NTC Thermistor Temperature Sensors

Product Information and Application Notes

THERM-O-DISC™

EMERSON™

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Together with our customers, Therm-O-Disc continuously works on new designs to meet the high demands of today's and future applications. We offer a wide range of NTC sensor packages, known for their long term stability and accurate measurements.

NTC thermistors are a semiconductor ceramic made with various metal oxides. Their electrical resistance decreases with increasing temperature. This resistance is processed by an electronic circuit to provide temperature measurement. While a bimetallic thermostat provides both temperature sensing and electrical circuit control, an NTC thermistor itself does not provide any control over heating elements, relays, etc. A thermistor is strictly a sensor and an electrical control would need to be implemented by the circuit utilizing the sensor.

Therm-O-Disc NTC Sensors offer economical, reliable and accurate solutions to those applications requiring more extensive sensing then the one or two temperature points typically offered by a bimetallic thermostat. NTC sensors provide a change in resistance with temperature that when combined with an electronic circuit provide a means of continuity measuring temperature over a wide range.

10J Series

The 10J series is a lead-wired temperature measurement sensor with a cost effective plastic shell. Custom designs can be developed if needed to meet complex application requirements. Complete or partial plastic designs can be developed with customized mounting features to fit various applications. Alternate materials and UL recognized models available upon request.

Specifications

- Typical thermal time constant 10 sec. (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
- Typical operating temperature range -40°C to 80°C or -20° to 105°C (dependant on wire rating)
- Insulation strength 500VAC/0.5mA/2sec. (inquire for others)
- Stable performance with high degree of accuracy

Applications

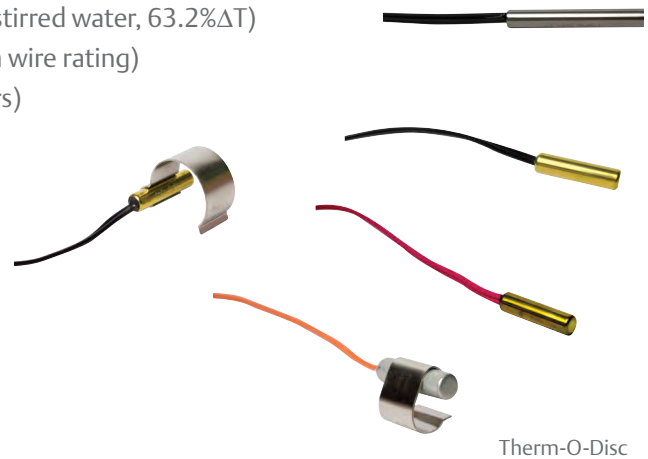
- Heat Pumps
- HVAC
- Furnace

11J Series

The 11J series is a lead-wired temperature measurement sensor with a brass/metal shell for use in HVAC systems. Custom designs can be developed if needed to meet complex application requirements. Brass or Stainless Steel designs can be developed with customized mounting features or one of several snap-on clips to fit various applications. UL recognized models available upon request.

Specifications

- Thermal time constant 10 sec. (measured: 25°C air to 85°C stirred water, 63.2%ΔT)
- Operating temperature range -40°C to 150°C (dependant on wire rating)
- Insulation strength 1500VAC/0.5mA/2sec. (inquire for others)
- Moisture resistance



Applications

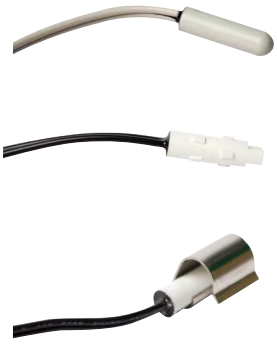
- Floor Heating
- Heat Pumps
- Boilers
- HVAC
- Solar Water Heaters
- Ambient Air Temperature Sensing

12J Series

The 12J series is a lead-wired temperature measurement sensor with epoxy-filled plastic shell. Designed for use in refrigeration and other high humidity environments, it can also be used successfully in general purpose applications. UL recognized models available upon request.

