

## ▶ Measuring resistor with the KTY-sensor

Monitoring of motor winding temperature,  
basic temperature measurement by using KTY-sensors

KTY 84-1...

KTY-sensor in windings



Color coding of leads, according to the SIEMENS-standards:

AWG24, white=minus

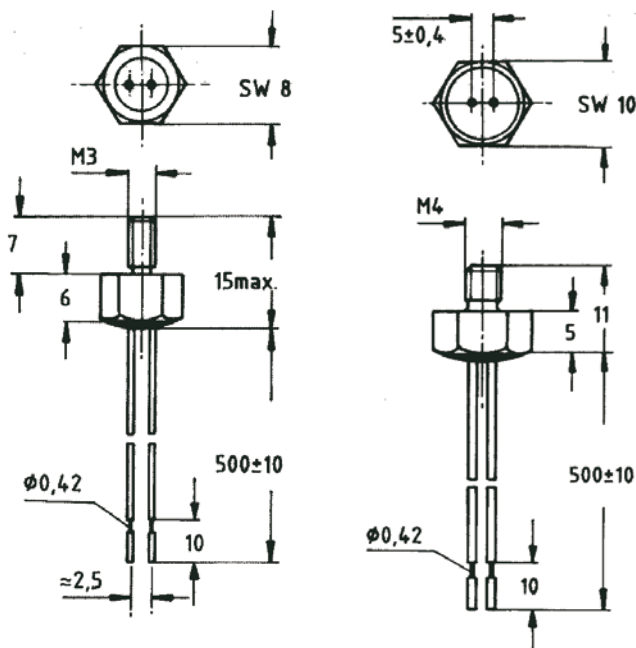
AWG24, brown=plus

or:

AWG24, yellow=minus

AWG24, green=plus

KTY-screw in sensor



### Basic information

The low-cost KTY-sensor is used for precise temperature monitoring, control, and switching in windings, bearings, machines, motors, transformers and many other industrial applications, where errors in measurements have to be excluded.

### Application

With outstanding accuracy and fail-safe operation, they have a wide range of applications in both automotive and industrial markets.

Industrial applications:

- overheating protection
- protection for power supplies
- process temperature control
- exhaust control
- toaster control
- temperature compensation for microprocessors

Automotive applications:

- oil temperature
- oil level
- water temperature
- diesel injection
- transmission
- engine coolant
- engine air
- air condition

### General function

The silicon temperature sensors in the KTY84-1 series have a nearly linear, positive temperature coefficient of resistance over the complete wide temperature range.

### Advantages of these sensors

- Low cost over a temperature range: -40 ... +300°C.
- Larger output signal than Pt100.
- Very long operation life.
- High long term stability.
- Low weight.
- Low thermal time constant.

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### Technical Data

#### Quick reference data:

sensor resistance  $R_{100}$ ,  $T_{amb} = 100^{\circ}\text{C}$ ,  $I_{cont} = 2\text{mA}$

Parameter	Min.	Max.	Unit	Marking Code
KTY 84-130	970	1030	Ohm	KT84L
KTY 84-150	950	1050	Ohm	KT84M
KTY 84-151	950	1000	Ohm	KT84O

#### Limiting values:

In accordance with the absolute maximum rating system (IEC 60134)

Symbol	Parameter	Conditions	Min.	Max.	Unit
$I_{cont}$	continuous sensor current	In free air $T_{amb} = 100^{\circ}\text{C}$ (Note 1)	-	10	mA
		In free air $T_{amb} = 300^{\circ}\text{C}$	-	2	mA
$T_{amb}$	ambient operation temperature		-40	300	$^{\circ}\text{C}$
$T_{stg}$	storage temperature		-55	300	$^{\circ}\text{C}$

