP	•	1"	48"	•	•	•
014	•		•	•	•	NA	Individual Miniature PVC	IPM		1"	48"	•	•	•
014	•	•	•	•	•	NA	Individual TFE Teflon	IT	•	1"	48"	•	•	•
014	•	•	•	•	•	NA	Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
014	•		•	•	•	NA	Individual Varnish-Insulated	IV		0.5"	12"	•	•	•
014	•		•	•	•	NA	Individual Tinned Copper	IC		0.5"	12"	•	•	•
014	•	•	•	•	•	NA	Individual Dumet	ID		0.5"	12"	•	•	•
014	•	•	•	•	•	NA	Individual Tefzel	IA		1"	48"	•	•	•
014		•	•			NA	Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
014		•	•			NA	Individual Large PVC	IPL	•	1"	48"	•	•	•
015	•		•	•	•		Individual PVC	IP	•	1"	48"	•	•	•
015	•		•	•	•		Individual Miniature PVC	IPM		1"	48"	•	•	•
015	•	•	•	•	•		Individual TFE Teflon	IT	•	1"	48"	•	•	•
015	•	•	•	•	•		Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
015	•		•	•	•		Individual Varnish-Insulated	IV		0.5"	12"	•	•	•
015	•		•	•	•		Individual Tinned Copper	IC		0.5"	12"	•	•	•
015	•	•	•	•	•		Individual Tefzel	IA		1"	48"	•	•	•
017	Call					NA	Individual Constantan	CON	•	3"	12"	•	•	•
017	Call					NA	Individual Tinned Copper	IC		3"	12"	•	•	•
017	Call					NA	Individual Varnish-Insulated	IV		3"	12"	•	•	•
017	Call					NA	Individual Miniature TFE Teflon	ITM		3"	12"	•	•	•
030	•		•	•			Round PVC*	RP		3"	1200"	•	•	•
030	•		•	•			Round Shielded PVC*	RPS		3"	1200"	•	•	•
030	•		•	•			Round Miniature PVC*	RPM		3"	1200"	•	•	•
030	•		•	•			Round TFE Teflon*	RT		3"	1200"	•	•	•
030	•		•	•			Round Shielded* TFE Teflon	RTS		3"	1200"	•	•	•
030	•		•	•			Individual PVC	IP	•	1"	48"	•	•	•
030	•		•	•			Individual Large PVC*	IPL	•	1"	48"	•	•	•
030	•		•	•			Individual Miniature PVC	IPM		1"	48"	•	•	•
030	•		•	•			Individual TFE Teflon	IT	•	1"	48"	•	•	•
030	•		•	•			Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
030	•		•	•			Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
030	•		•	•			Individual Tefzel	IA		1"	48"	•	•	•
031 or 032	•	•	•	•	•		Round PVC	RP		3"	1200"	•	•	•
031 or 032	•	•	•	•	•		Round Miniature PVC	RPM		3"	1200"	•	•	•
031 or 032	•	•	•	•	•		Round TFE Teflon	RT		3"	1200"	•	•	•
031 or 032	•	•	•	•	•		Round Shielded TFE Teflon	RTS		3"	1200"	•	•	•
031 or 032	•	•	•	•	•		Individual PVC	IP	•	1"	48"	•	•	•
031 or 032	•	•	•	032 only	032 only		Individual Large PVC	IPL	•	1"	48"	•	•	•
031 or 032	•	•	•	•	•		Individual Miniature PVC	IPM		1"	48"	•	•	•
031 or 032	•	•	•	•	•		Individual TFE Teflon	IT	•	1"	48"	•	•	•
031 or 032	•	•	•	•	•		Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
031 or 032	•	•	•	•	•		Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
031 or 032	•	•	•	•	•		Individual Tefzel	IA		1"	48"	•	•	•

*.75" Long Adapter

Configure-To-Order Thermistor Probes

Probe Style	Thermistor					Probe Length L ₁	Lead Style			Lead Length L ₂		Termination		
	44000 <small>(except Thermilinear)</small>	45000/ 46000	55000	44018/ 44019A	44020		Cable	Code	Color Available	Minimum Length	Maximum Length	Stripped & Tinned (ST)	Phone Plug (PH)	#6 Spade Lugs (SP)
033		Round PVC	RP		3"	1200"	.	.	.
033		Round Shielded PVC	RPS		3"	1200"	.	.	.
033		Round Miniature PVC	RPM		3"	1200"	.	.	.
033		Round TFE Teflon	RT		3"	1200"	.	.	.
033		Round Shielded TFE Teflon	RTS		3"	1200"	.	.	.
033		Individual PVC	IP	.	1"	48"	.	.	.
033		Individual Large PVC	IPL	.	1"	48"	.	.	.
033		Individual Miniature PVC	IPM	.	1"	48"	.	.	.
033		Individual TFE Teflon	IT	.	1"	48"	.	.	.
033		Individual Large TFE Teflon	ITL	.	1"	48"	.	.	.
033		Individual Miniature TFE Teflon	ITM	.	1"	48"	.	.	.
033		Individual Tefzel	IA	.	1"	48"	.	.	.
034 or 035		Round PVC	RP		3"	1200"	.	.	.
034 or 035		Round Shielded PVC	RPS		3"	1200"	.	.	.
034 or 035		Round Miniature PVC	RPM		3"	1200"	.	.	.
034 or 035		Round TFE Teflon	RT		3"	1200"	.	.	.
034 or 035		Round Shielded TFE Teflon	RTS		3"	1200"	.	.	.
034 or 035		Individual PVC	IP	.	1"	48"	.	.	.
034 or 035	.	.	.	035 only	035 only		Individual Large PVC	IPL	.	1"	48"	.	.	.
034 or 035		Individual Miniature PVC	IPM	.	1"	48"	.	.	.
034 or 035		Individual TFE Teflon	IT	.	1"	48"	.	.	.
034 or 035		Individual Large TFE Teflon	ITL	.	1"	48"	.	.	.
034 or 035		Individual Miniature TFE Teflon	ITM	.	1"	48"	.	.	.
034 or 035		Individual Tefzel	IA	.	1"	48"	.	.	.
036		Round PVC	RP		3"	1200"	.	.	.
036		Round Shielded PVC	RPS		3"	1200"	.	.	.
036		Round Miniature PVC	RPM		3"	1200"	.	.	.
036		Round TFE Teflon	RT		3"	1200"	.	.	.
036		Round Shielded TFE Teflon	RTS		3"	1200"	.	.	.
036		Individual PVC	IP	.	1"	48"	.	.	.
036		Individual Large PVC	IPL	.	1"	48"	.	.	.
036		Individual Miniature PVC	IPM	.	1"	48"	.	.	.
036		Individual TFE Teflon	IT	.	1"	48"	.	.	.
036		Individual Large TFE Teflon	ITL	.	1"	48"	.	.	.
036		Individual Miniature TFE Teflon	ITM	.	1"	48"	.	.	.
036		Individual Tefzel	IA	.	1"	48"	.	.	.
039	Call						TFE Teflon Tubing			1"	9"	.	.	.
050	NA	Round PVC	RP		3"	1200"	.	.	.
050	NA	Round Shielded PVC	RPS		3"	1200"	.	.	.
050	NA	Round Miniature PVC	RPM		3"	1200"	.	.	.
050	NA	Round TFE Teflon	RT		3"	1200"	.	.	.
050	NA	Round Shielded TFE Teflon	RTS		3"	1200"	.	.	.
050	NA	Individual PVC	IP	.	1"	48"	.	.	.
050	NA	Individual Large PVC	IPL	.	1"	48"	.	.	.
050	NA	Individual Miniature PVC	IPM	.	1"	48"	.	.	.
050	NA	Individual TFE Teflon	IT	.	1"	48"	.	.	.
050	NA	Individual Large TFE Teflon	ITL	.	1"	48"	.	.	.
050	NA	Individual Miniature TFE Teflon	ITM	.	1"	48"	.	.	.
050	NA	Individual Tefzel	IA	.	1"	48"	.	.	.