Specifications

- Typical thermal time constant 11 sec. (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
- Operating temperature range -40°C to 80°C or -40°C to 105°C(dependant on wire rating)
- Temperature exposure 1000 hours at -20°C & at 80°C, typical < 1% ΔR
- Insulation strength 3750VAC/0.5mA/2sec.
- Stable performance with high degree of accuracy
- Moisture resistance



Applications

- Refrigeration systems
- Freezer compartments
- Floor Heating
- Heat pumps
- Boilers
- Ambient temperature sensing

13J Series

The 13J series is a lead-wired temperature measurement sensor for applications where small size and fast response time is required. Its design is focused on the heater requirements and widely used in dry and high temperature environments. UL recognized models available upon request.

Specifications

- Thermal time constant 0.9 to 5sec (dependant on configuration) (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
- Operating temperature range -40°C to 175°C (dependant on shrink tube and wire rating)
- Insulation strength 600VAC/0.5mA/2sec (dependant on shrink tube rating)
- Stable performance and high degree of accuracy

Applications

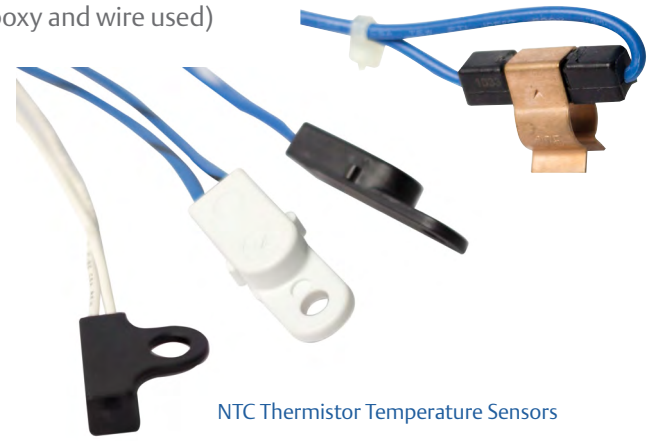
- Heater
- Humidifier
- Gas Boiler
- Ambient temperature sensing in dry environment
- HVAC systems

15J and 16J Series

The 15J &16J series are lead-wired temperature measurement sensors available as a fully-molded plastic body or epoxy-potted shell design with a Therm-O-Disc H-unit inside. These sensor types are typically designed for the refrigerator market but may be used in other humid environment applications. UL recognized models available upon request.

Specifications

- Thermal time constant: fully-molded 12-20 sec; epoxy-potted 13-15 sec. (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
- Operating temperature range -40°C up to 130°C (dependent on epoxy and wire used)
- Insulation strength 500VAC/0.5mA/2sec (inquire for others)
- Stable performance with high degree of accuracy



Applications

- Refrigerator
- Freezer compartments
- Ambient temperature sensing in humid environment
- HVAC systems
- Dishwashers

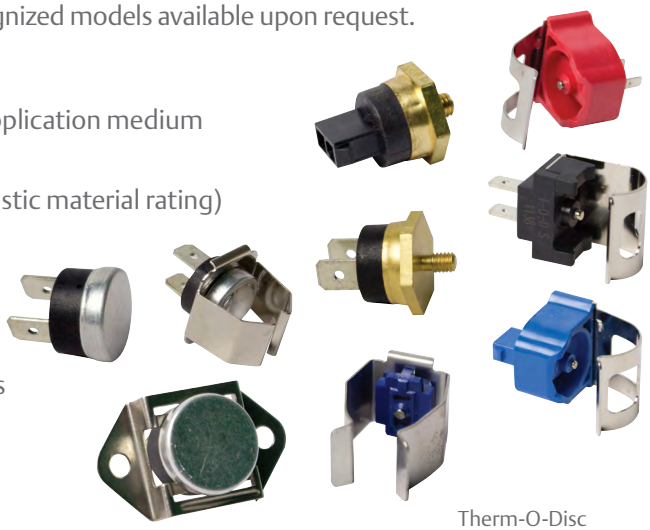
36J Series

36JB Series

The 36JB series is a temperature measurement sensor based on the ½" thermostat design. It's available with bead thermistor inside and comes in several well known designs as well as a fast response version. Designs can be developed with various mounting features including clips to fit various applications. UL recognized models available upon request.