#### Note

1. For temperatures greater than  $+200^{\circ}\text{C}$ , a sensor current of  $I_{cont} = 2\text{mA}$  must be used.

#### Characteristics:

$T_{amb} = 100^{\circ}\text{C}$ , in liquid, unless otherwise specified

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{100}$	sensor resistance	$I_{cont} = 2\text{mA}$				
TC	temperature coefficient		-	0.62	-	%/K
$R_{250}/R_{100}$	resistance ratio	$T_{amb} = 250^{\circ}\text{C}$ und $100^{\circ}\text{C}$	2.111	2.166	2.221	
$R_{25}/R_{100}$	resistance ratio	$T_{amb} = 25^{\circ}\text{C}$ und $100^{\circ}\text{C}$	0.595	0.603	0.611	
$\tau$	thermal time constant (note 1)	In still air	-	20	-	s
		In still liquid (Note 2)	-	1	-	s
		In flowing liquid (Note 2)	-	0.5	-	s

#### Note

1. The thermal time constant is the time taken for the sensor to reach 62.3% of the total temperature difference.

For example, if a sensor with a temperature of  $25^{\circ}\text{C}$  is moved to an environment with an ambient temperature of  $100^{\circ}\text{C}$ , the time of the sensor to reach a temperature of  $72.4^{\circ}\text{C}$  is the thermal time constant.

$$T_{62.3\%} = 25^{\circ}\text{C} + 0.632 * (100^{\circ}\text{C} - 25^{\circ}\text{C}) = 72.4^{\circ}\text{C}$$

2. Inert liquid, e.g. FC 43 manufactured by the 3M company

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$$I_{con} = 2 \text{ mA}$$

Ambient Temperature [°C]	Temp. Coeff. [%K]	KTY84-130				KTY84-150			
		Resistance [Ohm]			Temperature-Error [K]	Resistance [Ohm]			Temperature-Error [K]
		Min.	Typ.	Max.		Min.	Typ.	Max.	
-40	0.84	340	359	379	± 6.48	332	359	386	± 8.85
-30	0.83	370	391	411	± 6.36	362	391	419	± 8.76
-20	0.82	403	424	446	± 6.26	394	424	455	± 8.7
-10	0.80	437	460	483	± 6.16	428	460	492	± 8.65
0	0.79	474	498	522	± 6.07	464	498	532	± 8.61
10	0.77	514	538	563	± 5.98	503	538	574	± 8.58
20	0.75	555	581	607	± 5.89	544	581	618	± 8.55
25	0.74	577	603	629	± 5.84	565	603	641	± 8.54
30	0.73	599	626	652	± 5.79	587	626	665	± 8.53
40	0.71	645	672	700	± 5.69	632	672	713	± 8.5
50	0.70	694	722	750	± 5.59	679	722	764	± 8.46
60	0.68	744	773	801	± 5.47	729	773	817	± 8.42
70	0.66	797	826	855	± 5.34	781	826	872	± 8.37
80	0.64	852	882	912	± 5.21	835	882	929	± 8.31
90	0.63	910	940	970	± 5.06	891	940	989	± 8.25
100	0.61	970	1000	1030	± 4.9	950	1000	1050	± 8.17
110	0.60	1029	1062	1096	± 5.31	1007	1062	1117	± 8.66
120	0.58	1089	1127	1164	± 5.73	1067	1127	1187	± 9.17
130	0.57	1152	1194	1235	± 6.17	1128	1194	1259	± 9.69
140	0.55	1216	1262	1309	± 6.63	1191	1262	1334	± 10.24
150	0.54	1282	1334	1385	± 7.1	1256	1334	1412	± 10.8
160	0.53	1350	1407	1463	± 7.59	1322	1407	1492	± 11.37
170	0.52	1420	1482	1544	± 8.1	1391	1482	1574	± 11.96
180	0.51	1492	1560	1628	± 8.62	1461	1560	1659	± 12.58
190	0.49	1566	1640	1714	± 9.15	1533	1640	1747	± 13.2
200	0.48	1641	1722	1803	± 9.71	1607	1722	1837	± 13.85
210	0.47	1719	1807	1894	± 10.28	1683	1807	1931	± 14.51
220	0.46	1798	1893	1988	± 10.87	1760	1893	2026	± 15.19
230	0.45	1879	1982	2085	± 11.47	1839	1982	2125	± 15.88
240	0.44	1962	2073	2184	± 12.09	1920	2073	2226	± 16.59
250	0.43	2046	2166	2286	± 12.73	2003	2166	2329	± 17.32
260	0.42	2132	2261	2390	± 13.44	2087	2261	2436	± 18.15
270	0.41	2219	2357	2496	± 14.44	2172	2357	2543	± 19.36
280	0.38	2304	2452	2600	± 15.94	2255	2452	2650	± 21.21
290	0.34	2384	2542	2700	± 18.26	2333	2542	2751	± 24.14
300	0.29	2456	2624	2791	± 22.12	2404	2624	2844	± 29.05