Configure-To-Order Thermistor Probes

Probe Style	Thermistor					Probe Length L ₁	Lead Style			Lead Length L ₂		Termination		
	44000 (except Thermilinear)	45000/ 46000	55000	44018/ 44019A	44020		Cable	Code	Color Available	Minimum Length	Maximum Length	Stripped & Tinned (ST)	Phone Plug (PH)	#6 Spade Lugs (SP)
070 or 071	•	•	•	•	•	NA	Round SJO Neoprene	RN		3"	2000"	•	•	•
070 or 071	•	•	•	•	•	NA	Round Shielded SJO Neoprene	RNS		3"	2000"	•	•	•
081 or 082	•		•	•		NA	Flat PVC	FP		1"	120"	•	•	•
081 or 082	•		•	•		NA	Flat TFE Teflon	FT		1"	120"	•	•	•
081 or 082	•		•	•		NA	Individual PVC	IP	•	1"	48"	•	•	•
081 or 082	•		•	•		NA	Individual Miniature PVC	IPM		1"	48"	•	•	•
081 or 082	•		•	•		NA	Individual TFE Teflon	IT	•	1"	48"	•	•	•
081 or 082	•		•	•		NA	Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
081 or 082	•		•	•		NA	Individual Tefzel	IA		1"	48"	•	•	•
083	•	•	•	•		NA	Round PVC	RP		3"	1200"	•	•	•
083	•	•	•	•	•	NA	Round Miniature PVC	RPM		3"	1200"	•	•	•
083	•	•	•	•	•	NA	Round TFE Teflon	RT		3"	1200"	•	•	•
083	•	•	•	•		NA	Round Shielded TFE Teflon	RTS		3"	1200"	•	•	•
083	•	•	•	•	•	NA	Individual PVC	IP	•	1"	48"	•	•	•
083	•	•	•	•	•	NA	Individual Large PVC	IPL	•	1"	48"	•	•	•
083	•	•	•	•	•	NA	Individual Miniature PVC	IPM		1"	48"	•	•	•
083	•	•	•	•	•	NA	Individual TFE Teflon	IT	•	1"	48"	•	•	•
083	•	•	•	•	•	NA	Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
083	•	•	•	•	•	NA	Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
083	•	•	•	•	•	NA	Individual Tefzel	IA		1"	48"	•	•	•
084	•		•	•		NA	Round Miniature PVC	RPM		3"	1200"	•	•	•
084	•		•	•		NA	Round TFE Teflon	RT		3"	1200"	•	•	•
084	•		•	•		NA	Round Shielded TFE Teflon	RTS		3"	1200"	•	•	•
084	•		•	•	•	NA	Flat PVC	FP		1"	120"	•	•	•
084	•		•	•	•	NA	Flat TFE Teflon	FT		1"	120"	•	•	•
084	•		•	•	•	NA	Individual PVC	IP	•	1"	48"	•	•	•
084	•		•	•	•	NA	Individual Large PVC	IPL	•	1"	48"	•	•	•
084	•		•	•	•	NA	Individual Miniature PVC	IPM		1"	48"	•	•	•
084	•		•	•	•	NA	Individual TFE Teflon	IT	•	1"	48"	•	•	•
084	•		•	•	•	NA	Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
084	•		•	•	•	NA	Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
084	•		•	•	•	NA	Individual Varnish-Insulated	IV		1"	48"	•	•	•
084	•		•	•	•	NA	Individual Tefzel	IA		1"	48"	•	•	•
085	•	•	•	•		NA	Round PVC	RP		3"	120"	•	•	•
085	•	•	•	•		NA	Round Shielded PVC	RPS		3"	120"	•	•	•
085	•	•	•	•		NA	Round Miniature PVC	RPM		3"	120"	•	•	•
085	•	•	•	•		NA	Round TFE Teflon	RT		3"	120"	•	•	•
085	•	•	•	•		NA	Round Shielded TFE Teflon	RTS		3"	120"	•	•	•
085	•	•	•	•	•	NA	Flat PVC	FP		1"	120"	•	•	•
085	•	•	•	•	•	NA	Flat TFE Teflon	FT		1"	120"	•	•	•
085	•	•	•	•	•	NA	Individual PVC	IP	•	1"	48"	•	•	•
085	•	•	•	•	•	NA	Individual Large PVC	IPL	•	1"	48"	•	•	•
085	•	•	•	•	•	NA	Individual Miniature PVC	IPM		1"	48"	•	•	•
085	•	•	•	•	•	NA	Individual TFE Teflon	IT	•	1"	48"	•	•	•
085	•	•	•	•	•	NA	Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
085	•	•	•	•	•	NA	Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
085	•	•	•	•	•	NA	Individual Tefzel	IA		1"	48"	•	•	•

