



## **NTC thermistors for temperature measurement**

### NTC Probes

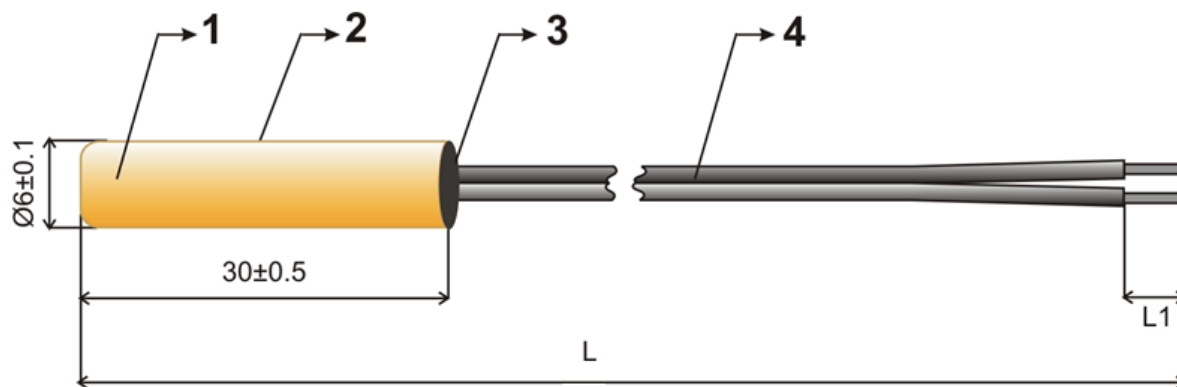
**Series/Type:** K800/10k/A1  
**Ordering code:** B57800K0103A001  
Date: 2009-07-09  
Version: 2

**Application**

Temperature sensor for heat pumps

**Version**

NTC-thermistor soldered to black PVC-insulated twin wire AWG22 (12x Ø0.18 mm, heat proof up to 105°C) and coated with epoxy resin



L = 870 ± 10 mm

dimensions in mm

L1 = 4 ± 1 mm

| No. | Item       | Material       | Property                | Remarks |
|-----|------------|----------------|-------------------------|---------|
| 1   | Thermistor | Ceramic        | EPCOS NTC-wafer         | coated  |
| 2   | casing     | copper         | Ø6 x 30 mm              |         |
| 3   | casting    | epoxy resin    | flexible                | black   |
| 4   | Cable      | PVC insulation | 2x AWG 22 (12xØ0.18 mm) | black   |

**Ratings and characteristics**

Climatic category (IEC 60068-1)

Lower category temperature

Upper category temperature

Rated resistance  $R_N$  // Tolerance

Rated temperature

B-value :  $B_{(25/100)}$  // Tolerance

R/T-Curve no. //  $R_{25}$

Max power rating at 25°C

Thermal time constant (25°C → 85°C water)

Dissipation factor (in air)

Thermal cooling time constant (in air)

Heat capacity

Insulation resistance

Voltage proof

|               |                    |                        |
|---------------|--------------------|------------------------|
|               |                    | : <b>30 / 100 / 56</b> |
|               | [°C]               | : <b>-30</b>           |
|               | [°C]               | : <b>100</b>           |
| $R_N$         | [Ω // %]           | : <b>10000 // 1</b>    |
| $T_N$         | [°C]               | : <b>25</b>            |
| $B_N$         | [K//%]             | : <b>3988 // 1</b>     |
|               | [n//Ω]             | : <b>8016</b>          |
| $P_{25}$      | [mW]               | : <b>60 mW</b>         |
| $\tau_a$      | [s]                | : <b>approx. 8*</b>    |
| $\delta_{th}$ | [mW/K]             | : <b>approx. 5*</b>    |
| $\tau_C$      | [s]                | : <b>approx. 50*</b>   |
| $C_{th}$      | [mJ/K]             | : <b>approx. 250*</b>  |
| $R_{is}$      | [MΩ]               | : <b>&gt; 100 MΩ</b>   |
| $V_{is}$      | [V <sub>AC</sub> ] | : <b>1500</b>          |

\*typical values

Remarks: --

## NTC-RESISTANCE-TEMPERATURE-CURVE

**R/T-Curve = 8016 / A01**
**R<sub>N</sub> at 25 °C = 10000 Ω ± 1.0 %**
**R at 25°C = 10000 Ω**
**B(25/100) = 3988 K ± 1.0 %**

