

DAEKWANG SENSOR CO., LTD.
THERMISTOR & SENSOR ASSEMBLY

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DAE KWANG
SENSOR TECHNOLOGY

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DAEKWANG SENSOR

THERMISTOR & SENSOR ASSEMBLY



THERMISTOR SENSOR Markets AND Applications



MEDICAL ELECTRONICS

- Blood analysis equipment
- Blood dialysis equipment
- Blood oxygenator equipment
- Clinical fever thermometers
- Esophageal tubes
- Infant incubators
- Internal body temperature monitors
- Internal temperature sensors
- Intravenous injection temperature regulators
- Skin temperature monitors
- Thermodilution catheter probes

CONSUMER ELECTRONICS

- Air conditioners
- Clothes dryers
- Dishwashers
- Electric water heaters
- Fire detectors
- Home weather stations
- Oven temperature control
- Rechargeable battery packs
- Refrigerator and freezer temperature control
- Small appliance controls
- Solar collector controls
- Toasters
- Washing machines
- Hot water boilers
- Fan heater
- Bidet

FOOD HANDING And PROCESSING

- Coffee makers
- Deep fryers
- Fast food processing
- Perishable shipping
- Temperature controlled food storage systems
- Thermometers for use in food preparation

COMMUNICATION

- Rectifier
- SMPS
- BMS



AUTOMOTIVE

- Automatic climate control
- Coolant sensors
- Electric coolant fan temperature sensors
- Emission controls
- Engine block temperature sensors
- Engine oil temperature sensors
- Intake air temperature sensors
- Oil level sensors
- Outside air temperature sensor
- Transmission oil temperature sensors
- Water level sensors
- Inverter
- Converter
- BMS

We serve customers with the best quality with confidence and passion

DAE KWANG Sensor has extensive experience in designing Thermistor Sensor Assemblies to suit the specific needs of users for a wide range of applications.

Has supplied quality products such as temperature sensors to a variety of industries such as automotives, home appliances, medical devices and telecommunications, since foundation in 1992.

We will continue to strive to realize customer satisfaction and quality management goals, and promote technical development to remain competitive and supply the best products to contribute to the corporate competitiveness and development of customer companies.



MOLDING TYPE

FEATURES

- Operating Temperature : -40 ~ 105 °C
- Withstand Volatage : 1800 VAC for 1 sec
- Insulation resistance : Min 100 MΩ at 500 VDC (Normal temperature)

RING TERMINAL TYPE

FEATURES

- Operating Temperature : -40 ~ 105 °C
- Withstand Volatage : 1800 VAC for 1 sec
- Insulation resistance : Min 100 MΩ at 500 VDC (Normal temperature)

CASE TYPE

FEATURES

- Operating Temperature : -40 ~105 °C
- Withstand Volatage : 1800 VAC for 1 sec
- Insulation resistance : Min 100 MΩ at 500 VDC (Normal temperature)



NIPPLE TYPE

FEATURES

- Operating Temperature : -40 ~ 105 °C
- Withstand Volatage : 1800 VAC for 1 sec
- Insulation resistance : Min 100 MΩ at 500 VDC (Normal temperature)

CASE & BRACKET TYPE

FEATURES

- Operating Temperature : -40 ~ 230 °C
- Withstand Volatage : 1800 VAC for 1 sec
- Insulation resistance : Min 100 MΩ at 500 VDC (Normal temperature)



ETC.