Configure-To-Order Thermistor Probes

Probe Style	Thermistor					Probe Length L ₁	Lead Style			Lead Length L ₂		Termination		
	44000 <small>(except Thermilinear)</small>	45000/ 46000	55000	44018/ 44019A	44020		Cable	Code	Color Available	Minimum Length	Maximum Length	Stripped & Tinned (ST)	Phone Plug (PH)	#6 Spade Lugs (SP)
090 or 093	•		1/4" only	•		1/8" or 1/4"	Flat TFE Teflon	FT		1"	120"	•	•	•
090 or 093	•		1/4" only	•			Individual PVC	IP	•	1"	48"	•	•	•
090 or 093	•		1/4" only	•			Individual Miniature PVC	IPM		1"	48"	•	•	•
090 or 093	•		1/4" only	•			Individual TFE Teflon	IT	•	1"	48"	•	•	•
090 or 093	•		1/4" only	•			Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
090 or 093	•		1/4" only	•			Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
090 or 093	•		1/4" only	•		Individual Tefzel	IA		1"	48"	•	•	•	
091 or 094	•	1/4" only	1/4" only	•		1/8" or 1/4"	Round Miniature PVC	RPM		3"	120"	•	•	•
091 or 094	•	1/4" only					Flat PVC	FP		1"	120"	•	•	•
091 or 094	•	1/4" only	1/4" only	•	•		Flat TFE Teflon	FT		1"	120"	•	•	•
091 or 094	•	1/4" only	1/4" only	•	•		Individual PVC	IP	•	1"	48"	•	•	•
091 or 094	•	1/4" only					Individual Large PVC	IPL	•	1"	48"	•	•	•
091 or 094	•	1/4" only	1/4" only	•	•		Individual Miniature PVC	IPM		1"	48"	•	•	•
091 or 094	•	1/4" only	1/4" only	•	•	Individual TFE Teflon	IT	•	1"	48"	•	•	•	
091 or 094	•	1/4" only	1/4" only	•	•	Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•	
091 or 094	•	1/4" only	1/4" only	•	•	Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•	
091 or 094	•	1/4" only	1/4" only	•	•	Individual Tefzel	IA		1"	48"	•	•	•	
100, 101, 102	•	†	•	•		1/8" or 1/4"	Round PVC	RP		3"	120"	•	•	•
100, 101, 102	•	†	•	•			Round Shielded PVC	RPS		3"	120"	•	•	•
100, 101, 102	•	†	•	•			Round Miniature PVC	RPM		3"	120"	•	•	•
100, 101, 102	•	†	•	•			Round TFE Teflon	RT		3"	120"	•	•	•
100, 101, 102	•	†	•	•			Round Shielded TFE Teflon	RTS		3"	120"	•	•	•
100, 101, 102	•	†	•	•			Flat PVC	FP		1"	120"	•	•	•
100, 101, 102	•	†	•	•			Flat TFE Teflon	FT		1"	120"	•	•	•
100, 101, 102	•	†	•	•			Individual PVC	IP	•	1"	48"	•	•	•
100, 101, 102	•	†	•	•			Individual Large PVC	IPL	•	1"	48"	•	•	•
100, 101, 102	•	†	•	•			Individual Miniature PVC	IPM		1"	48"	•	•	•
100, 101, 102	•	†	•	•			Individual TFE Teflon	IT	•	1"	48"	•	•	•
100, 101, 102	•	†	•	•			Individual Large TFE Teflon	ITL	•	1"	48"	•	•	•
100, 101, 102	•	†	•	•			Individual Miniature TFE Teflon	ITM		1"	48"	•	•	•
100, 101, 102	•	†	•	•			Individual Tefzel	IA		1"	48"	•	•	•

† 101 & 102 only

Lead Colors Available
 Black: Blk Green: Grn
 Brown: Brn Blue: Blu
 Red: Red Violet: Vio
 Orange: Org Gray: Gry
 Yellow: Yel White: Wht

Handheld YSI 4600 Series Precision Thermometers take metrology-level

temperature measurement to the laboratory, the manufacturing floor, and the field, at an affordable price.

YSI offers three versions of the thermometer to address a broad range of temperature measurement applications.

■ **The YSI 4600** gives you high-precision and the convenience of a wide selection of off-the-shelf YSI 400 Series Probes.

■ **The YSI 4610** offers higher system accuracy with interchangeable probes.

■ **The YSI 4600S** provides metrology-level accuracy because we calibrate each unit with a specific probe.

All versions include the following features:

- Resolution to 0.01°C
- RS232 port
- NIST traceability
- °F or °C readout
- Hold
- Min/max
- ΔT
- Store

YSI 4600 Series Precision Thermometers



YSI 4600 – High Accuracy

A precision thermometer for use with standard YSI 400 Series Probes over the wide range -40 to +150°C. Ideal for applications requiring high system accuracy and application flexibility, the instrument offers high accuracy, $\pm 0.015^\circ\text{C}$, from 0 to 50°C; system accuracy is $\pm 0.115^\circ\text{C}$ with over 20 styles of YSI 400 Series Probes.

■ Stainless steel tubular ■ Air/gas ■ Vinyl tip ■ Catheter

Use the YSI 4600 to measure –

■ Gas & air ■ Liquids ■ Semi-solids & solids

YSI 4610 – Higher Accuracy with Interchangeable Probes

Specifically designed for applications in which high accuracy and interchangeability are required across the biomedical temperature range. Also used for any other applications requiring high sensitivity over a temperature range of 0 to 70°C. System accuracy is $\pm 0.05^\circ\text{C}$ from 20 to 50°C with two special probes – a small diameter, stainless-steel probe, and a vinyl tip general-purpose probe.

■ Biomedical ■ Analytical instrument calibration ■ Field service
■ Process validation ■ Data acquisition

YSI 4600S – Transfer Standard

Offers metrology-level accuracy over user-defined temperature ranges. Each system is calibrated with a matched probe (built using a YSI 46000 Super-Stable Glass Thermistor) appropriate for your application. Single-point and 4-point NIST-traceable calibrations are available. System accuracy as tight as $\pm 0.025^\circ\text{C}$ between 0 to 50°C is obtainable with a 4-point calibration. Contact YSI for calibration details.

■ Metrology labs ■ Testing labs ■ Critical process monitoring
■ Transfer standard

Specifications

Accuracy and Temperature Range

YSI 4600 Thermometer

(System accuracy with YSI 400 Series Probes)

- ±0.350°C at -40°C
- ±0.115°C from 0 to 50°C
- ±0.125°C at 70°C
- ±0.275°C at 100°C
- ±0.720°C at 150°C

YSI 4610 Thermometer

(System accuracy with YSI 4610 Series Probes)

- ±0.05°C from 20 to 50°C
- ±0.1°C at 0°C
- ±0.1°C at 70°C

YSI 4600S Thermometer

(System accuracy with YSI Configure-to-Order Probe, using 4-point calibration)

- ±0.025°C from 0 to 50°C
- System accuracy from -40 to 125°C depends on specified calibration.

Resolution: 0.01°C from -40 to +102°C; 0.02°C from 102 to 150°C

Repeatability: 0.0002 to 0.01°C (-20 to +100°C) typical for one week at constant ambient temperature.

Reading rate: 2 readings per second

Display: 4 1/2-digit LCD

Battery Life: 20 hours typical (9V alkaline cell included)

Battery Indicator: Displays flashing battery symbol when less than 5% of life remains

Temperature Units: °F or °C selected from keypad

Auto Shutoff: 10 minutes with battery power and no RS232 communications

Mating Connection: 1/4" phone jack for probes; 9-pin RS232 serial output

Operating Conditions: 10 to 40°C; 0 to 85% RH

Size: 21h x 10w x 3.8d cm, 0.34 kg; 8.25h x 4.00w x 1.50d inches, 12 oz

About calibration

We provide every YSI temperature product with a Certificate of Traceability, indicating that it was calibrated during manufacture with standards traceable to the National Institute of Standards and Technology.

YSI 4600 Accessories

- YSI 4651 RS232 Cable
- YSI 4652 Carrying Case
- YSI 4654 Tripod
- YSI 4661 Battery Eliminator, US
- YSI 400 Series Probes for YSI 4600 Thermometer
- YSI 401 Vinyl Tip General-Purpose Probe
- YSI 402 Small Vinyl Tip General-Purpose Probe
- YSI 403 Stainless Steel Tubular Probe
- YSI 404 Glass Tubular Probe
- YSI 406 Small SS Tubular Probe
- YSI 410 Tubular Probe with NPT Fitting
- YSI 416 Autoclavable Tubular Probe
- YSI 418 Pointed Tubular Probe
- YSI 408 Banjo Surface Probe
- YSI 409A High-Temperature Surface Probe
- YSI 409B Surface Probe
- YSI 421 Autoclavable Surface Probe
- YSI 427 Small Surface Probe
- YSI 405 Air/Gas Probe
- YSI 451 1 mm Flexible General-Purpose Probe

YSI 4610 Series Probes for the YSI 4610 Thermometer

- YSI 4611 1 mm Flexible General-Purpose Probe
- YSI 4612 Small Flexible General-Purpose Probe

YSI Configure-to-Order Probes for the YSI 4600S Thermometer

For optimal long-term performance, we recommend using YSI 46000 Super-Stable Glass Thermistors with the YSI 4600S system. These thermistors are available in some Configure-to-Order Probe styles. Call YSI Customer Service for details.

