



# **NTC thermistors for temperature measurement**

Probe assemblies

**Series/Type:** B57020  
**Date:** March 2006

**Applications**

- Cabinet and evaporator in refrigerators and deep freezers

**Features**

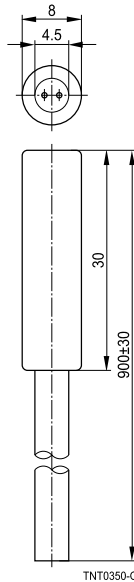
- Thermistor in molded plastic case
- PVC-insulated connecting cable (white)
- Conductor cross section:  $2 \times 0.34 \text{ mm}^2$
- Construction based on DIN EN 60 730 -1/VDE protection class 2
- UL approval (E252167)

**Options**

- Alternative head dimensions, resistance ratings, rated temperatures, resistance tolerances and cable lengths available on request.
- Color markings on cable available on request.
- Single insulated versions with twin wires available on request.

**Delivery mode**

Bulk

**Dimensional drawing**


Dimensions in mm

**General technical data**

Climatic category	(IEC 60068-1)		40/80/56	
Max. power	(at 25 °C)	$P_{25}$	350	mW
Resistance tolerance		$\Delta R_R/R_R$	±2	%
Rated temperature		$T_R$	0	°C
Dissipation factor	(in air)	$\delta_{th}$	approx. 10	mW/K
Thermal time constant	(in water)	$\tau_a$	approx. 35	s
Insulation resistance	(V = 500 VDC)	$R_{ins}$	>1000	MΩ

**Electrical specification and ordering codes**

$R_{25}$ Ω	$R_0$ Ω	No. of R/T characteristic	$B_{25/100}$ K	Ordering code
5000	16330	2003	$3980 \pm 1.5\%$	B57020M2502A017

**Reliability data**

Test	Standard	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat	IEC 60068-2-2	Storage at upper category temperature T: 80 °C t: 1000 h	< 2%	No visible damage
Storage in damp heat, steady state	IEC 60068-2-78	Temperature of air: 40 °C Relative humidity of air: 93% Duration: 56 days	< 2%	No visible damage
Storage in coldness		Storage at lower category temperature T: -40 °C t: 1000 h	< 2%	No visible damage
Rapid temperature cycling (in air)	IEC 60068-2-14	Lower test temperature: -40 °C Upper test temperature: 80 °C Time to change from lower to upper temperature: <30 s Number of cycles: 1000 Medium: air	< 2%	No visible damage
Storage in water		Temperature of water: 30 °C t: 4000 h Applied voltage with drop resistor 10 k $\Omega$ : 10 VDC switched between on ( $t_{on}$ = 30 min) and off ( $t_{off}$ = 30 min)	< 2%	No visible damage
Temperature cycling test		Lower test temperature: -30 °C Upper test temperature: 10 °C Test frequency <15 min under wetness and frozen water Number of cycles: 50000 Medium: air	< 2%	No visible damage
Voltage proof test		3750 VAC, 1 min		No flashover
Insulation test		The sensors are placed in a vessel containing metallic balls of 1 mm diameter (with total immersed head). The applied voltage is 500 VDC.		Above 1000 M $\Omega$