FEATURES

- Operating Temperature : -40 ~ 200 °C
- Withstand Volatage : 1800 VAC for 1 sec
- Insulation resistance : Min 100 MΩ at 500 VDC (Normal temperature)

REED S/W ASSEMBLY

FEATURES

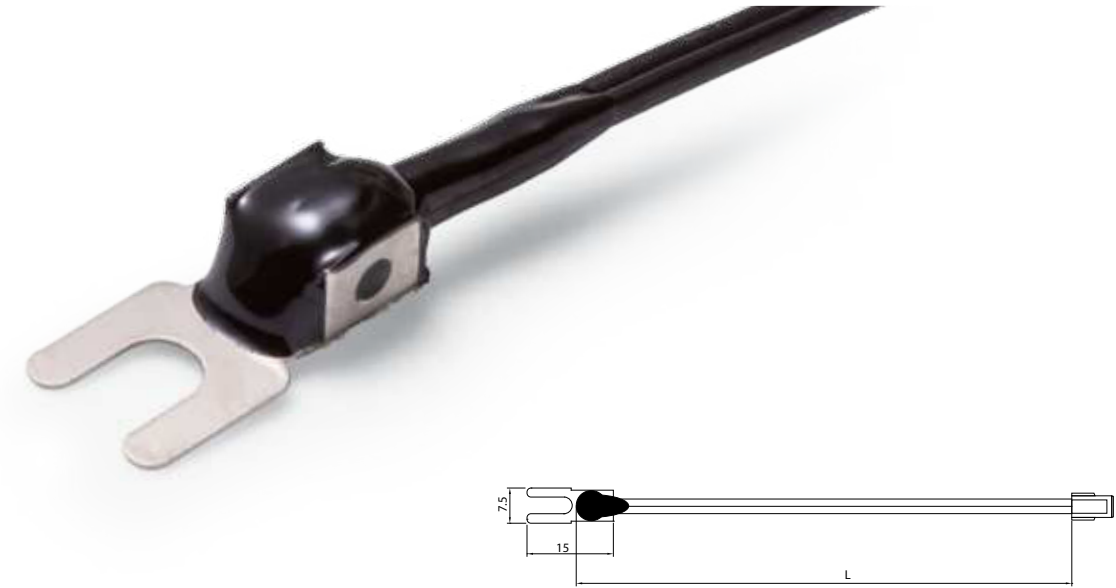
- Operating Temperature : -20 ~ 80 °C
- AT : 10 ~ 45