How to Order

Please order from your
YSI representative or
YSI Customer Service.

Call 937 427-1231 ext. 770

STANDARD PLATINUM RESISTANCE THERMOMETERS (SPRTs)

For Metrology and
Calibration Labs

With four leads (current and potential), these thermometers are highly stable over long periods. Resistance is about 25.5 ohms at 0°C; the gallium ratio is higher than 1.11807, which meets the interpolation standard of the International Temperature Scale of 1990 (ITS-90).

Calibration Reports

You may order a calibration report for your SPRT that relates temperature to resistance. Standard calibration ranges are listed in the specifications. We compute reports from fixed-point measurements according to ITS-90, traceable to the National Institute of Standards and Technology (NIST).

Calibration reports are computer-generated at 1-degree intervals. For each temperature, the reports show:

- RT/R.01°C: the ratio of resistance at temperature to the water triple point
- Increments: the difference between successive values of resistance ratio
- Resistance in ohms is optional

The error introduced by linear interpolation between successive values of temperature is less than 0.0001°C. Reports include the computed coefficients of the thermometer and traceability to NIST.

YSI 8100 Series
The World's Working
Standard of Temperature

Four Types of Thermometers

YSI 8163 and 8167 SPRTs, with protection tubes of fused quartz, are designed to measure from -200 to +500°C. We offer two time constants – 6 seconds (YSI 8163) and 3.5 seconds (YSI 8167). Both models are available in two lengths – 470 and 560 millimeters. We supply each thermometer with a protective case for storage and shipping.

Reference-Grade Platinum Elements

The reference-grade platinum element in each YSI SPRT is wound and annealed to minimize internal and external strains. Each thermometer is sealed to avoid contamination.

If you have a calibration report for your SPRT, you may use it with any suitable four-terminal resistance measuring system with a range of 4 to 85 ohms, such as Leeds & Northrup, Guildline, Automatic Systems Ltd., Tinsley, Instrulab, and Hewlett-Packard.

Platinum RTD Calibration

YSI will calibrate platinum RTDs based on ITS-90. All calibrations are traceable to NIST and we furnish a certificate of calibration and a certificate of traceability. Standard calibration temperatures are -40, 0, +25, +40, +70, +100, and +125°C. We can also calibrate your RTD at any reference point of ITS-90 between -189 and +420°C.



Specifications

Model Number	Calibration Report			Material Sensitive Portion		Protection Tube		Response Time(2)	Time Constant(3)	Leadwire
	Information	Check Points	Table Range			Tube Length	Immersion			
YSI 8163	Usable range -200 to +500°C		None(1)							
YSI 8163B	Resistance at 0.01°C, A4, B4, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP, Mercury TP, a comparison near Argon TP	-200 to +500°C	Quartz	0.290" OD max (7.36 mm) 1.3125" L (33.33 mm)	470 mm	7" min (177.8 mm) 14" max (355.6 mm)	15 sec	6 sec	4-lead flexible copper cable 8 feet (2.43 m) long with gold-plated lugs
YSI 8163C	Resistance at 0.01°C, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP	0 to 500°C							
YSI 8167	Usable range -200 to +500°C		None(1)							
YSI 8167B	Resistance at 0.01°C, A4, B4, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP, Mercury TP, a comparison near Argon TP	-200 to +500°C	Quartz	0.290" OD max (7.36 mm) 1.3125" L (33.33 mm)	470 mm	7" min (177.8 mm) 14" max (355.6 mm)	8 sec	3.5 sec	4-lead flexible copper cable 8 feet (2.43 m) long with gold-plated lugs
YSI 8167C	Resistance at 0.01°C, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP	0 to 500°C							
YSI 8163L	Usable range -200 to +500°C		None(1)							
YSI 8163LB	Resistance at 0.01°C, A4, B4, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP, Mercury TP, a comparison near Argon TP	-200 to +500°C	Quartz	0.290" OD max (7.36 mm) 1.3125" L (33.33 mm)	560 mm (4)	7" min (177.8 mm) 18" max (457.2 mm)	15 sec	6 sec	4-lead flexible copper cable 8 feet (2.43 m) long with gold-plated lugs
YSI 8163LC	Resistance at 0.01°C, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP	0 to 500°C							
YSI 8167L	Usable range -200 to +500°C		None(1)							
YSI 8167LB	Resistance at 0.01°C, A4, B4, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP, Mercury TP, a comparison near Argon TP	-200 to +500°C	Quartz	0.290" OD max (7.36 mm) 1.3125" L (33.33 mm)	560 mm (4)	7" min (177.8 mm) 18" max (457.2 mm)	8 sec	3.5 sec	4-lead flexible copper cable 8 feet (2.43 m) long with gold-plated lugs
YSI 8167LC	Resistance at 0.01°C, A8, B8, as well as tabular data at 1°C intervals	Water TP, Tin & Zinc FP	0 to 500°C							
	Calibration	Temperature R								
YSI-M-17715	YSI 8163QB or YSI 8163LB -200 to +500°C									
YSI-M-17716	YSI 8163QC or YSI 8163LC 0 to +500°C									
YSI-M-17719	YSI 8167-25B or YSI 8167LB		-200 to +500°C							
YSI-M-17720	YSI 8167-25C or YSI 8167LC		0 to +500°C							
YSI-M-17710	Protective Case for 470 mm Thermometer									
YSI-M-17710	Protective Case for 560 mm Thermometer									

1. Uncalibrated thermometers are of interest to purchasers able to perform calibrations, or who require calibrations performed by the National Institute of Standards and Technology. We'll ship a thermometer to the NIST, but you must order the service directly from NIST.
2. Response Time: Time required for 90% of a temperature change in stirred water moving approximately 1 fps.
3. Time Constant: Time required for 63.2% of a temperature change in stirred water moving approximately 1 fps.
4. New long probes

