# NTC thermistors for temperature measurement

## Probe assemblies

**Series/Type:** **B57500 / B57501**
Date: March 2006

### Applications

- Evaporator sensor for air conditioning systems
- Heating systems

### Features

- Copper case
- Twin cable (black)
- PVC-insulated wires with tinned ends, $T_{max}$ = 105 °C

### Options

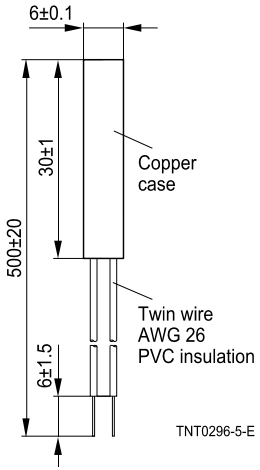
Alternative resistance ratings, rated temperatures, resistance tolerances, wire lengths and AWG 22, AWG 24 or AWG 26 available on request

### Delivery mode

Bulk

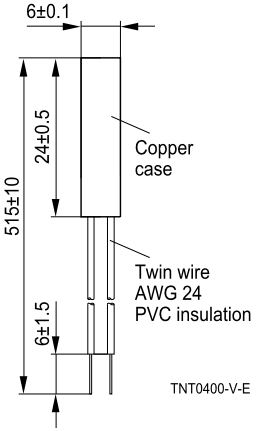
### Dimensional Drawings

**K500**




Dimensions in mm

**K501**




Dimensions in mm

### General technical data

| | | | | |
|---|---|---|---|---|
| Climatic category | (IEC 60068-1) | | 30/100/56 | |
| Max. power | (at 25 °C) | $P_{25}$ | 60 | mW |
| Resistance tolerance | | $\Delta R_R/R_R$ | ±3 | % |
| Rated temperature | | $T_R$ | 25 | °C |
| Dissipation factor | (in air) | $\delta_{th}$ | approx. 7 | mW/K |
| Thermal cooling time constant | (in air) | $\tau_c$ | approx. 130 | s |
| Thermal time constant | (in water) | $\tau_a$ | approx. 8 | s |
| Heat capacity | | $C_{th}$ | approx. 900 | mJ/K |
| Insulation resistance | (V = 100 VDC) | $R_{ins}$ | >100 | MΩ |
| Test voltage | (t = 1 s) | $V_{test}$ | 1.5 | kVAC |

### Electrical specification and ordering codes

| Type | AWG | $R_{25}$<br>Ω | No. of R/T characteristic | $B_{25/100}$<br>K | Ordering code |
|---|---|---|---|---|---|
| K500 | 26 | 10 k | 8016 | 3988 ±0.5% | B57500K0103A001 |
| K501 | 24 | 6.8 k | 8016 | 3988 ±0.5% | B57501K0682A002 |

**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<br>T: 100 °C<br>t: 1000 h | < 2% | No visible damage |
| Storage in damp heat, steady state | IEC 60068-2-78 | Temperature of air: 40 °C<br>Relative humidity of air: 93%<br>Duration: 56 days | < 2% | No visible damage |
| Storage in coldness | | Storage at lower category temperature<br>T: −30 °C<br>t: 1000 h | < 2% | No visible damage |
| Rapid temperature cycling (in fluid) | IEC 60068-2-14 | Lower test temperature: 0 °C<br>Upper test temperature: 100 °C<br>Time to change from lower to upper temperature: <30 s<br>Number of cycles: 1000<br>Medium: oil | < 2% | No visible damage |
| Vibration resistance | IEC 60068-2-6 | Frequency range: 5 ... 500 Hz<br>Amplitude: 7.5 mm, 2 g<br>Duration: 3 x 8 h | < 3% | No visible damage |
| Long-term stability (empirical value) | | Temperature: 100 °C<br>t: 10000 h | < 3% | No visible damage |
| Voltage proof test | | 1500 VAC,<br>1 s | | 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 100 VDC. | | Above 100 MΩ |

## R/T characteristics

| | **B57500K0103A001** | | | | | |
|---|---|---|---|---|---|---|
| R/T No. | 8016 | | | | | |
| T (°C) | $B_{25/100}$ = 3988 K, $R_{25}$ = 10000 Ω, $T_R$ = 25 °C, $\Delta R_R/R_R$ = ± 2% | | | | | |
| | $R_{nom}$[Ω] | $R_{min}$[Ω] | $R_{max}$[Ω] | $\Delta R_R/R_R$[±%] | ΔT[±°C] | α (%/K) |
| −30.0 | 177000 | 168920 | 185080 | 4.6 | 0.7 | 6.2 |
| −25.0 | 130370 | 124640 | 136100 | 4.4 | 0.7 | 6.0 |
| −20.0 | 97070 | 92955 | 101190 | 4.2 | 0.7 | 5.8 |
| −15.0 | 72929 | 69949 | 75909 | 4.1 | 0.7 | 5.6 |
| −10.0 | 55330 | 53150 | 57510 | 3.9 | 0.7 | 5.4 |
| −5.0 | 42315 | 40708 | 43922 | 3.8 | 0.7 | 5.3 |
| 0.0 | 32650 | 31454 | 33846 | 3.7 | 0.7 | 5.1 |
| 5.0 | 25388 | 24491 | 26284 | 3.5 | 0.7 | 5.0 |
| 10.0 | 19900 | 19223 | 20577 | 3.4 | 0.7 | 4.8 |
| 15.0 | 15708 | 15192 | 16223 | 3.3 | 0.7 | 4.7 |
| 20.0 | 12490 | 12095 | 12885 | 3.2 | 0.7 | 4.5 |
| **25.0** | **10000** | **9700** | **10300** | **3.0** | **0.7** | **4.4** |
| 30.0 | 8057 | 7802 | 8312 | 3.2 | 0.7 | 4.3 |
| 35.0 | 6531 | 6318 | 6745 | 3.3 | 0.8 | 4.1 |
| 40.0 | 5327 | 5147 | 5507 | 3.4 | 0.8 | 4.0 |
| 45.0 | 4369 | 4217 | 4520 | 3.5 | 0.9 | 3.9 |
| 50.0 | 3603 | 3474 | 3732 | 3.6 | 0.9 | 3.8 |
| 55.0 | 2986 | 2877 | 3096 | 3.7 | 1.0 | 3.7 |
| 60.0 | 2488 | 2395 | 2581 | 3.8 | 1.0 | 3.6 |
| 65.0 | 2083 | 2003 | 2163 | 3.8 | 1.1 | 3.5 |
| 70.0 | 1752 | 1683 | 1821 | 3.9 | 1.2 | 3.4 |
| 75.0 | 1481 | 1422 | 1541 | 4.0 | 1.2 | 3.3 |
| 80.0 | 1258 | 1207 | 1309 | 4.1 | 1.3 | 3.2 |
| 85.0 | 1072 | 1028 | 1117 | 4.2 | 1.3 | 3.2 |
| 90.0 | 917.7 | 878.7 | 956.7 | 4.2 | 1.4 | 3.1 |
| 95.0 | 788.5 | 754.4 | 822.6 | 4.3 | 1.4 | 3.0 |
| 100.0 | 680.0 | 650.1 | 709.9 | 4.4 | 1.5 | 2.9 |