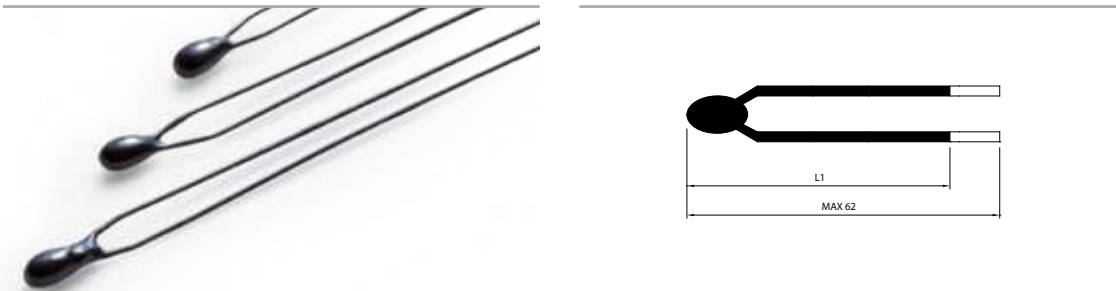
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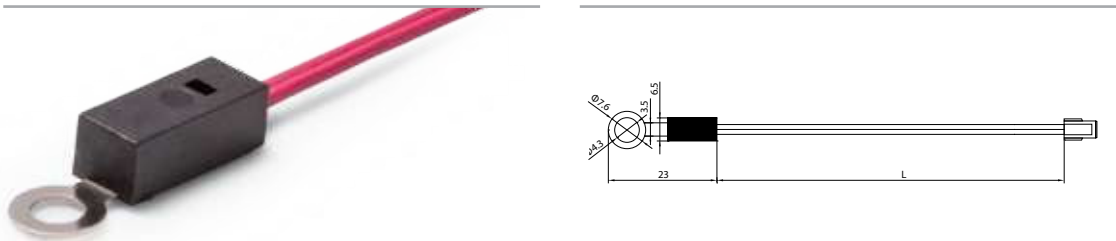
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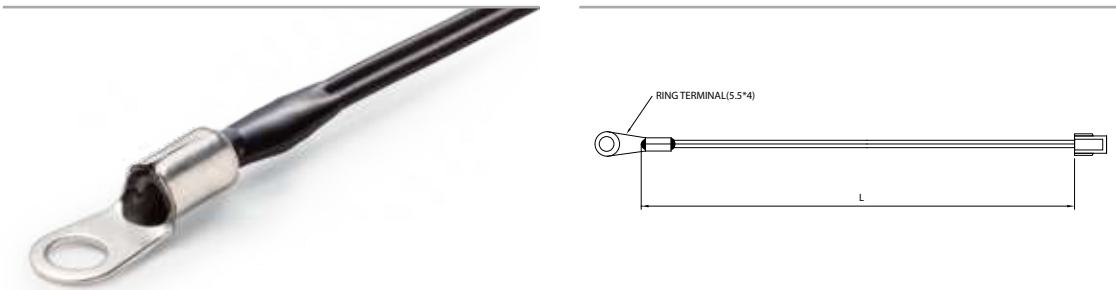
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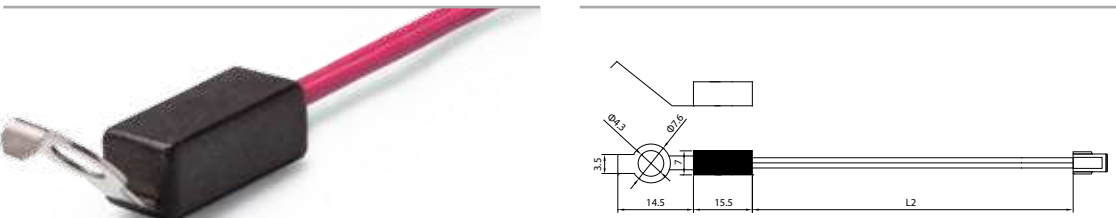
