NTC thermistors for temperature measurement

Probe assemblies

Series/Type:	**K525**
Ordering code:	**B57525K***
Date:	October 2018
Version:	P0.1

Preliminary data

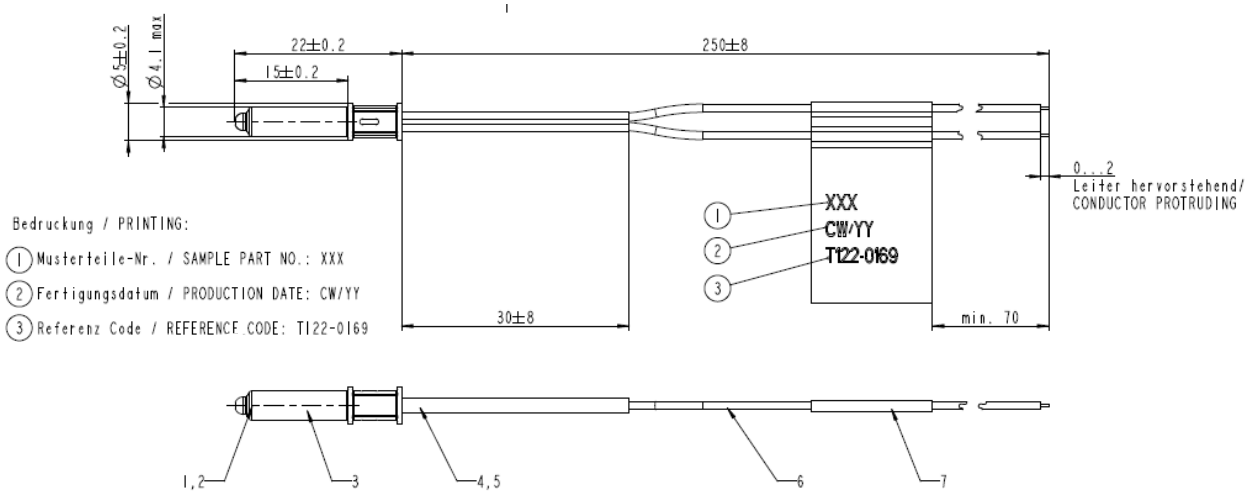
Applications

Temperature measurement up to 300 °C for
- Automotive
- Industrial
- Consumer applications

Features
- Small sensor head
- High voltage strength 4000 V AC
- Good chemical resistance against acid and alkalis on sensor tip

Options
- Alternative wire lengths on request

Delivery mode
Bulk



Dimension in mm

Pos.	Name	Remarks
1	NTC	G1550
2	Potting	Ceramic based potting
3	Housing	Aluminum oxide ceramic
4	Protection sleeve	Fiber glass 300 °C
5	Crimp	Cupronickel
6	Wire	AWG 26 PTFE insulated, nickel plated copper
7	Label	Self-adhesive plastic foil

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Electrical specification

Climatic category (IEC 60068-1)		:	10/300/56
(test without voltage)			
Lower category temperature		[°C] :	–10
Maximum operating temperature (sensor head)	$T_{op, max}$	[°C] :	300
Rated resistance R_R // Tolerance	R_R	[Ω // %] :	3300 // ± 2.5
Rated temperature	T_R	[°C] :	100
B-value : $B_{25/100}$ // Tolerance	B	[K // %] :	3988 // ± 1
R/T-Curve no. // R_{25}		[n // Ω] :	7002 // 48538
Thermal time constant (in water)[1)]	t_a	[s] :	approx. 1.2
Test voltage (t = 1 s; I_{creep} = 0.1 mA)	V_{test}	[V_{AC}] :	4000
Insulation resistance (V = 500 V DC)	R_{ins}	[MΩ] :	>100

[1)] Sensor immersion depth for thermal time constant measurement in water is approx. 15 mm.

Remarks:
The sensor systems are produced under sample conditions; the mass production is under development.

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R/T characteristics

R/T curve 7002 / A01
R at 25 °C 48538 Ω
$B_{25/100}$ 3988 K ± 1%
R_R at 100 °C 3300 Ω ± 2.5%

Temp. °C	R_{Nom} Ω	R_{Min} Ω	R_{Max} Ω	” R ±%	” T ±°C	± %/K
–10	267584	248806	286362	7.0	1.3	5.4
–5	204828	191033	218623	6.7	1.3	5.3
0	158112	147894	168331	6.5	1.3	5.1
5	123033	115405	130662	6.2	1.3	4.9
10	96473	90735	102210	5.9	1.2	4.8
15	76202	71856	80547	5.7	1.2	4.6
20	60613	57300	63927	5.5	1.2	4.5
25	48538	45995	51081	5.2	1.2	4.4
30	39119	37156	41082	5.0	1.2	4.3
35	31722	30198	33246	4.8	1.2	4.1
40	25877	24687	27066	4.6	1.1	4.0
45	21228	20295	22162	4.4	1.1	3.9
50	17510	16774	18246	4.2	1.1	3.8
55	14518	13935	15101	4.0	1.1	3.7
60	12098	11635	12562	3.8	1.1	3.6
65	10131	9760	10501	3.7	1.0	3.5
70	8523.0	8226.0	8819.0	3.5	1.0	3.4
75	7202.0	6963.0	7441.0	3.3	1.0	3.3
80	6112.0	5919.0	6305.0	3.2	1.0	3.2
85	5209.0	5052.0	5365.0	3.0	0.9	3.2
90	4457.0	4330.0	4583.0	2.8	0.9	3.1
95	3828.0	3725.0	3931.0	2.7	0.9	3.0
100	3300.0	3218.0	3382.0	2.5	0.9	2.9
105	2855.0	2778.0	2932.0	2.7	0.9	2.9
110	2479.0	2409.0	2549.0	2.8	1.0	2.8
115	2159.0	2095.0	2223.0	3.0	1.1	2.7
120	1887.0	1829.0	1946.0	3.1	1.2	2.7
125	1654.0	1601.0	1708.0	3.2	1.2	2.6
130	1455.0	1406.0	1503.0	3.3	1.3	2.5
135	1283.0	1238.0	1327.0	3.5	1.4	2.5

