

NASA Space-Qualified Thermistors

- **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 to specify the performance requirements for these thermistors. We re-qualify a group of thermistors every year and screen every thermistor before stocking.

Re-qualification includes the following tests that are referenced in MIL R-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

We screen every YSI 44900 Series Thermistor according to this specification. Screening includes visual and mechanical requirements, thermal shock, high-temperature storage, insulation resistance and additional resistance versus temperature analysis.

This qualification and screening gives you confidence that the component will perform to the rigorous requirements of space flight or other application. Customers often submit their own specifications that use our testing capabilities in combinations not in the Goddard specification.

Thermistors procured in compliance with GSFC-311-P-18 are identified by a specific Goddard part number with a 311P18 prefix, a dash number for resistance and range, a lead code and a lead length code. We stock components with S style leads 7.6 cm long. Please contact YSI Customer Service when ordering other lead styles or lengths.

Special Test Services

We offer special test services to qualify parts per customer source control drawings. All YSI thermistors and probes can be custom built and tested to meet the most stringent qualification requirements.

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](#).

Time Constant: 1 sec max when suspended by its leads in a well-stirred oil bath.

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 Technical Information Section.

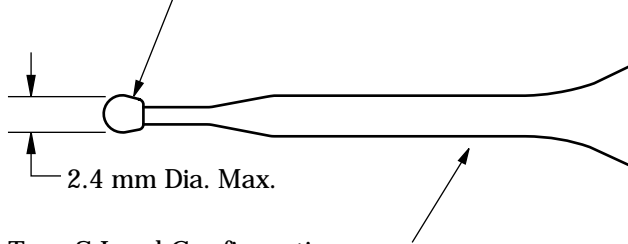
Interchangeability Tolerance Data: Tables on pages 17 and 18 show nominal resistance values, ohms per degree, and tolerance at select temperatures over the operating range.

Outgas: YSI 44900 Series Thermistors are tested in accordance with ASTM E-595-90, 0.66% TML 0.01% CVM, 0.10% WVR.

Cage Code: 1L9U5

Bare Lead Thermistor

Green Acceptance Dot

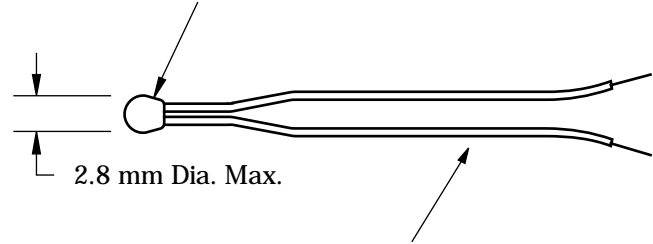


Type S Lead Configuration
32 AWG Tinned Solid Copper Wire
7.6 cm Min.

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

Insulated Lead Thermistor

Green Acceptance Dot

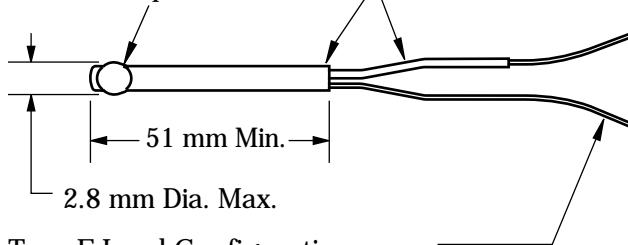


Type A Lead Configuration
28 AWG Stranded Tefzel-Insulated Wire
7.6 cm Min.

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

Teflon Covered Thermistor

Green Acceptance Dot



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

For more information,
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	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 75°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 75°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.

±0.2°C Interchangeability Tolerance Data

The table shows nominal resistance values, ohms per degree (sensitivity), and tolerances in °C and percent for the YSI Thermistor Series.

YSI Series	Description
440__	Epoxy-Encapsulated
450__	High-Temperature Hermetic Thermistors
460__	Super-Stable Thermistors
550__	GEM Glass-Encapsulated Thermistors

The first three digits of the YSI model number specify the series of thermistor. The last two digits specify the thermistor type.

Example: 44016, 45016, 46016, 55016, all define YSI B Mix 10K Thermistors.