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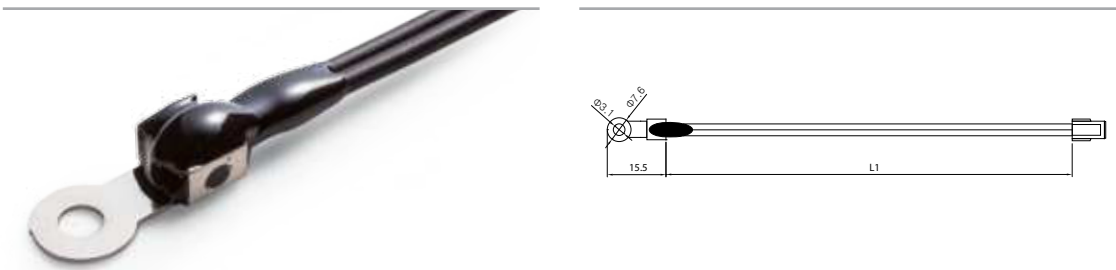
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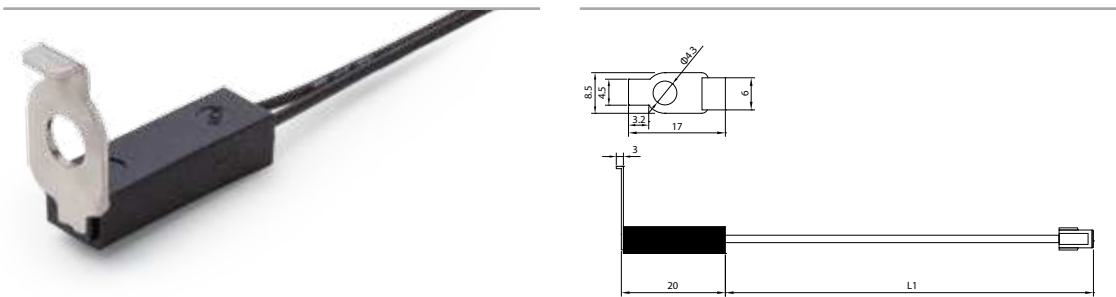
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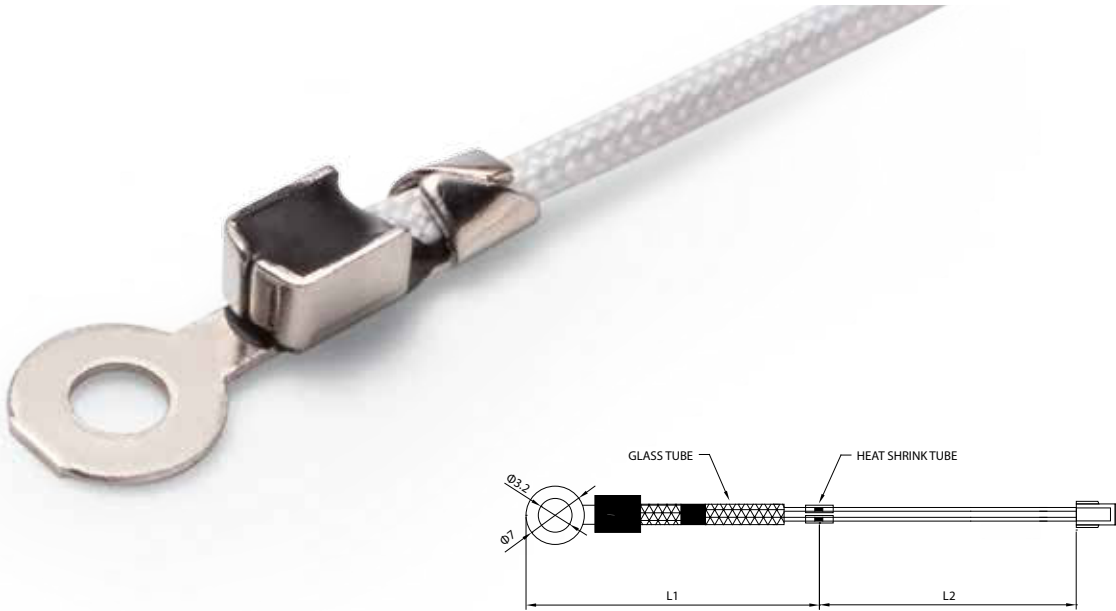