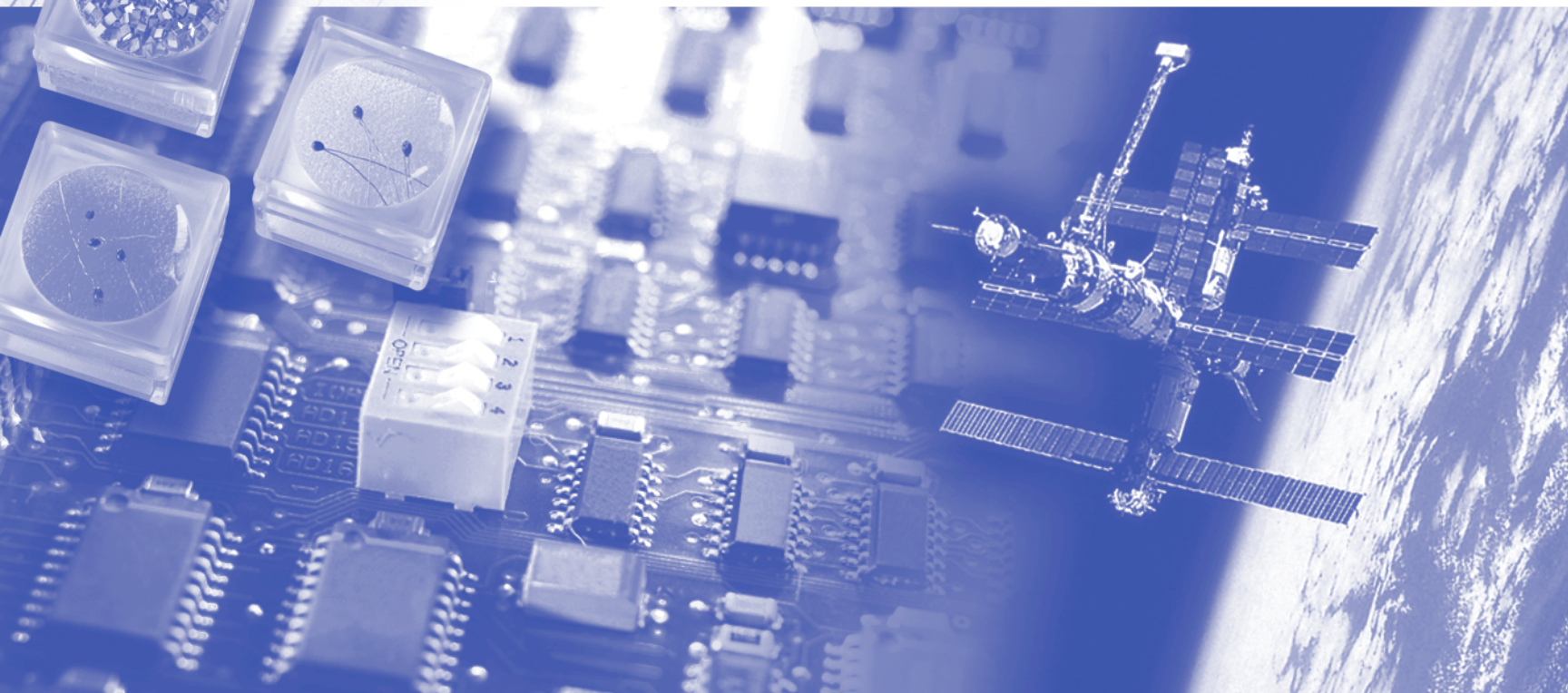
YSI VECO® TEMPERATURE PRODUCTS

With the addition in 1999 of Victory Engineering and the VECO® brand product line, YSI can now better assist customers with greater design choices for critical measurement applications where stability, extremely small size, or high reliability are required. Victory Engineering has a long and distinguished history since its founding in 1942. The Electric and Bell Labs, which originally developed thermistors, cross-licensed Victory as the first thermistor manufacturer in the United States.

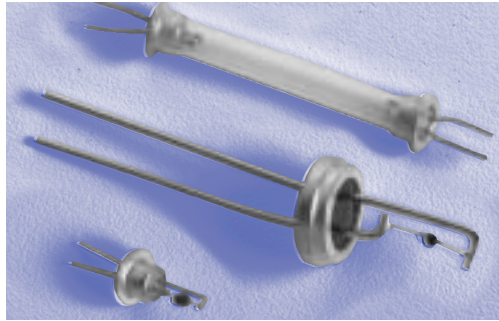
Since 1953, thermistors have been Victory Engineering's primary activity, meeting military, industrial, and commercial specifications and requirements. Unparalleled thermistor calibration accuracy has

resulted from investment in the most precise test equipment, standards, and controlled environmental baths and chambers. Calibrations are performed with accuracies of 0.01% or better on resistance and 0.01°C or better on temperature.

Now as Victory/YSI, the division offers VECO® brand high-reliability products, which continue to be an integral part of numerous space programs, starting with Mercury, Gemini, and Apollo, to the current Mars Global Surveyor, Cassini-Huygens Mission, Meteosat SG, and the International Space Station. This experience provides substantial evaluation data on the reliability of VECO brand products and their application to a wider range of industries and applications.



Bead Thermistors



VECO® bead thermistors utilize metallic oxide semiconductor material sintered on platinum-iridium alloy lead wires and feature a hermetic seal via a controlled glass coating for excellent stability under continuous exposure to conductive, corrosive, and other hostile environments. Fast response times and high power sensitivities in a mini size make them

ideal for applications involving measuring and controlling the temperature of liquid or gas flow. Specific applications are gas chromatography and thermal conductivity gas analysis. They are available in a complete range of resistance values, resistance-temperature characteristics, and with any desired calibration accuracy of temperature or resistance. Complete product information is contained in Bulletin MB012.

Specifications

Maximum Operating and Storage Temperatures

Continuous Operation: 325°C (617°F)

Intermittent Operation: 550°C (1,022°F)

Bead Diameter	0.005	0.010	0.013	0.043
Dissipation Constant (d) Mw/°C	0.045	0.09	0.10	0.35
Time Constant (t) (seconds) Still Air @ 25°C	0.12	0.5	1.0	6.0

VECO Part Number	Zero Power Resistance Ro @ 25°C (ohms)	Temperature Coefficient α @ 25°C (%/°C)	Ratio			Dimensions		
			Ro @ 0°C Ro @ 50°C	Ro @ 25°C Ro @ 125°C		A	B	C
Micro-Beads (Figure 1 or 2)								
32A402A	2,000 ± 25%	-3.3	5.2	13.2	0.25	0.005	0.0007	
41A401A	10,000 ± 25%	-3.6	6.0	16.1	0.25	0.005	0.0007	
43A401A	30,000 ± 25%	-3.9	7.1	20.6	0.25	0.005	0.0007	
51A401A	100,000 ± 25%	-4.0	7.4	21.8	0.25	0.005	0.0007	
61A401A	1 Meg ± 25%	-4.6	10.3	35.8	0.25	0.005	0.0007	
Ultra Small and Small Beads (Figure 1, 2, or 3)								
31A7	1,000 ± 25%	-3.3	5.2	13.2	0.3125	0.010	0.001	
32A50	2,000 ± 25%	-3.4	5.6	14.6	0.3125	0.010	0.001	
32A48	2,000 ± 25%	-3.4	5.6	14.6	0.3750	0.013	0.001	
41A5	10,000 ± 25%	-3.9	7.1	20.6	0.3125	0.010	0.001	
51A22	100,000 ± 25%	-4.4	9.2	30.1	0.3125	0.010	0.001	
Medium Beads (Figure 1, 2, or 3)								
32A12	2,000 ± 20%	-3.9	7.1	20.6	0.3125	0.043	0.004	
35A1	5,000 ± 20%	-4.0	7.4	21.8	0.3125	0.043	0.004	
51A2	100,000 ± 15%	-4.6	10.3	35.8	0.3125	0.043	0.004	
61A2	1 Meg ± 20%	-5.0	12.6	51.9	0.3125	0.043	0.004	