**R/T characteristics**

<b>B57020M2502A017</b>						
R/T No.	2003					
T (°C)	B <sub>25/100</sub> = 3980 K, R <sub>25</sub> = 5000 Ω, T <sub>R</sub> = 0 °C, ΔR <sub>R</sub> /R <sub>R</sub> = ± 2%					
	R <sub>nomL</sub> [Ω]	R <sub>minL</sub> [Ω]	R <sub>maxL</sub> [Ω]	ΔR <sub>R</sub> /R <sub>R</sub> [±%]	ΔT[±°C]	α (%/K)
-40.0	169160	159350	178970	5.8	0.9	6.7
-35.0	121800	115390	128200	5.3	0.8	6.5
-30.0	88766	84552	92979	4.7	0.8	6.2
-25.0	65333	62555	68111	4.3	0.7	6.0
-20.0	48614	46778	50450	3.8	0.6	5.8
-15.0	36503	35291	37715	3.3	0.6	5.6
-10.0	27680	26883	28478	2.9	0.5	5.5
-5.0	21166	20646	21686	2.5	0.5	5.3
<b>0.0</b>	<b>16330</b>	<b>16003</b>	<b>16657</b>	<b>2.0</b>	<b>0.4</b>	<b>5.1</b>
5.0	12696	12386	13006	2.4	0.5	5.0
10.0	9951	9670	10232	2.8	0.6	4.8
15.0	7855	7604	8105	3.2	0.7	4.7
20.0	6246	6025	6467	3.5	0.8	4.5
25.0	5000	4806	5194	3.9	0.9	4.4
30.0	4029	3859	4198	4.2	1.0	4.3
35.0	3266	3118	3414	4.5	1.1	4.1
40.0	2665	2535	2794	4.8	1.2	4.0
45.0	2186	2073	2298	5.1	1.3	3.9
50.0	1803	1705	1901	5.4	1.4	3.8
55.0	1495	1410	1581	5.7	1.5	3.7
60.0	1247	1172	1321	6.0	1.7	3.6
65.0	1044	979.0	1110	6.3	1.8	3.5
70.0	878.9	821.7	936.1	6.5	1.9	3.4
75.0	743.1	692.9	793.4	6.8	2.0	3.3
80.0	631.0	586.9	675.2	7.0	2.2	3.2

## Cautions and warnings

### General

See "Important notes" at the end of this document.

### Storage

- Store thermistors only in original packaging. Do not open the package before storage.
- Storage conditions in original packaging: storage temperature  $-25\text{ °C} \dots +45\text{ °C}$ , relative humidity  $\leq 75\%$  annual mean, maximum 95%, dew precipitation is inadmissible.
- Do not store SMDs where they are exposed to heat or direct sunlight. Otherwise, the packing material may be deformed or SMDs may stick together, causing problems during mounting.
- Avoid contamination of thermistors surface during storage, handling and processing.
- Avoid storage of thermistor in harmful environments like corrosive gases (SO<sub>x</sub>, Cl etc).
- After opening the factory seals, such as polyvinyl-sealed packages, use the SMDs as soon as possible.
- Solder thermistors after shipment from EPCOS within the time specified:  
SMDs: 12 months  
Leaded components: 24 months

### Handling

- NTC thermistors must not be dropped. Chip-offs must not be caused during handling of NTCs.
- Components must not be touched with bare hands. Gloves are recommended.
- Avoid contamination of thermistor surface during handling.

### Soldering

- Use resin-type flux or non-activated flux.
- Insufficient preheating may cause ceramic cracks.
- Rapid cooling by dipping in solvent is not recommended.
- Complete removal of flux is recommended.

### Mounting

- When NTC thermistors are encapsulated with sealing material or overmolded with plastic material, the precautions given in chapter "Mounting instructions", "Sealing, potting and overmolding" must be observed.
- Electrode must not be scratched before/during/after the mounting process.
- Contacts and housings used for assembly with thermistor have to be clean before mounting.
- During operation, the thermistor's surface temperature can be very high (ICL). Ensure that adjacent components are placed at a sufficient distance from the thermistor to allow for proper cooling of the thermistors.
- Ensure that adjacent materials are designed for operation at temperatures comparable to the surface temperature of the thermistor. Be sure that surrounding parts and materials can withstand this temperature.
- Make sure that thermistors (ICLs) are adequately ventilated to avoid overheating.
- Avoid contamination of thermistor surface during processing.

## Operation

- Use thermistors only within the specified operating temperature range.
- Use thermistors only within the specified voltage and current ranges (ICLs).
- Environmental conditions must not harm the thermistors. Use thermistors only in normal atmospheric conditions.
- Contact of NTC thermistors with any liquids and solvents should be prevented. It must be ensured that no water enters the NTC thermistor (e.g. through plug terminals). For measurement purposes (checking the specified resistance vs. temperature), the component must not be immersed in water but in suitable liquids (e.g. Galden).
- Avoid dewing and condensation.
- Be sure to provide an appropriate fail-safe function to prevent secondary product damage caused by malfunction (e.g. use VDR for limitation of overvoltage condition).

## Important notes

The following applies to all products named in this publication:

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