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$$I_{cont} = 2 \text{ mA}$$

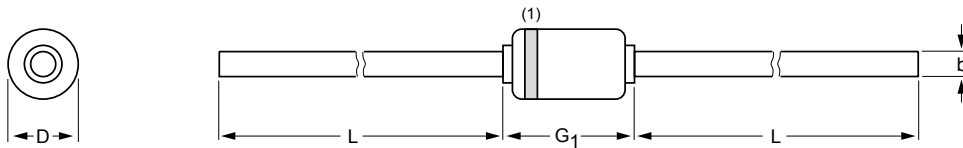
Ambient Temperature [°C]	Temp. Coeff. [%K]	KTY84-151			Temperature- Error [K]
		Resistance [Ohm]			
		Min.	Typ.	Max.	
-40	0.84	332	350	368	± 5.79
-30	0.83	362	381	399	± 5.48
-20	0.82	394	414	433	± 5.72
-10	0.80	428	449	469	± 5.62
0	0.79	464	486	507	± 5.51
10	0.77	503	525	547	± 5.41
20	0.75	544	566	589	± 5.31
25	0.74	565	588	611	± 5.25
30	0.73	587	610	633	± 5.2
40	0.71	632	656	679	± 5.08
50	0.70	379	704	728	± 4.96
60	0.68	729	754	778	± 4.83
70	0.66	781	806	831	± 4.68
80	0.64	835	860	885	± 4.53
90	0.63	891	916	942	± 4.37
100	0.61	950	975	1000	± 4.19
110	0.60	1007	1036	1064	± 4.58
120	0.58	1067	1099	1131	± 4.99
130	0.57	1128	1164	1199	± 5.41
140	0.55	1191	1231	1271	± 5.84
150	0.54	1256	1300	1345	± 6.3
160	0.53	1322	1372	1421	± 6.77
170	0.52	1391	1445	1500	± 7.25
180	0.51	1461	1521	1581	± 7.75
190	0.49	1533	1599	1664	± 8.27
200	0.48	1607	1679	1751	± 8.81
210	0.47	1683	1761	1839	± 9.36
220	0.46	1760	1846	1931	± 9.93
230	0.45	1839	1932	2024	± 10.51
240	0.44	1920	2021	2121	± 11.11
250	0.43	2003	2112	2220	± 11.73
260	0.42	2087	2205	2321	± 12.42
270	0.41	2172	2298	2424	± 13.37
280	0.38	2257	2391	2525	± 14.79
290	0.34	2335	2479	2622	± 16.98
300	0.29	2406	2558	2710	± 20.61

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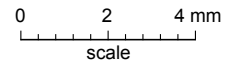
KTY 84-1...

**Mechanical data:**



**DIMENSIONS** (mm are the original dimensions)

UNIT	b max.	D max.	G <sub>1</sub> max.	L min.
mm	0.55	1.6	3.04	25.4



**Note**

1. The marking band indicates the cathode.

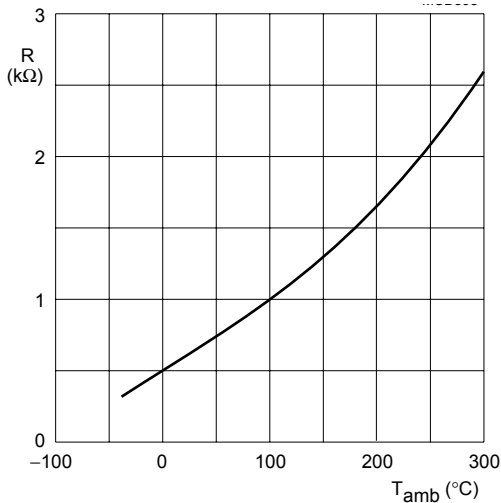
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOD68		DO-34				97-06-09