Preliminary data

Temp. °C	R_{Nom} Ω	R_{Min} Ω	R_{Max} Ω	” R ±%	” T ±°C	± %/K
140	1135.0	1094.0	1175.0	3.6	1.5	2.4
145	1006.0	968.80	1043.0	3.7	1.6	2.4
150	894.50	860.40	928.60	3.8	1.6	2.3
155	797.30	766.10	828.60	3.9	1.7	2.3
160	712.50	683.80	741.20	4.0	1.8	2.2
165	638.20	611.80	664.60	4.1	1.9	2.2
170	573.00	548.70	597.30	4.2	2.0	2.1
175	515.60	493.30	538.00	4.3	2.1	2.1
180	465.00	444.40	485.60	4.4	2.2	2.0
185	420.30	401.20	439.30	4.5	2.3	2.0
190	380.60	363.00	398.20	4.6	2.4	2.0
195	345.30	329.00	361.60	4.7	2.5	1.9
200	314.00	298.90	329.10	4.8	2.6	1.9
205	286.00	272.00	300.00	4.9	2.6	1.8
210	261.00	248.00	274.00	5.0	2.7	1.8
215	238.60	226.50	250.70	5.1	2.9	1.8
220	218.50	207.20	229.70	5.2	3.0	1.7
225	200.40	189.90	210.90	5.2	3.1	1.7
230	184.10	174.30	193.90	5.3	3.2	1.7
235	169.40	160.30	178.60	5.4	3.3	1.6
240	156.20	147.60	164.70	5.5	3.4	1.6
245	144.10	136.20	152.10	5.5	3.5	1.6
250	133.20	125.80	140.70	5.6	3.6	1.6
255	123.30	116.30	130.40	5.7	3.7	1.5
260	114.30	107.80	120.90	5.8	3.8	1.5
265	106.10	99.950	112.30	5.8	3.9	1.5
270	98.640	92.830	104.50	5.9	4.1	1.5
275	91.800	86.330	97.270	6.0	4.2	1.4
280	85.540	80.380	90.700	6.0	4.3	1.4
285	79.800	74.940	84.670	6.1	4.4	1.4
290	74.540	69.950	79.130	6.2	4.5	1.4
295	69.700	65.370	74.040	6.2	4.7	1.3
300	65.250	61.160	69.350	6.3	4.8	1.3

Preliminary data

Reliability data

Test	Test conditions	R_{100}/R_{100} (typical)	Remarks
High temperature exposure (storage)	Temperature: 300 °C Duration: 1000 h DUT: sensor tip exposed to the temp.	< 3%	No visible damage
Low temperature exposure (storage)	Temperature: –10 °C Duration: 1000 h DUT: entire sensor	< 3%	No visible damage
Operational life	Temperature: 250 °C Test voltage on NTC: 0.3 V with series resistor Duration: 1000 h DUT: entire sensor	< 3%	No visible damage
Rapid temperature cycling in air	Lower test temperature: –10 °C Upper test temperature: 150 °C Dwell time at each temperature: 15 min Transition time: < 15 s Number of cycles: 1000 DUT: entire sensor	< 3%	No visible damage
Storage in damp heat, steady state	Temperature: 40 °C Relative humidity of air: 93% Duration: 56 days DUT: entire sensor	< 5%	No visible damage

Preliminary data

Cautions and warnings

Storage

- Store thermistors only in original packaging. Do not open the package prior to storage.
- Storage conditions in original packaging: storage temperature −10 °C ... +45 °C, relative humidity d75% annual mean, <95% maximum 30 days per annum, 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 (SOx, 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 TDK Electronics.
  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.
- Washing processes may damage the product due to the possible static or cyclic mechanical loads (e.g. ultrasonic cleaning). They may cause cracks to develop on the product and its parts, which might lead to reduced reliability or lifetime.

Bending/ twisting leads

- A lead (wire) may be bent at a minimum distance of twice the wire's diameter plus 4 mm from the component head or housing. When bending ensure the wire is mechanically relieved at the component head or housing. The bending radius should be defined.

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.
- The applied tensile forces on cables or leads during mounting and operation must be within specified value.
- 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 shall 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).
- Exclude 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.

This listing does not claim to be complete, but merely reflects the experience of TDK Electronics Group.

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