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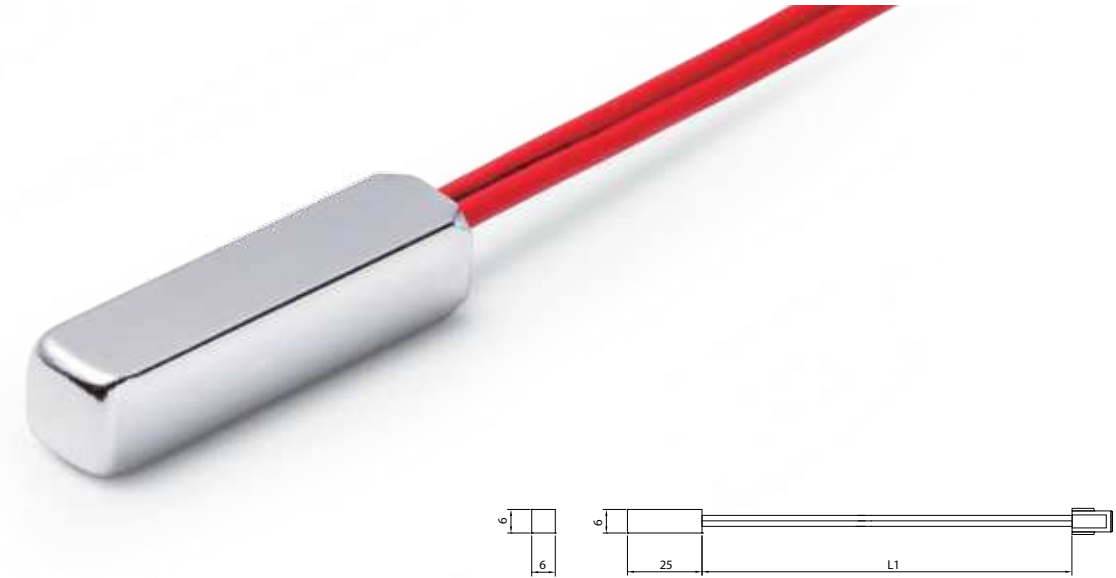
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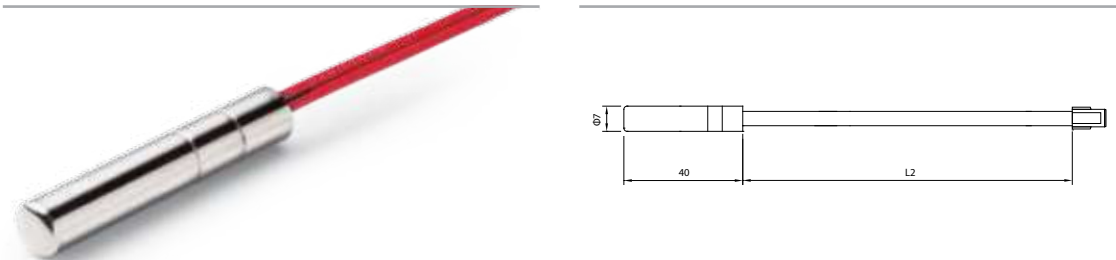
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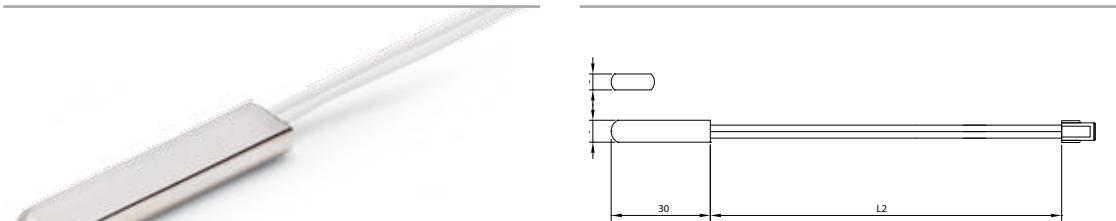
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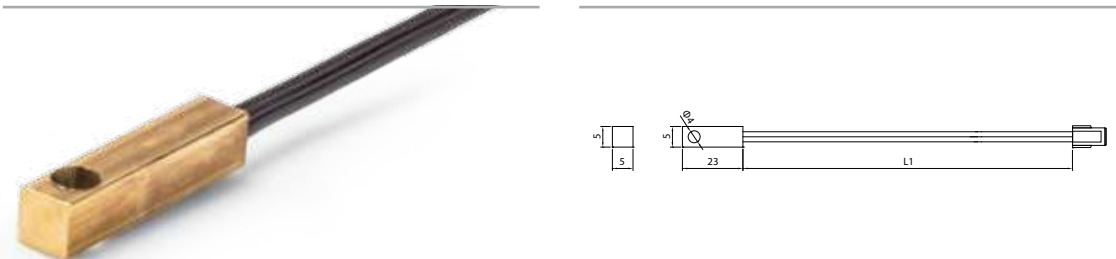