Specifications

- Thermal time constant: 2-3 sec. (measured: 25°C air to 85°C, application medium [brass pipe, flatness, screw thread, or stirred water], 63.2% ΔT)
- Operating temperature range -40°C to 200°C (dependent on plastic material rating)
- Insulation strength 500VAC/0.5mA/2sec. (inquire for others)
- Moisture resistance



Applications

- Boiler Heating Systems
- Storage Water Heaters
- General fast response applications
- Small Appliances

36J Series

36JD Series

The 36JD series is a temperature measurement sensor based on the ½" thermostat design. It has two fast response thermistors inside and comes in the same housing design as 36JB/JH. By electronically analyzing the differential of both thermistors, this product replaces an NTC and a thermostat with a single device. Designs can be developed with various mounting features including clips to fit various applications.

Specifications

- Thermal time constant: 3-4 sec. (measured: 25°C air to 85°C application medium brass tube or hot plate, 63.2% ΔT)
- Operating temperature range -20°C to 130°C
- Insulation strength 500VAC/0.5mA/1sec. (inquire for others)
- Moisture resistance

Applications

- Boiler Heating Systems
- Instant Hot Water Heater

36JH Series

The 36JH series is a temperature measurement sensor based on the ½" thermostat design. It's available with an H-Unit sensor inside and comes in numerous widely used designs. UL recognized models available upon request. Designs can be developed with various mounting features including clips to fit various applications.

Specifications

- Thermal time constant: 11 sec. (measured: 25°C air to 85°C application medium brass tube or hot plate, 63.2% ΔT)
- Operating temperature range -40°C to 200°C
- Insulation strength 1500VAC/0.5mA/2sec. (inquire for others)
- Moisture resistance

Applications

- Boiler Heating Systems
- AC Units
- Laundry
  - Clothes Dryer
  - Washer
- Dishwashers

74J and 75J Series

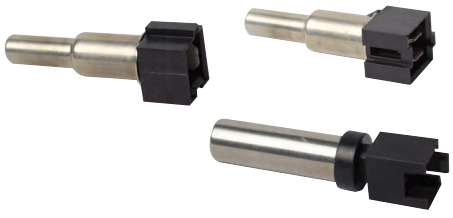
The 74J and 75J series temperature sensors are developed for major appliances like clothes washers and dishwashers. The 74J is available in an all-plastic design as well as stainless steel versions. Metal or plastic designs can be developed with customized features and connector options to fit various applications. The 75J is an all-plastic design. UL recognized models available upon request.

Specifications

- Typical thermal time constant 10-22 sec. dependant on material (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
- Typical operating temperature range -40°C to 130°C
- Insulation strength 3750VAC/0.5mA/1sec. (inquire for alternative values)
- Stable performance with high degree of accuracy

Applications

- Laundry
  – Washer
- Dishwasher
- Water Heaters



76J and 77J Series

These series are developed for air-stream temperature measurement with a plastic or metal shell, customized as needed to interface with application requirements. UL recognized models available upon request.

Applications

- Laundry
  - Clothes Dryer
  - Washer
- HVAC Air Duct Sensing

76J and 77J Series

76J Series

Complete or partial plastic designs typically developed with flange-style mounting features to fit various applications.

Specifications

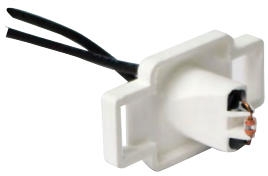
- Typical thermal time constant (dependant on wire rating): (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
  Metal – 1 sec. **Plastic** – dependent on plastic thickness.
- Typical operating temperature range -40°C to 125°C
- Insulation strength 1500VAC/0.5mA/2sec. (inquire for others)
- Stable performance with high degree of accuracy
- Moisture resistant

77J Series

Plastic and metal designs with flange-style mounting feature. Some plastic designs are Class II insulation compliant.

Specifications

- Thermal time constant (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
  Metal – 1 sec. **Plastic** – dependent on plastic thickness.
- Operating temperature range -40°C to 200°C (dependant on wire rating)
- Insulation strength 3750VAC/0.5mA/2sec. (inquire for others)
- Plastic sealed shell is moisture resistant



80J Series

The 80J series is a design solution with plastic cover and box, focused on the measurement of outdoor ambient temperature. Plastic designs can be developed with customized appearance and mounting features. Molded from UV resistant materials.

Specifications

- Typical operating temperature range -30°C to 60°C
- Temperature exposure 1000 hours at -20°C & at 80°C, typical < 1% ΔR
- Stable performance with high degree of accuracy

Applications

- Outdoor temperature sensing

93J Series

The 93J is a precise temperature measurement sensor with an ultra fast response time to be used in numerous applications. Both the immersion style and the flat-tipped version are available in various rugged designs. UL recognized models are available upon request.