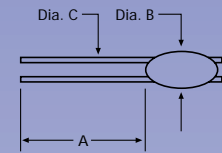


Figure 1

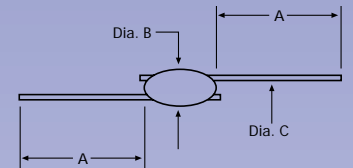


Figure 2

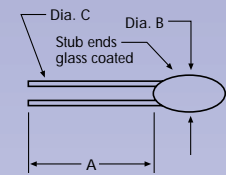
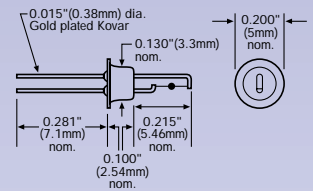
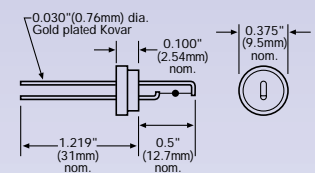


Figure 3



Mounting Option 1



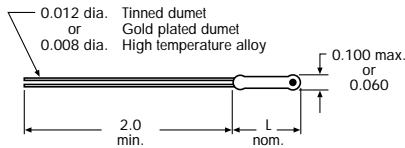
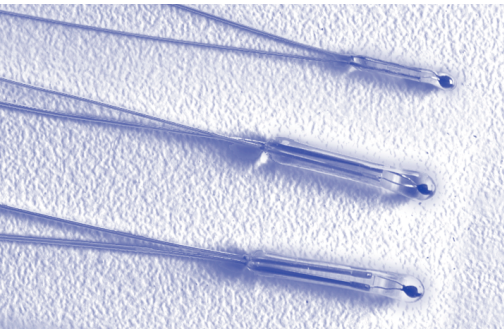
Mounting Option 2

How to Order

Please order from your YSI representative or YSI Customer Service.

Call 937 427-1231 ext. 770

Bead-In-Glass Probes



VECO® Bead-In-Glass Probes consist of bead thermistors with sintered-in platinum-iridium leads embedded in solid glass. Hermetically sealed, they have excellent stability over long periods of time under continuous exposure to harsh environments. They retain excellent stability at temperatures to 325°C (617°F) for storage or continuous operation, and to 550°C (1,022°F) for intermittent operation. For complete product information request VECO Bulletin MGR061.

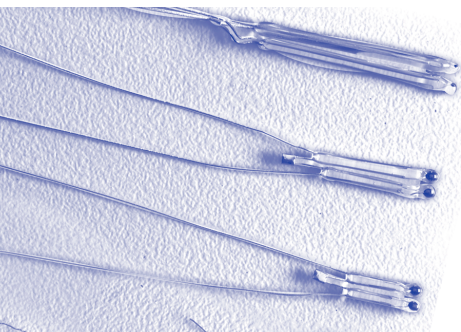
	VECO Part Number	Zero Power Resistance R_0 @ 25°C (ohms)	Temperature Coefficient α @ 25°C (%/°C)	Ratio		
				R_0 @ 0°C	R_0 @ 50°C	R_0 @ 125°C
0.100 Probes 0.5" Long	31A11	1,000 ± 20%	-3.8	6.9	19.7	
	32A11	2,000 ± 20%	-3.9	7.1	20.6	
	35A11	5,000 ± 20%	-4.0	7.4	21.8	
	41A11	10,000 ± 20%	-4.4	9.1	29.7	
	45A11	50,000 ± 20%	-4.5	9.5	31.5	
	51A11	100,000 ± 15%	-4.6	10.3	35.8	
0.060 Probes 0.25" and 0.5" Long (Leads 0.008 Dia.)	55A11	500,000 ± 20%	-5.0	12.3	49.6	
	61A11	1Meg ± 20%	-5.0	12.6	51.9	
	31A52	1,000 ± 20%	-3.8	6.9	19.7	
	32A129	2,000 ± 20%	-3.9	7.1	20.6	
	35A36	5,000 ± 20%	-4.0	7.4	21.8	
	41A28	100,000 ± 20%	-4.4	9.1	29.7	

Typical Time and Dissipation Constants

Type of Probe	Time Constant* (seconds)			Dissipation Constant* (Mw/(C))		
	Still Air	Still Oil	Still Water	Still Air	Still Oil	Still Water
0.100"	22.0	2.00	1.00	1.0	3.5	5.0
0.060"	6.0	0.50	0.25	0.6	2.0	3.0

*Units supported by their lead in indicated ambient at 25°C.

Isotherm® Thermistors



Some applications may require one or more of the following:

- Special resistance calibration
- Resistance versus temperature curve
- Matching or interchangeability

Isotherm® matched sets of thermistors (two or more units in series, parallel, or series-parallel combination) can be supplied to track a nominal resistance versus temperature curve to within a stated tolerance over a specified range. Isotherm units can be supplied such that the units within a group track each other at one or more points, or over a specified temperature range, to within a given tolerance on resistance. Further information is contained in Technical Bulletin MTM141.

VECO Part Number	Temperature Range		Figure	Zero-Power Resistance R_0 @ 25°C (ohms)	Ratio R_0 @ 0°C / R_0 @ 50°C	Dissipation Constant d @ 25°C (Mw/°C)	Time Constant t (seconds)
	°F	°C					
A371	-40 to 300	-40 to 150	4	2.0K	6.9	2	22
A372	-40 to 320	-40 to 160	4	2.5K	7.1	2	22
A373	-40 to 340	-40 to 170	4	4.0K	7.1	2	22
A374	0 to 600	-20 to 315	4	50.0K	9.4	2	22
A375	-65 to 270	-55 to 135	5	4.0K	7.1	0.2	10

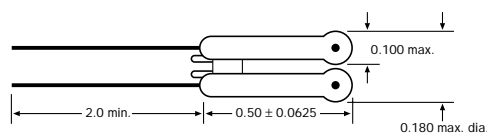


Figure 4

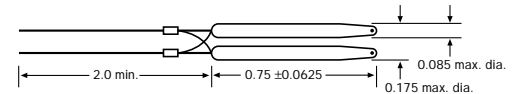
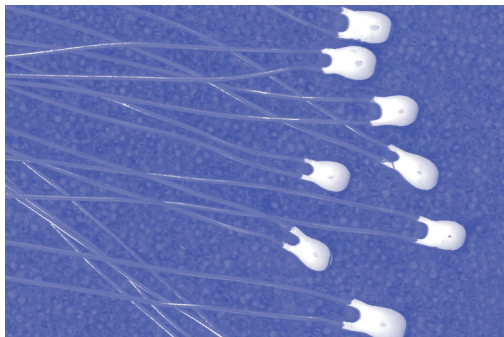


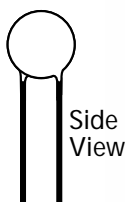
Figure 5

SensiChip® NTC Chip Thermistors



SensiChips® are used in a variety of applications such as:

- Temperature Measurement
- Temperature Compensation
- Temperature Control
- Liquid Level Measurement
- Power Level Control
- Voltage Control

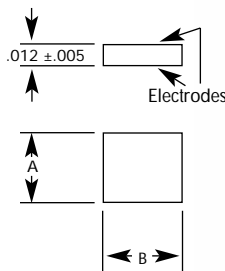
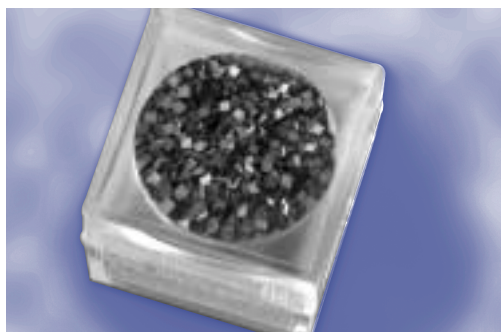


...with leads

VECO® SensiChip® NTC Chip thermistors utilize tape cast technology and offer a wide range of resistance values and tolerances to suit your specific application. They feature epoxy coating and offer very good long-term stability. They are designed for use from -55°C to +150°C. See Product Bulletin FP-0008.