| | **B57501K0682A002** | | | | | |
|---|---|---|---|---|---|---|
| R/T No. | 8016 | | | | | |
| T (°C) | $B_{25/100}$ = 3988 K, $R_{25}$ = 6800 Ω, $T_R$ = 25 °C, $\Delta R_R/R_R$ = ± 2% | | | | | |
| | $R_{nom}$[Ω] | $R_{min}$[Ω] | $R_{max}$[Ω] | $\Delta R_R/R_R$[±%] | ΔT[±°C] | α (%/K) |
| −30.0 | 120360 | 114870 | 125850 | 4.6 | 0.7 | 6.2 |
| −25.0 | 88651 | 84753 | 92550 | 4.4 | 0.7 | 6.0 |
| −20.0 | 66008 | 63210 | 68806 | 4.2 | 0.7 | 5.8 |
| −15.0 | 49592 | 47565 | 51618 | 4.1 | 0.7 | 5.6 |
| −10.0 | 37624 | 36142 | 39107 | 3.9 | 0.7 | 5.4 |
| −5.0 | 28774 | 27681 | 29867 | 3.8 | 0.7 | 5.3 |

| | **B57501K0682A002** | | | | | |
|---|---|---|---|---|---|---|
| R/T No. | 8016 | | | | | |
| T (°C) | $B_{25/100}$ = 3988 K, $R_{25}$ = 6800 Ω, $T_R$ = 25 °C, $\Delta R_R/R_R$ = ± 2% | | | | | |
| | $R_{nom}$[Ω] | $R_{min}$[Ω] | $R_{max}$[Ω] | $\Delta R_R/R_R$[±%] | $\Delta T$[±°C] | α (%/K) |
| 0.0 | 22202 | 21389 | 23015 | 3.7 | 0.7 | 5.1 |
| 5.0 | 17264 | 16654 | 17873 | 3.5 | 0.7 | 5.0 |
| 10.0 | 13532 | 13071 | 13993 | 3.4 | 0.7 | 4.8 |
| 15.0 | 10681 | 10331 | 11032 | 3.3 | 0.7 | 4.7 |
| 20.0 | 8493 | 8224 | 8762 | 3.2 | 0.7 | 4.5 |
| **25.0** | **6800** | **6596** | **7004** | **3.0** | **0.7** | **4.4** |
| 30.0 | 5479 | 5306 | 5652 | 3.2 | 0.7 | 4.3 |
| 35.0 | 4441 | 4296 | 4586 | 3.3 | 0.8 | 4.1 |
| 40.0 | 3622 | 3500 | 3744 | 3.4 | 0.8 | 4.0 |
| 45.0 | 2971 | 2868 | 3074 | 3.5 | 0.9 | 3.9 |
| 50.0 | 2450 | 2363 | 2537 | 3.6 | 0.9 | 3.8 |
| 55.0 | 2031 | 1956 | 2105 | 3.7 | 1.0 | 3.7 |
| 60.0 | 1692 | 1628 | 1755 | 3.8 | 1.0 | 3.6 |
| 65.0 | 1416 | 1362 | 1471 | 3.8 | 1.1 | 3.5 |
| 70.0 | 1191 | 1145 | 1238 | 3.9 | 1.2 | 3.4 |
| 75.0 | 1007 | 966.9 | 1048 | 4.0 | 1.2 | 3.3 |
| 80.0 | 855.4 | 820.4 | 890.4 | 4.1 | 1.3 | 3.2 |
| 85.0 | 729.2 | 698.8 | 759.6 | 4.2 | 1.3 | 3.2 |
| 90.0 | 624.0 | 597.5 | 650.5 | 4.2 | 1.4 | 3.1 |
| 95.0 | 536.2 | 513.0 | 559.4 | 4.3 | 1.4 | 3.0 |
| 100.0 | 462.4 | 442.1 | 482.7 | 4.4 | 1.5 | 2.9 |

## 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 °C ... +45 °C, relative humidity ≤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 (SOx, 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 ot 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).

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