Thermistor	__01	__02	__03	__04	__05	__07	__17	__16	__06	__08	__11	__14	__15
-80°C													
Nom Res	14470	67660	2788K	1660K	2211K	3685K	4423K	7371K	3558K				
Ohms/°	960	4880	20700	142K	189K	315K	379K	63K	262K				
Tol °C	0.60	0.60	0.60	1.00	1.00	1.00	1.00	1.00	1.00				
Tol %	4.10%	4.50%	4.64%	8.60%	8.60%	8.50%	8.60%	8.60%	7.40%				
-40°C													
Nom Res	1374	5198	19640	75790	101K	168300	201900	336500	239800	884600	3356K		
Ohms/°	69	284.5	1115	5045	6710	11250	13450	22400	14200	53700	209K		
Tol °C	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40		
Tol %	2.01%	2.19%	2.28%	2.66%	2.66%	2.66%	2.66%	2.66%	2.37%	2.50%	2.49%		
0°C													
Nom Res	239.2	777.5	2710	7355	9796	16330	19600	32660	29490	94980	333100	1088K	3966K
Ohms/°	9.1	32.05	117	376	500	835	1K	1670	1370	4695	17150	58K	226K
Tol °C	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Tol %	0.76%	0.83%	0.86%	1.02%	1.02%	1.02%	1.02%	1.02%	1.02%	0.93%	1.00%	1.03%	1.10%
25°C													
Nom Res	100	300	1K	2252	3K	5K	6K	10K	10K	30K	100K	300K	1000K
Ohms/°	3.2	10.55	37.05	99	131.5	219	264	438	402.5	1290	4495	14500	51650
Tol °C	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Tol %	0.64%	0.70%	0.74%	0.88%	0.88%	0.88%	0.88%	0.88%	0.81%	0.86%	0.90%	0.97%	1.03%
40°C													
Nom Res	63.1	181.4	589.5	1200	1598	2663	3197	5329	5592	16150	52190	149400	473200
Ohms/°	1.85	5.8	19.85	48.5	64.5	107	129.5	215	208	640	2175	6700	22800
Tol °C	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Tol %	0.61%	0.64%	0.67%	0.80%	0.80%	0.80%	0.80%	0.80%	0.74%	0.80%	0.83%	0.90%	0.96%
70°C													
Nom Res	28.3	75.2	233	394.5	525.4	875.7	1051	1752	1990	5359	16370	42850	123300
Ohms/°	0.7	2	6.6	13.5	17.95	29.95	36	60	63.5	182.5	585	1655	5150
Tol °C	0.36	0.36	0.36	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Tol %	0.88%	0.96%	1.02%	0.68%	0.68%	0.68%	0.68%	0.68%	0.64%	0.68%	0.71%	0.77%	0.84%
100°C													
Nom Res	14.3	35.8	106.4	152.8	203.8	339.6	407.1	678.5	816.8	2069	6005	14480	38200
Ohms/°	0.3	0.9	2.6	4.45	5.95	9.95	11.85	19.75	22.55	61	187	490	1380
Tol °C	1.00	1.00	1.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Tol %	2.09%	2.26%	2.41%	0.88%	0.88%	0.88%	0.88%	0.88%	0.83%	0.88%	0.93%	1.02%	1.09%
150°C													
Nom Res				41.9	55.6	92.7	111.6	186.1	237	550.2	1481	3186	7447
Ohms/°				0.9	1.3	2.17	2.4	4	5.3	13.3	38	88	222
Tol °C				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Tol %				2.30%	2.33%	2.30%	2.30%	2.30%	2.22%	2.35%	2.57%	2.71%	2.93%
200°C													
Nom Res				14.9	19.8	32.9	39.6	65.9	86.5	186.7			
Ohms/°				0.25	0.40	0.60	0.70	1.20	1.55	3.65			
Tol °C				1.30	1.30	1.30	1.30	1.30	1.30	1.30			
Tol %				2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%			

±0.05°C Interchangeability Tolerance Data

The table shows nominal resistance values, ohms per degree (sensitivity), and tolerances in °C and percent, for the YSI Thermistor Series.

YSI Series	Description
460_ _	Super-Stable Thermistors

The first three digits of the YSI model number specify the series of thermistor. The last two digits specify the thermistor type.

Example: 46046 defines a YSI B Mix 10K Thermistor.

Thermistor 46043	46040	46044	46047	46046	46041	
-80°C						
Nom Res	1660K	2211K	3685K	4423K	7371K	3558K
Ohms/°	142K	189K	315K	379K	630K	262K
Tol °C	1.00	1.00	1.00	1.00	1.00	1.00
Tol %	8.60%	8.60%	8.50%	8.60%	8.60%	7.40%
-40°C						
Nom Res	75790	101K	168.3K	201.9K	336.5K	239.8K
Ohms/°	5045	6710	11250	13450	22400	14200
Tol °C	0.20	0.20	0.20	0.20	0.20	0.40
Tol %	1.33%	1.33%	1.33%	1.33%	1.33%	2.37%
0°C						
Nom Res	7355	9796	16.33K	19.6K	32.66K	29.49K
Ohms/°	376	500	835	1000	1670	1370
Tol °C	0.05	0.05	0.05	0.05	0.05	0.05
Tol %	0.26%	0.26%	0.26%	0.26%	0.26%	0.23%
25°C						
Nom Res	2252	3K	5K	6K	10K	10K
Ohms/°	99	131.5	219	264	438	402.5
Tol °C	0.05	0.05	0.05	0.05	0.05	0.05
Tol %	0.22%	0.22%	0.22%	0.22%	0.22%	0.21%
40°C						
Nom Res	1200	1598	2663	3197	5329	5592
Ohms/°	48.5	64.5	107	129.5	215	208
Tol °C	0.05	0.05	0.05	0.05	0.05	0.05
Tol %	0.20%	0.20%	0.20%	0.20%	0.20%	0.18%
70°C						
Nom Res	394.5	525.4	875.7	1051	1752	1990
Ohms/°	13.5	17.95	29.95	36	60	63.5
Tol °C	0.05	0.05	0.05	0.05	0.05	0.05
Tol %	0.17%	0.17%	0.17%	0.17%	0.17%	0.16%
100°C						
Nom Res	152.8	203.8	339.6	407.1	678.5	816.8
Ohms/°	4.45	5.95	9.95	11.85	19.75	22.55
Tol °C	0.15	0.15	0.15	0.15	0.15	0.30
Tol %	0.44%	0.44%	0.44%	0.44%	0.44%	0.83%
150°C						
Nom Res	41.9	55.6	92.7	111.6	186.1	237
Ohms/°	0.9	1.3	2.17	2.4	4	5.3
Tol °C	1.00	1.00	1.00	1.00	1.00	1.00
Tol %	2.30%	2.33%	2.30%	2.30%	2.30%	2.22%
200°C						
Nom Res	14.9	19.8	32.9	39.6	65.9	86.5
Ohms/°	0.25	0.40	0.60	0.70	1.20	1.55
Tol °C	1.30	1.30	1.30	1.30	1.30	1.30
Tol %	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%

For more information,
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