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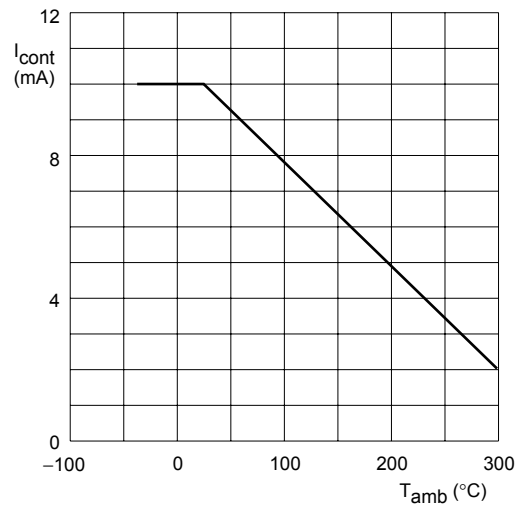
KTY 84-1...

### Characteristic curves of KTY 84-...

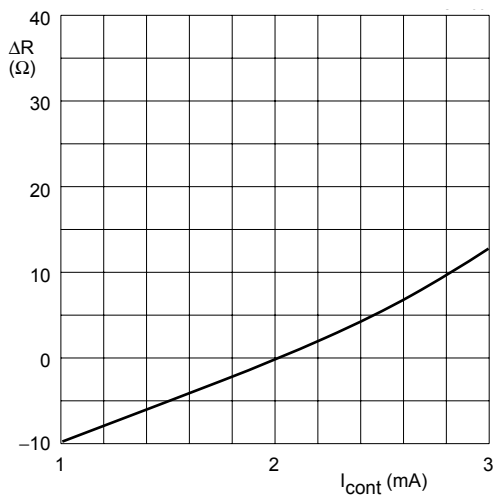


$I_{cont} = 2 \text{ mA}$

Sensor resistance as a function of ambient temperature; average values.

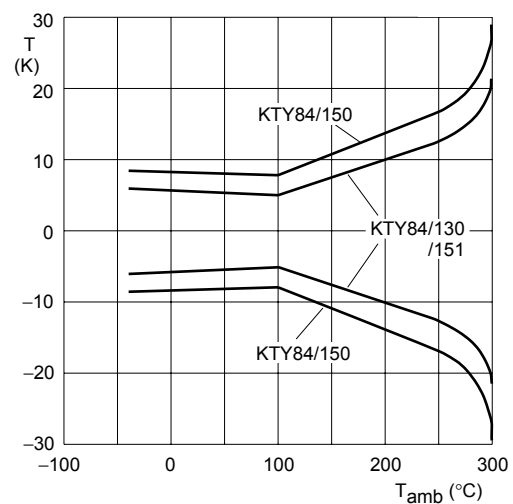


Maximum operating current for safe operation



$T_{amb} = 100^\circ\text{C}$

Deviation of sensor resistance as a function of operating current in still liquid.



Maximum expected temperature error ( $\Delta T$ ).