VECO Part Number	Resistance (ohms @ 25°C)	Ratio 0/50	A Coated Dia. (Max)
SensiChip®			
15SA1A053	50	5.28	0.095
21SA1A043	100	5.28	0.095
20SB1A044	250	5.81	0.095
21SC1A103	100	6.80	0.150
20SC1A083	250	6.80	0.125
25SC1A053	500	6.80	0.095
31SC1A044	1,000	6.80	0.095
21SD1A103	100	7.04	0.150
20SD1A083	250	7.04	0.125
25SD1A053	500	7.04	0.095
31SD1A044	1,000	7.04	0.095
30SF1A073	2,500	9.06	0.110
32SF1A083/1	2,252	9.06	0.125
35SF1A053	5,000	9.06	0.095
41SF1A044	10,000	9.06	0.095
45SQ1A053	50,000	10.45	0.095
51SQ1A044	100,000	10.45	0.095
52SP1A044	200,000	11.78	0.095
61SJ1A044	100,000	13.12	0.095
50SJ1A084	250,000	13.12	0.125
55SJ1A074	500,000	13.12	0.110

Surface Mount NTC Thermistors

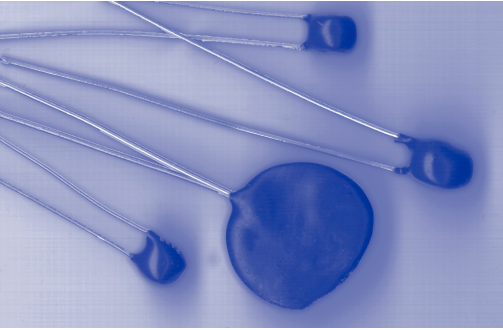


Easily Mounts Directly Onto Substrate. These new thermistors are available in a wide range of resistances (with up to 1% tolerance) and feature top/bottom metalization for easy mounting on substrate. Designed to meet MIL-PRF-23648 and MIL-STD-883; standard contact surface is silver. VECO® Surface Mount Thermistors are also available with gold or palladium/silver contacts. For special attachment requirements, see Product Bulletin FP-0071.

VECO Part Number	Resistance (ohms @25°C) ± 10%	Ratio (0/50 ± 5%)	A & B Length (inch)	Tolerance (± inch)
21SA0B043	100	5.28	0.040	0.010
20SB0B044	250	5.81	0.040	0.010
25SC0B053	500	6.80	0.050	0.010
31SC0B044	1,000	6.80	0.040	0.010
21SD0B103	100	7.04	0.100	0.020
20SD0B083	250	7.04	0.080	0.015
25SD0B053	500	7.04	0.050	0.010
31SD0B044	1,000	7.04	0.040	0.010
30SF0B073	2,500	9.06	0.065	0.015
32SF0B083/1	2,252	9.06	0.080	0.015
35SF0B053	5,000	9.06	0.050	0.010
41SF0B044	10,000	9.06	0.040	0.010
45SQ0B053	50,000	10.45	0.050	0.010
51SQ0B044	100,000	10.45	0.040	0.010
50SJ0B083	250,000	13.12	0.080	0.015
55SJ0B073	500,000	13.12	0.065	0.015
61SJ0B044	1,000,000	13.12	0.040	0.010
62SK0B044	2,000,000	14.73	0.040	0.010
71SM0B053	10,000,000	*23.80	0.050	0.010
72SM0B044	20,000,000	*23.80	0.040	0.010

* = ±6% Note: Contact thickness = 0.001 ± 0.0005 inch.

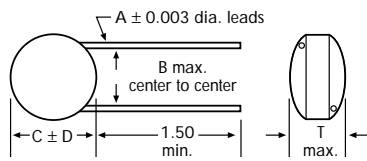
Military Grade Thermistors



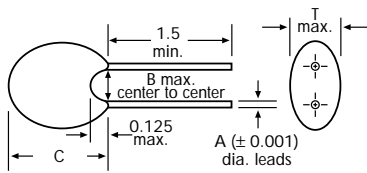
VECO® Military Grade general purpose chip and disk style thermistors meet the requirements of MIL-PRF-23648. They are designed for temperature measurement, control, or compensation applications within a temperature range of -55°C to + 125°C. Both disc and chip styles exhibit excellent long-term stability. The disc style is available in either ratio, A or B, and the RTH44 chip style is available in ratio B only. See Technical Bulletin MMT103.

Typical Time and Dissipation Constants

Styles	Resistance Range Available Min.-Max.	Resistance Ratio	Thermal Time Constant Max. Sec.	Dissipation Constant (Mw/°C) Min.	Max. Power Rating (watts)	Dimensions				
						A	B	C	D	T
RTH06	68 - 560	A	80	5	0.5	0.020	0.180	0.250	0.050	0.260
	680 - 4.7K	B	80	5	0.5					
RTH08	27 - 180	A	250	10	1.0	0.025	0.245	0.440	0.060	0.360
	180 - 1.8K	B	250	10	1.0					
RTH10	10 - 82	A	450	15	1.5	0.032	0.410	0.850	0.070	0.450
	68 - 330	B	450	15	1.5					
RTH44	2.5K - 10K	B	25	2	0.2	0.0126	0.080	0.250	—	0.135



Styles RTH06, RTH08, RTH10



Style RTH44

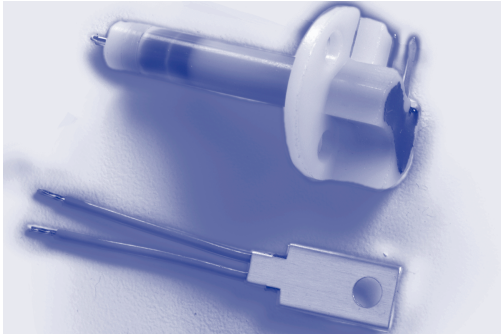
Zero Power Resistance Ratio Characteristics

Temp. °C	Ro (T)/Ro (25°C)	
	A	B
-55	54.9	100.0
-15	5.77	7.38
0	2.85	3.27
20	1.00	1.00
50	0.405	0.360
75	0.184	0.148
100	0.0923	0.067
125	0.0503	0.0340