Specifications

- Typical thermal time constant 1-2 sec. (dependent on tip configuration)
  (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
- Typical operating temperature range -40°C to 200°C (dependent on wire rating, epoxy rating and plastic)
- Insulation strength 500VAC/0.5mA/2sec. (inquire for others)
- Stable performance with high degree of accuracy
- Moisture resistant

Applications

- Boiler Heating Systems
- Bath/Spa (Shower units)
- Laundry
  - Dryer
  - Steamer
- Small Appliances
  - Coffee Makers
  - Single Brewers, Multi-Brewers
  - Kettles
  - Dishwasher

95J Series

The 95J series is a temperature measurement sensor intended to be immersed in direct contact with liquids like water or flue gases. It has a small tip with a fast response and comes in several designs with different molded connector types and thread options. Metal or plastic designs can be developed with customized mounting features to fit various applications. UL recognized models available upon request.

Specifications

- Typical thermal time constant 1-1.8 sec. (dependent on tip configuration) (measured: 25°C air to 85°C stirred water, 63.2% ΔT)
- Typical operating temperature range -40°C to 140°C (dependant on wire rating)
- Insulation strength 500VAC/0.5mA/2sec. (inquire for others)
- Stable performance with high degree of accuracy
- Moisture resistant

Applications

- Boiler Heating Systems
- Storage water heaters
- Other fast response in liquid applications
- Exhaust gas temperature detection

Automotive and RV

These custom designs can be developed with easy mounting features to fit various applications for sensing air or fluid temperature in engine or interior HVAC applications of automotive and recreational vehicles.

Applications

- Ambient Air Temp
- Intake Air Temp
- HVAC Temp
- Engine Temp
- Battery Temp – Electric & Hybrid Vehicles

Automotive and RV

Specifications

Ambient Air Temp Sensors
All-plastic designs for measuring ambient air temperature

- Fast thermal response
- Stable performance with high degree of accuracy
- Operating temp range -40° to 105°C
- Various mounting and interface configurations
- Moisture resistant

Intake Air Temp Sensors
Measures average temperature of air intake to the engine.

HVAC Air Temp Sensors
Measures temperature of air flow in interior air ducts and evaporator fins.

- Fast thermal response
- Stable performance with high degree of accuracy
- Operating temp range -40° to 85°C
- Various mounting and interface configurations
- Moisture resistant

Engine Coolant and Exhaust Temp Sensors
Measure temperature of fluid in engine coolant or exhaust gas applications.

- Fast thermal response
- Stable performance with high degree of accuracy
- Operating temp range -40° to 150°C; 250°C for exhaust gas sensor
- Various mounting and interface configurations
- Moisture resistant

Battery Temp Sensors
Measure temperature of battery cell or battery coolant applications.

- Fast thermal response
- Stable performance with high degree of accuracy
- Operating temp range -40° to 85°C to 100°C (depending on design)
- Various mounting and interface configurations
- Moisture resistant

For custom designs to meet your application needs, contact a Therm-O-Disc Sales Engineer.
Refer to Technical Data for BETA specs.