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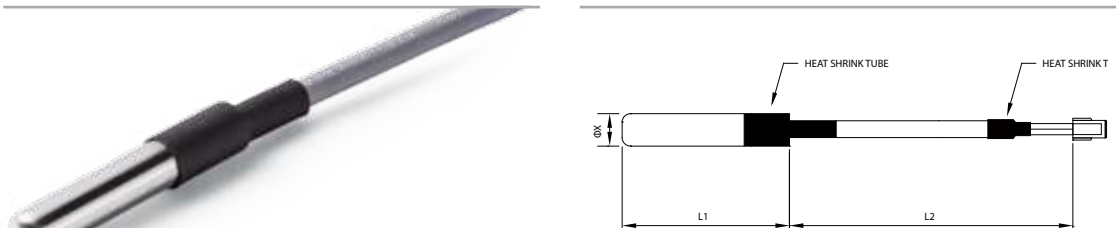
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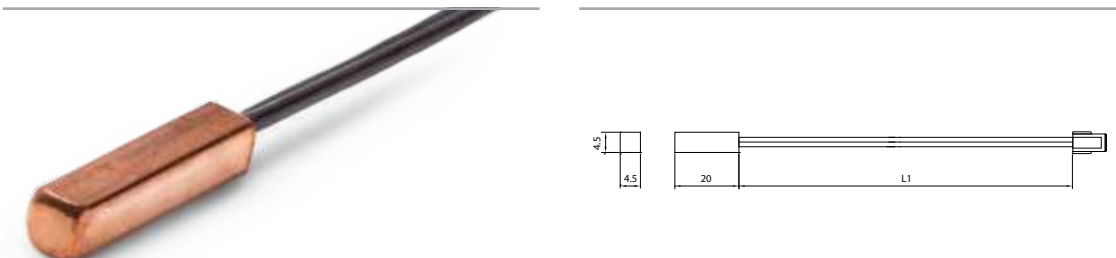
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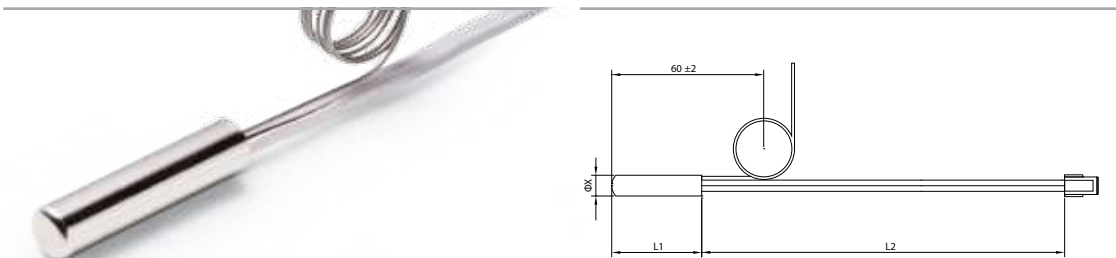
