NTC thermistors for temperature measurement

NTC Probes

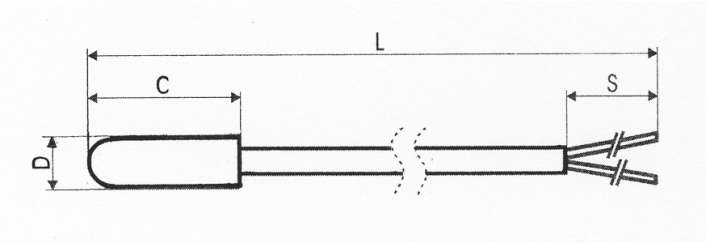
Series/Type: **M2025/10k/A1**
Ordering code: **B57025M2103A001**

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Version: 1

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Application

Temperature measurement in refrigerators and deep freezers



Version

Thermistor encapsulated in plastic housing, Sensor head with rounded tip

PVC-insulated connecting cable:
LiYY 2x0,22mm^2 (2xAWG24)
Outer diameter 4,0mm nom.
Sheath white,
Lead insulation blue/brown

L = 1170 ± 10 mm
D = ϕ 6,5 ± 0,2 mm
C = 25 ± 0,5 mm
S = 50 ± 5 mm
Wire stripping length 4,8 ± 1 mm

Ratings and characteristics

Climatic category (IEC 60068-1)			: **40/80/56**
Lower category temperature		[°C]	: **-40**
Upper category temperature		[°C]	: **+80**
Rated resistance R_N // Tolerance	R_N	[Ω // %]	: **32654 // ± 2**
Rated temperature	T_N	[°C]	: **0**
B-value : $B_{(25/100)}$ // Tolerance	B_N	[K//%]	: **3980 // ± 1,5**
R/T-Curve no. // R_{25}		[n//Ω]	: **2003 // 9998**
Max power rating at 25°C	P_{25}	[mW]	: **150**
Dissipation factor (in air)	δ_{th}	[mW/K]	: **approx. 7**
Thermal time constant (water)	τ_a	[s]	: **approx. 25**
Insulation resistance	R_{is}	[MΩ]	: **>100**
Voltage proof	V_{is}	[V]	: **1250**

Remarks

Sensor materials are not specified for direct food contact, for instance in accordance to 90/128/EEC and FDA

RT-curve:

NTC-RESISTANCE-TEMPERATURE-CURVE

R/T-Curve = 2003 / A02 **B(25/100) = 3980 [K] ± 1,5 [%]**

R at 25°C = 9998 [Ω] **R_N at 0 °C = 32654 [Ω] ± 2,0 [%]**

T [°C]	R_nom [Ω]	R_min [Ω]	R_max [Ω]	Δ R / R [±%]
-40	338253	318635	357870	5,8
-35	243546	230730	256361	5,3
-30	177499	169074	185925	4,7
-25	130642	125087	136196	4,3
-20	97211	93539	100882	3,8
-15	72992	70569	75416	3,3
-10	55351	53756	56945	2,9
-5	42325	41284	43365	2,5
0	**32654**	**32001**	**33307**	**2,0**
5	25387	24767	26007	2,4
10	19898	19337	20460	2,8
15	15707	15206	16207	3,2
20	12490	12047	12932	3,5
25	9998	9610	10386	3,9
30	8056	7717	8395	4,2
35	6531	6235	6827	4,5
40	5328	5070	5586	4,8
45	4371	4146	4595	5,1
50	3606	3410	3802	5,4
55	2990	2819	3161	5,7
60	2493	2344	2642	6,0
65	2088	1958	2219	6,3
70	1758	1643	1872	6,5
75	1486	1386	1586	6,8
80	1262	1174	1350	7,0

RELIABILITY DATA :

Test	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat	Storage at upper category temperature Temperature: 80°C; Duration: 1000 h	< 2 %	No visible damage
Storage in coldness	Storage at lower category temperature Temperature: -40°C; Duration: 1000 h	< 2 %	No visible damage
Storage in damp, heat, steady state	Temperature of air: 40°C Relative humidity of air: 93 % Duration: 56 days	< 2 %	No visible damage
Rapid change of temperature	Lower test temperature: -40°C (time: 10±5min) Upper test temperature: 80°C (time: 10±5min) Time to change from lower to upper temperature: < 30 sec; Number of cycles: 1000 Medium: air	< 2 %	No visible damage
Storage in water	Temperature of water: 30°C Duration: 4000 h Voltage 5 V_{dc} over series resistance R_v = 10kΩ, switched between on (t_{on} = 30 min) and off (t_{off} = 30 min)	< 2 %	No visible damage
Temperature cycling test	Lower test temperature: -20°C Upper test temperature: 30°C Two bath method; Sensor heads in a small plastic bag, filled with water; Voltage 3 V_{dc} over series resistance R_v = 15kΩ; number of cycles: 50000 Cycle time: appr. 2min	< 2 %	No visible damage
Voltage proof test	1250 V_{ac} ; 1min		No flash over
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 V_{dc}		ABOVE 100MΩ

Cautions and warnings

Storage

- Store thermistors in original packaging only. Do not open the package prior to storage.
- Storage conditions in original packaging: storage temperature -25°C …+45°C, relative humidity ≤ 75% annual mean, maximum 95%, dew precipitation is inadmissible.
- Do not store thermistors where they are exposed to heat or direct sunlight. Otherwise, the packing material may be deformed or components may stick together, causing problems during mounting.
- Avoid contamination of thermistor surface during storage, handling and processing.
- Avoid storage of thermistors in harmful environments like corrosive gases (SO_x, Cl etc.)
- Use the components as soon as possible after opening the factory seals, i.e. the polyvinyl-sealed packages.
- Solder thermistors within the time specified after shipment from EPCOS. For leaded components this is 24 months.

Handling

- NTC thermistors must not be dropped. Chip-offs or any other damage must not be caused during handling of NTCs.
- Do not touch components 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

- Ensure that no thermo-mechanical stress occurs due to production processes (curing or overmolding processes) when thermistors are sealed, potted or overmolded or during their subsequent operation. The maximum temperature of the thermistor must not be exceeded. Ensure that the materials used (sealing/potting compound and plastic material) are chemically neutral.
- Electrodes/contacts must not be scratched or damaged before/during/after the mounting process.
- Contacts and housing used for assembly with the thermistor must be clean before mounting.
- 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 the temperature.
- Avoid contamination of the thermistor surface during processing.
- The connections of sensors (e.g. cable end, wire end, plug terminal) may only be exposed to an environment with normal atmospheric conditions.
- Tensile forces on cables or leads must be avoided during mounting and operation.
- Bending or twisting of cables or leads directly on the thermistor body is not permissible.
- Avoid using chemical substances as mounting aids. It must be ensured that no water or other liquids enter the NTC thermistors (e.g. through plug terminals). In particular, water based substances (e.g. soap suds) must not be used as mounting aids for sensors.

Operation

- Use thermistors only within the specified operating temperature range.
- Use thermistors only within the specified power range.
- Environmental conditions must not harm the thermistors. Only use the thermistors under normal atmospheric conditions or within the specified conditions.
- Ensure that no significant thermo-mechanical stress occurs during operation due to the mounting situation. Fixtures must not overstress the sensor by an excessive mechanical preload.
- Contact of NTC thermistors with any liquids and solvents should be prevented. It must be ensured that no water enters the NTC thermistors (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 unless thermistor is specified for these conditions.
- Bending or twisting of cables and/or wires is not permissible during operation of the sensor in the application.
- Be sure to provide an appropriate fail-safe function to prevent secondary product damage caused by malfunction.

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