Technical Data

Typical Resistance/Temperature

T (°C)	Grade 1	Grade 5	Grade 9	Grade 15	Grade 18	Grade 19
	B25/85=3977K	B25/85=4107K	B25/85=3435K	B25/85=3740K	B25/85=4269K	B25/85=3468K
	Multiplier					
-40	33.731	37.254	19.582	25.792	43.675	21.650
-35	24.320	26.633	14.828	19.117	30.734	16.235
-30	17.741	19.258	11.343	14.308	21.888	12.302
-25	13.080	14.068	8.7613	10.808	15.766	9.413
-20	9.7391	10.382	6.8274	8.235	11.481	7.269
-15	7.3206	7.7426	5.3675	6.3280	8.4469	5.6631
-10	5.5531	5.8255	4.2524	4.9020	6.2765	4.4483
-5	4.2457	4.4229	3.3904	3.8260	4.7080	3.5214
0	3.2741	3.3847	2.7226	3.0080	3.5634	2.8084
5	2.5446	2.6125	2.2026	2.3830	2.7204	2.2555
10	1.9930	2.0342	1.7929	1.8990	2.0940	1.8236
15	1.5726	1.5947	1.4675	1.5240	1.6246	1.4838
20	1.2497	1.2594	1.2081	1.2310	1.2700	1.2146
25	1	1	1	1	1	1
30	0.8055	0.8008	0.8314	0.8171	0.7929	0.8282
35	0.6529	0.8448	0.6947	0.6713	0.6329	0.6897
40	0.5324	0.5223	0.5833	0.5544	0.5084	0.5774
45	0.4367	0.4256	0.4916	0.4603	0.4109	0.4858
50	0.3602	0.3487	0.416	0.3841	0.3340	0.4106
55	0.2986	0.2872	0.3534	0.3219	0.2731	0.3487
60	0.2488	0.2379	0.3013	0.2711	0.2245	0.2974
65	0.2083	0.198	0.2585	0.2293	0.1855	0.2547
70	0.1752	0.1655	0.2227	0.1948	0.1541	0.2191
75	0.1481	0.1389	0.1324	0.1662	0.1286	0.1891
80	0.1257	0.1174	0.1668	0.1423	0.1078	0.1639
85	0.1070	0.0995	0.14510	0.12230	0.09083	0.14246
90	0.0916	0.0847	0.12697	0.10550	0.07683	0.12434
95	0.0787	0.0724	0.11115	0.09133	0.06526	0.10886
100	0.0680	0.0621	0.09760	0.07935	0.05566	0.09560
105	0.05890	0.0535	0.08596	0.06917	0.04766	0.08420
110	0.05118	0.0462	0.07593	0.06048	0.04096	0.07438
115	0.04466	0.0401	0.06726	0.05305	0.03533	0.06588
120	0.03911	0.0349	0.05926	0.04668	0.03058	0.05850
125	0.03435	0.0304	0.05324	0.04119	0.02656	0.05209
130	0.03028	0.0267	0.04756	0.03645	0.02314	0.04649
135	0.02676	0.0234	0.04260	0.03234	0.02023	0.04158
140	0.02373	0.0206	0.03826	0.02878	0.01773	0.03729
145	0.02109	0.0182	0.03443	0.02567	0.01559	0.03351
150	0.01879	0.0162	0.03106	0.02295	0.01375	0.03018

For higher temp values, contact a Therm-O-Disc Sales Engineer.

Product Nomenclature Thermistors

Model Designation System

XXJ	1B	XXXXX
I	II	III

I – Series designator, where X is any numeral between 0-9
II – BETA value indicator + NTC type (Ex: 1B, 1C, 1E, 1G, 1H, 1M, 1R, 1S, etc.)
III – Customer specific numbers (4 or 5 digits)

Product Nomenclature Thermistors – UL Recognized

Model Designation System

XXJ	1B	A	M	XXXXX
I	II	III	IV	V

I – Series designator, where X is any change to numeral between 0-9
II – BETA value indicator + NTC type (Ex: 1B, 1E, 1G, 1H, 1M, 1R, etc.)
III – Temperature rating – A, B, C etc. – See table below for details

III	Max Op Temp
A	80
B	90
C	105
D	120
E	125
F	130
G	150
H	180
K	200

IV – Construction
- E - Plastic shell with epoxy fill
- M - Dead metal shell
- R - Molded in plastic
- X - Not insulated with or without shell

V – Customer specific numbers (4 or 5 digits)

Important Notice

The scope of the technical and application information included in this article is necessarily limited. Operating environments and conditions can materially affect the operating results of Therm-O-Disc™ products. **Users must determine the suitability of any Therm-O-Disc component for their specific application, including the level of reliability required, and are solely responsible for the function of the end-use product. It is important to review the Application Notes which can be found at www.tod.com.**

The warranty of this product stated in the terms and conditions of sale does not extend to any losses or damages due to misuse, accident, abuse, neglect, normal wear and tear, negligence (other than Seller's), unauthorized modification or alteration, use beyond rate capacity, or improper installation, maintenance or application. To the extent that Buyer or its agents has supplied specifications, information, representation of operating conditions or other data to Seller in the selection or design of the product and preparation of Seller's quotation, and in the event that actual operating conditions or other conditions differ from those represented by Buyer, any warranties or other provisions contained herein which are affected by such conditions shall be null and void. Buyer is solely responsible for determining the suitability of this product for its application. Furthermore, Buyer is solely responsible for the function of the end-use product. Seller terms and conditions apply.

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