| Temp. [°C] | R Nom [Ω]    | R Min [Ω]   | R Max [Ω]    | ΔR [±%]    | ΔT [±°C]   | α [%/K]    |
|------------|--------------|-------------|--------------|------------|------------|------------|
| -40        | 336500       | 320419      | 352582       | 4,8        | 0,7        | 6,7        |
| -35        | 242589       | 231867      | 253311       | 4,4        | 0,7        | 6,4        |
| -30        | 177000       | 169786      | 184214       | 4,1        | 0,7        | 6,2        |
| -25        | 130370       | 125487      | 135252       | 3,7        | 0,6        | 6,0        |
| -20        | 97070        | 93743       | 100397       | 3,4        | 0,6        | 5,8        |
| -15        | 72929        | 70652       | 75206        | 3,1        | 0,6        | 5,6        |
| -10        | 55330        | 53765       | 56895        | 2,8        | 0,5        | 5,4        |
| -5         | 42315        | 41237       | 43393        | 2,5        | 0,5        | 5,3        |
| 0          | 32650        | 31907       | 33393        | 2,3        | 0,4        | 5,1        |
| 5          | 25388        | 24877       | 25898        | 2,0        | 0,4        | 5,0        |
| 10         | 19900        | 19550       | 20250        | 1,8        | 0,4        | 4,8        |
| 15         | 15708        | 15470       | 15946        | 1,5        | 0,3        | 4,7        |
| 20         | 12490        | 12330       | 12650        | 1,3        | 0,3        | 4,5        |
| <b>25</b>  | <b>10000</b> | <b>9900</b> | <b>10100</b> | <b>1,0</b> | <b>0,2</b> | <b>4,4</b> |
| 30         | 8057         | 7955        | 8159         | 1,3        | 0,3        | 4,3        |
| 35         | 6531         | 6434        | 6628         | 1,5        | 0,4        | 4,1        |
| 40         | 5327         | 5237        | 5417         | 1,7        | 0,4        | 4,0        |
| 45         | 4369         | 4286        | 4451         | 1,9        | 0,5        | 3,9        |
| 50         | 3603         | 3528        | 3678         | 2,1        | 0,5        | 3,8        |
| 55         | 2986         | 2918        | 3054         | 2,3        | 0,6        | 3,7        |
| 60         | 2488         | 2427        | 2549         | 2,5        | 0,7        | 3,6        |
| 65         | 2083         | 2028        | 2138         | 2,6        | 0,8        | 3,5        |
| 70         | 1752         | 1703        | 1801         | 2,8        | 0,8        | 3,4        |
| 75         | 1481         | 1437        | 1525         | 3,0        | 0,9        | 3,3        |
| 80         | 1258         | 1219        | 1297         | 3,1        | 1,0        | 3,2        |
| 85         | 1072         | 1037        | 1108         | 3,3        | 1,0        | 3,2        |
| 90         | 917,7        | 886,1       | 949,3        | 3,4        | 1,1        | 3,1        |
| 95         | 788,5        | 760,2       | 816,9        | 3,6        | 1,2        | 3,0        |
| 100        | 680,0        | 654,6       | 705,4        | 3,7        | 1,3        | 2,9        |
| 105        | 588,6        | 565,8       | 611,4        | 3,9        | 1,4        | 2,9        |
| 110        | 511,2        | 490,7       | 531,7        | 4,0        | 1,4        | 2,8        |
| 115        | 445,4        | 426,9       | 463,9        | 4,2        | 1,5        | 2,7        |
| 120        | 389,3        | 372,6       | 406,0        | 4,3        | 1,6        | 2,7        |
| 125        | 341,7        | 326,6       | 356,8        | 4,4        | 1,7        | 2,6        |

**RELIABILITY DATA :**

| Test   | Test conditions  | $\Delta R_{25}/R_{25}$<br>(typical) | Remarks           |
|--|--|-------------------------------------|-------------------|
| Storage in dry heat<br>IEC 60068-2-2                 | Storage at upper category temperature in air;<br>temperature: 100°C;<br>duration: 1000 h   | < 2 %                               | No visible damage |
| Storage in coldness                                  | Storage at lower category temperature in air;<br>temperature: -30°C;<br>duration: 1000 h   | < 2 %                               | No visible damage |
| Storage in damp heat, steady state<br>IEC 60068-2-78 | Temperature of air: 40°C<br>Relative humidity of air: 93 %;<br>duration: 56 days   | < 3 %                               | No visible damage |
| Rapid temperature cycling in air<br>IEC 60068-2-14   | Lower test temperature: -30°C<br>Upper test temperature: 100°C<br>Dwelling time: 15 minutes<br>Number of cycles: 1000                                  | < 3 %                               | No visible damage |
| Storage in water                                     | Storage in water with total immersed head<br>temperature: 80°C;<br>duration: 1000 h  | < 3%                                | No visible damage |
| Vibration test<br>IEC 60068-2-6                      | Frequency range: 5 Hz to 500 Hz<br>Amplitude: 7.5 mm / 2 g<br>Linear sweep; X,Y and Z direction for 8 h each   | < 3 %                               | No visible damage |
| Voltage proof  | 1500 V <sub>AC</sub> , 50 Hz, 1 sec  | --                                  | No flashover      |
| Insulation test                                      | The sensors are placed in a vessel containing metallic balls of 1 mm diameter (with total immersed head)<br>The applied voltage is 500 V <sub>DC</sub> | --                                  | ABOVE<br>100 MΩ   |

## 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  $-25^{\circ}\text{C} \dots +45^{\circ}\text{C}$ , relative humidity  $\leq 75\%$  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 ( $\text{SO}_x$ , 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.
- 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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