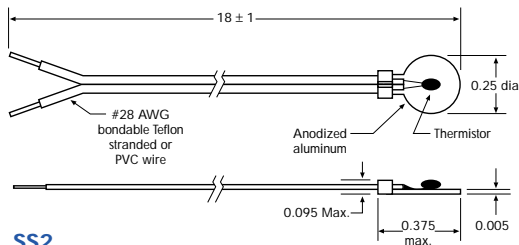
Resistance Ratio Values

Code Symbol	MIL-PRF-23648 Resistance Ratio Ro (25°C)/Ro (125°C)	Ref. Commercial Resistance Ratio Ro (0°C)/Ro (50°C)
A	19.8±10%	6.85
B	29.4±10%	9.10

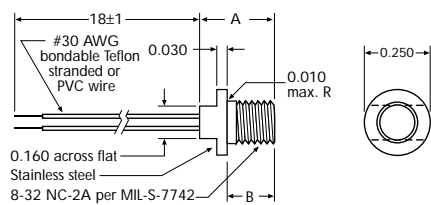
Thermistor Sensor Assemblies



VECO® Thermistor Sensor Assemblies are complete, ready-to-mount, temperature-sensing units. The surface mounting SS series is used in heat sealing controls, transistor compensation, process controls, heat sinks and mold temperature measurement applications. The SF series is designed for air temperature, oceanographic, flow or vacuum measurements, process and liquid level controls, gas analyzers, cryogenics, fuel oil preheat, or alarm devices. Within the limitations of size, they may be equipped with thermistors of any type and any electrical characteristics. Custom assemblies may also be ordered. A full description of the Sensor Assemblies is contained in Technical Bulletin MS082.

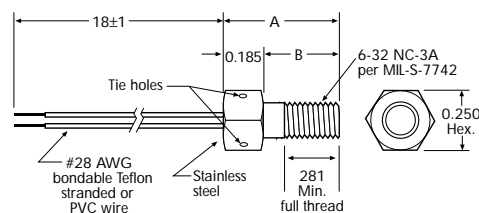


SS2



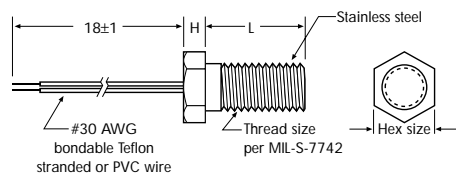
SS15

Type	A	B
SS15A	0.260	0.170
SS15B	0.375	0.265
SS15G	1.000	0.910



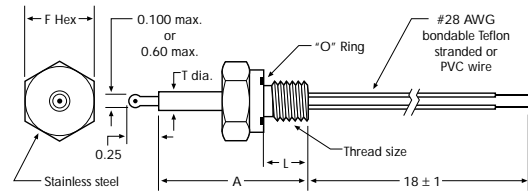
SS16

Type	A	B
SS16A	0.562	0.375
SS16B	0.781	0.600
SS16C	0.906	0.724



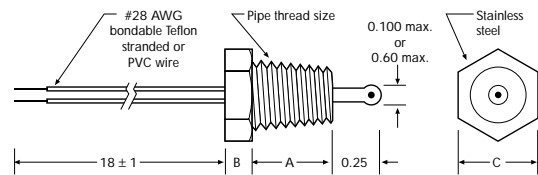
SS17

Type	H	Hex Size	Thread Size
SS17A	0.110	0.250	8-32
SS17B	0.120	0.312	10-32
SS17C	0.15625	0.4375	1/4-20



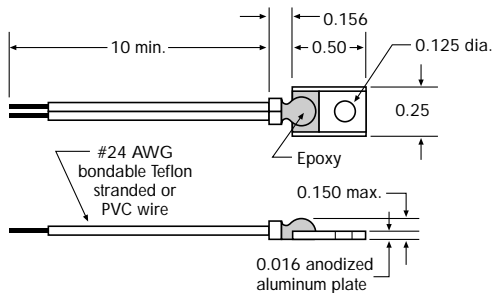
SF9

Type	Thread Size	T	A	L	F
SF9A	5/16 - 24	0.125	1.21875	0.34375	0.5625
SF9B	3/8 - 24	0.1875	1.28125	0.375	0.625
SF9C	7/16 - 20	0.25	1.4375	0.40625	0.75



SF14

Type	Pipe Thread Size	A	B	C
SF14A	1/8	0.5625	0.25	0.4375
SF14B	1/4	0.625	0.25	0.625
SF14C	3/8	0.6875	0.3125	0.6875
SF14D	1/2	0.75	0.3125	0.875



SS25

Note: All dimensions are in inches.

ENGINEERED-TO-ORDER PROBES

If you don't find a standard or configure-to-order probe that suits your needs, YSI can custom engineer and manufacture a cost-effective solution specifically for your application. Engineered-to-order probes and OEM devices from YSI offer the flexibility of custom design at a price comparable to standard products.

For more information on engineered-to-order probes and OEM devices, contact YSI Technical Support at:

Temperature@YSI.com

937 427-1231 ext. 770

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Sales Policy

To quickly qualify for open account status, please supply this information to our Credit Manager:

- Two credit references from vendors
- Bank reference
- Name of CEO or president
- Name of Treasurer
- Name of Controller
- Credit limit desired

Terms of Sale

Terms are Net 30 days from invoice date. We also accept VISA/Mastercard, COD, Pay-in-Advance and Letter of Credit (L/C). Shipping is prepaid and added, FOB Dayton, Ohio, or shipping charges can be collect with a carrier account number.

OEM or Contract Discounts

Qualification for OEM discount requires that these conditions be met:

- Use of YSI product in a fashion that's integral with the product
- Description of application in the simplest, non-proprietary terms
- Expected use rate
- Permission to advertise, if use is not proprietary

We will negotiate all agreements based on product and volume. Typically, all purchases of similar products may be mixed for discount. Delivery schedules are a significant factor in developing the terms of a purchase agreement. Contact your local agent or YSI Customer Service.

Order Change and Cancellation

The cancellation of any orders entered for stock products must be done 30 days prior to shipping date. With few exceptions, orders for special products and Configure-to-Order probes cannot be cancelled.

Returned Goods

Products that are returnable are:

- Standard catalog thermistors
- Products that have been negotiated as returnable at the time of order placement
- Standard medical product that Customer Service can easily determine has not been opened or used

Please contact YSI Customer Service to receive a TAN (return) number. A 20% re-stocking fee will apply.

Minimum Orders

Our minimum order value for thermistor components is 100 pieces. For smaller quantities, please contact a YSI Dealer. There is a \$500 USD minimum order required for all other YSI products.

Expedited Service

Anticipated delivery for Special products or Configure-to-Order probes is 4 weeks. If standard delivery needs to be expedited please contact YSI Customer Service to discuss material and resource availability.

Limited Warranty

We warrant our products against defects in materials and workmanship when the products are used according to their ratings and specifications. Our maximum liability is limited to repair or replacement (at our option) of defective products. For sensors, sensor assemblies, special products, and instruments, the warranty period is 1 year from shipment date. We will handle warranty repairs and replacements expeditiously. Contact YSI Customer Service for instructions on returning products.



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