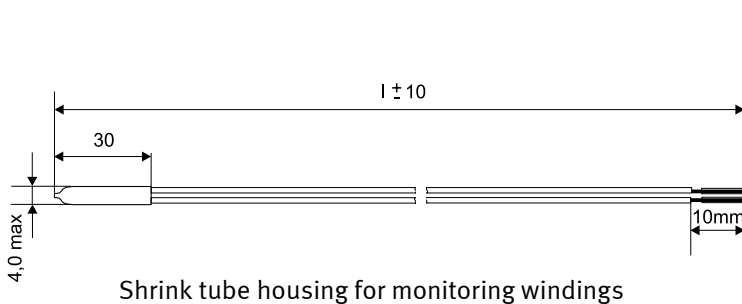
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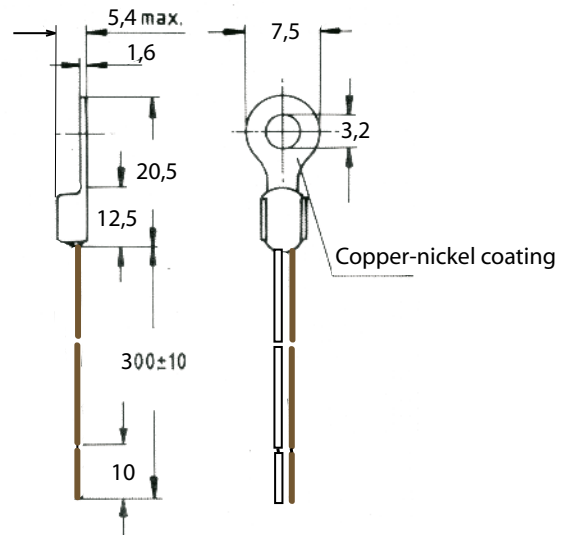
KTY 84-1...

### KTY-sensors:

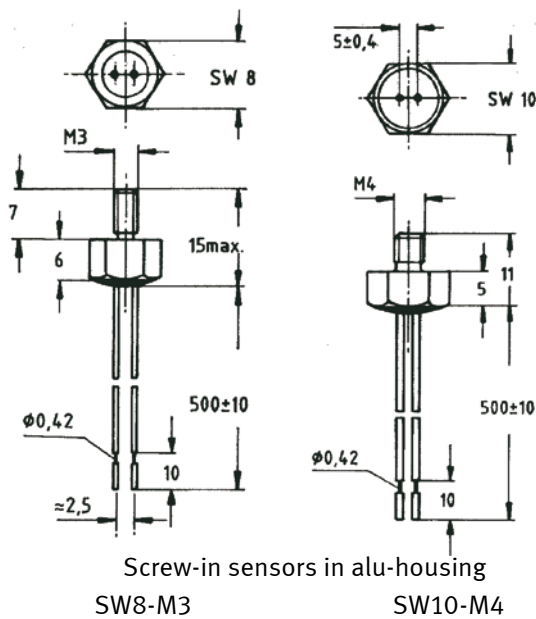
examples of KTY-thermistor-housings



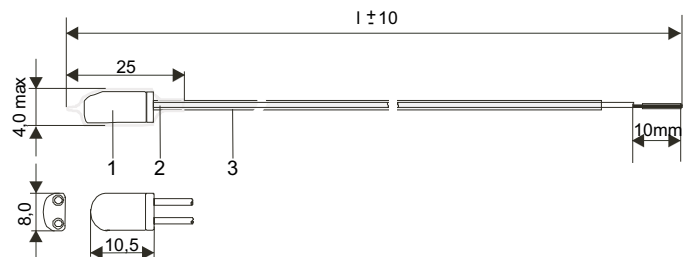
Shrink tube housing for monitoring windings



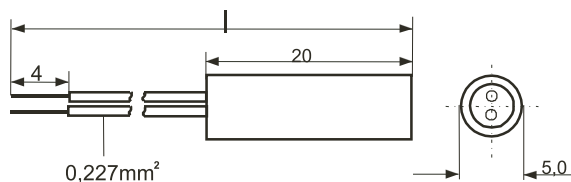
Example: KTY-sensor in cable shoe M3 - surface sensor



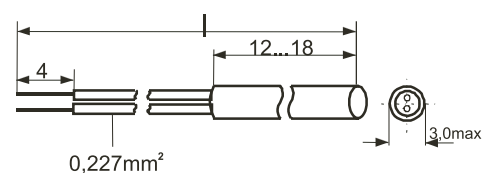
Screw-in sensors in alu-housing  
SW8-M3                      SW10-M4



- 1 = KTY-sensor, insulated twice, in stainless steel or PPS-housing
- 2 = Terminal: stranded silver copper wire insulated with Teflon (PTFE), AWG 24 or AWG 26 according to the manufacturers choice; optional: AWG 20
- 3 = additional shrink tube (optional)



KTY-thermistor in stainless steel



KTY-Thermistor in ceramics-  
or brass-housing

For further advice and information contact: