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NTC thermistors for temperature measurement

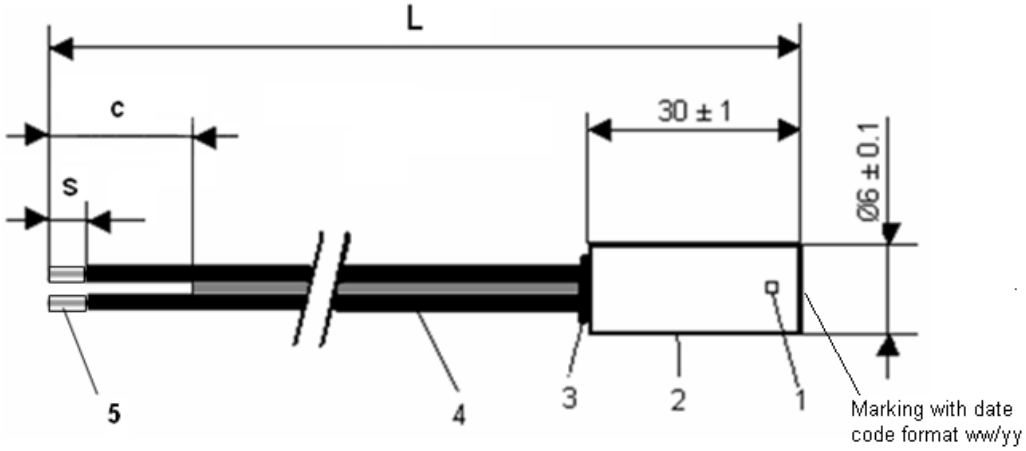
NTC Probes

Series/Type: **K800/4.7k/A1**
Ordering code: **B57800K0472A001**

Date: 2008-07-10
Version: 1

Application Temperature sensor for heat pumps

Version NTC-thermistor soldered to black PVC-insulated twin wire AWG26 (7x Ø0.16 mm, heat proof up to 105°C) and coated with epoxy resin



L = 4000 ± 30 mm
s = 5 ± 0.5 mm
c…splitted 40 ± 2 mm

No.	Item	Material	Property	Remarks
1	Thermistor	ceramics	EPCOS NTC-wafer	
2	casing	copper	Ø6 x 30 mm	
3	casting	epoxy resin	flexible	black
4	cable	PVC insulation	2 x AWG 26 (7xØ0.16 mm)	black (2.2 x 1.1)±0.1 mm
5	end splice	brass	Stocko RSB 7999 V-0.5	

Ratings and characteristics

Climatic category (IEC 60068-1)		:	**40 / 100 / 56**
Lower category temperature		[°C] :	**-40**
Upper category temperature		[°C] :	**100**
Rated resistance R_N // Tolerance	R_N	[Ω // %] :	**4700 // 1**
Rated temperature	T_N	[°C] :	**25**
B-value : $B_{(25/100)}$ // Tolerance	B_N	[K//%] :	**3988 // 1**
R/T-Curve no. // R_{25}		[n//Ω] :	**8016**
Max power rating at 25°C	P_{25}	[mW] :	**60 mW**
Thermal time constant (water)	τ_a	[s] :	**approx. 8***
Dissipation factor (in air)	δ_{th}	[mW/K] :	**approx. 5***
Thermal cooling time constant (in air)	τ_C	[s] :	**approx. 50***
Heat capacity	C_{th}	[mJ/K] :	**approx. 250***
Insulation resistance	R_{is}	[MΩ] :	**> 100 MΩ**
Voltage proof	V_{is}	[V_{AC}] :	**1500**

*typical values

Remarks: IVT p/n 14766

NTC-RESISTANCE-TEMPERATURE-CURVE

R/T-Curve = 8016 / A01 **R_N at 25 °C = 4700 Ω ± 1.0 %**

R at 25°C = 4700 Ω **B(25/100) = 3988 K ± 1.0 %**

Temp. [°C]	R Nom [Ω]	R Min [Ω]	R Max [Ω]	ΔR [±%]	ΔT [±°C]	α [%/K]
-30	83190	79799	86580	4,1	0,7	6,2
-25	61274	58979	63569	3,7	0,6	6,0
-20	45623	44059	47187	3,4	0,6	5,8
-15	34277	33206	35347	3,1	0,6	5,6
-10	26005	25269	26741	2,8	0,5	5,4
-5	19888	19382	20394	2,5	0,5	5,3
0	15346	14997	15694	2,3	0,4	5,1
5	11932	11692	12172	2,0	0,4	5,0
10	9353	9189	9517	1,8	0,4	4,8
15	7383	7271	7494	1,5	0,3	4,7
20	5870	5795	5945	1,3	0,3	4,5
25	**4700**	**4653**	**4747**	**1,0**	**0,2**	**4,4**
30	3787	3739	3835	1,3	0,3	4,3
35	3070	3024	3115	1,5	0,4	4,1
40	2504	2461	2546	1,7	0,4	4,0
45	2053	2014	2092	1,9	0,5	3,9
50	1693	1658	1729	2,1	0,5	3,8
55	1404	1372	1435	2,3	0,6	3,7
60	1169	1141	1198	2,5	0,7	3,6
65	979	953,3	1005	2,6	0,8	3,5
70	823,4	800,4	846,5	2,8	0,8	3,4
75	696,2	675,6	716,9	3,0	0,9	3,3
80	591,3	572,7	609,8	3,1	1,0	3,2
85	504	487,4	520,6	3,3	1,0	3,2
90	431,3	416,5	446,2	3,4	1,1	3,1
95	370,6	357,3	383,9	3,6	1,2	3,0
100	319,6	307,7	331,5	3,7	1,3	2,9

RELIABILITY DATA :

Test	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat IEC 60068-2-2	Storage at upper category temperature in air; temperature: 100°C; duration: 1000 h	< 2 %	No visible damage
Storage in coldness	Storage at lower category temperature in air; temperature: -40°C; duration: 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	< 3 %	No visible damage
Rapid temperature cycling in air IEC 60068-2-14	Lower test temperature: -30°C Upper test temperature: 100°C Dwelling time: 15 minutes Number of cycles: 1000	< 3 %	No visible damage
Rapid temperature cycling in liquid	Lower test temperature: -30°C Upper test temperature: +90°C Medium: water+ethyleneglycol Dwelling time: 2 minutes Load : 5 V_{DC} with 6.8 kΩ pre-resistor Number of cycles: 5000	< 3%	No visible damage
Freezing / Thawing	Lower test temperature: -25°C Upper test temperature: +30°C Dwelling time: 4 minutes Sensors heads are placed in rubber bags, filled with water; Load: 5 V_{DC} with 6.8 kΩ pre-resistor Number of cycles: 5000	< 3%	No visible damage
Storage in water	Storage in water with total immersed head temperature: 80°C; duration: 1000 h	< 3%	No visible damage
Vibration test IEC 60068-2-6	Frequency range: 5 Hz to 500 Hz Amplitude: 7.5 mm / 2 g Linear sweep; X,Y and Z direction for 8 h each	< 3 %	No visible damage
Voltage proof	1500 V_{AC} , 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) The applied voltage is 500 V_{DC}	--	ABOVE 100 MΩ

Cautions and warnings

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 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 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 components as soon as possible.
- Solder thermistors after shipment from EPCOS within the time specified:
  Leaded components: 24 months

Handling

- NTC thermistors must not be dropped. Chip-offs must not be caused during handling of NTCs.
- Components should 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 thermistors are sealed, potted or overmolded, there must be no mechanical stress caused by thermal expansion during the production process (curing/overmolding process) and during later operation. The upper category 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 before/during/after the mounting process.
- Contacts and housing 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 the temperature.
- Make sure that thermistors (ICLs) are adequately ventilated to avoid overheating.
- Avoid contamination of thermistor surface during processing.
- During mounting and operation tensile forces on the leads are to be avoided.
- Bending or twisting of the leads directly on the thermistor body is not permissible.
- During operation of the sensor in the application, bending or twisting of cables and/or wires is not permissible.

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 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.
- 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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