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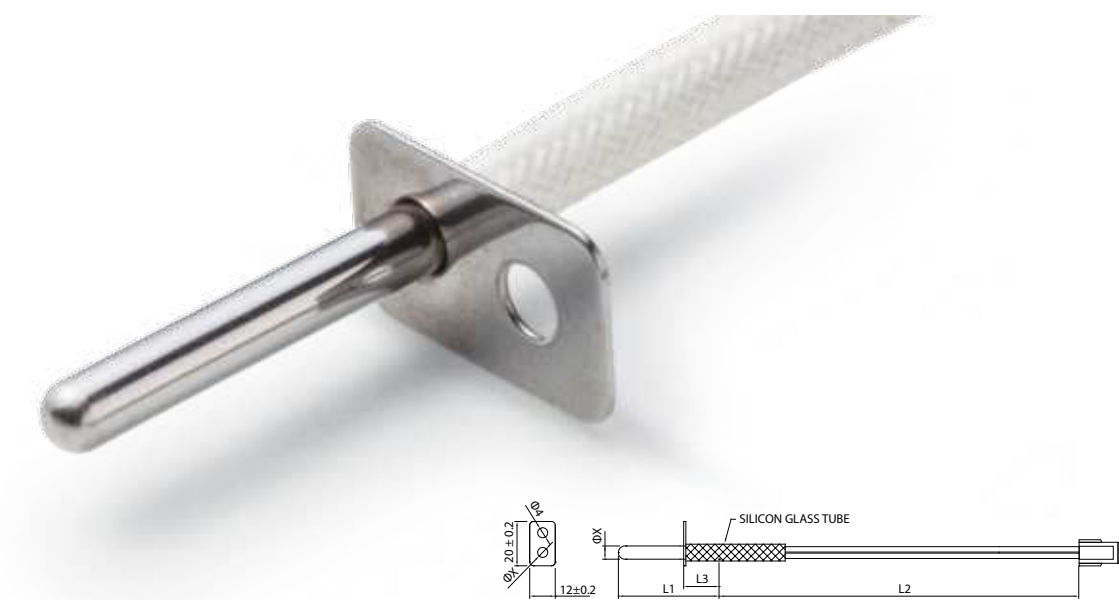
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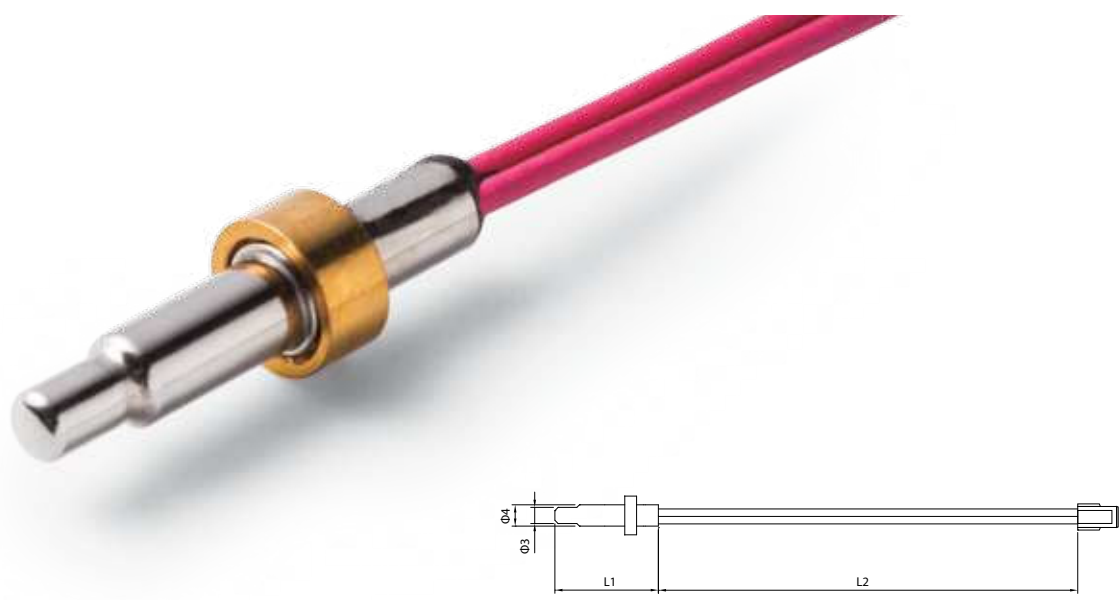
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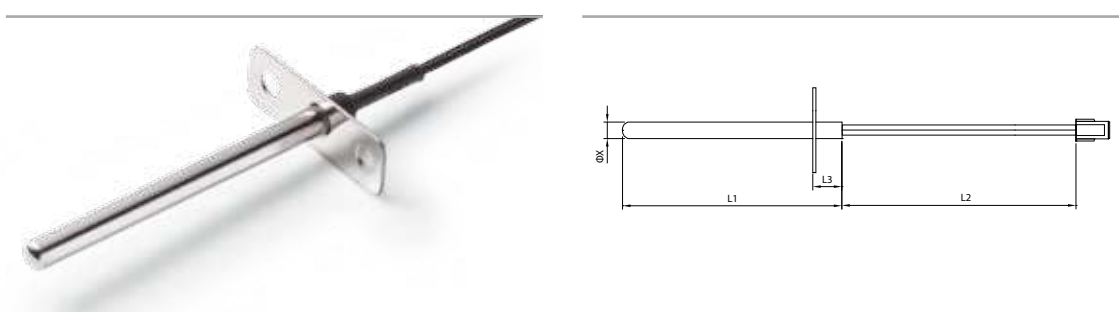
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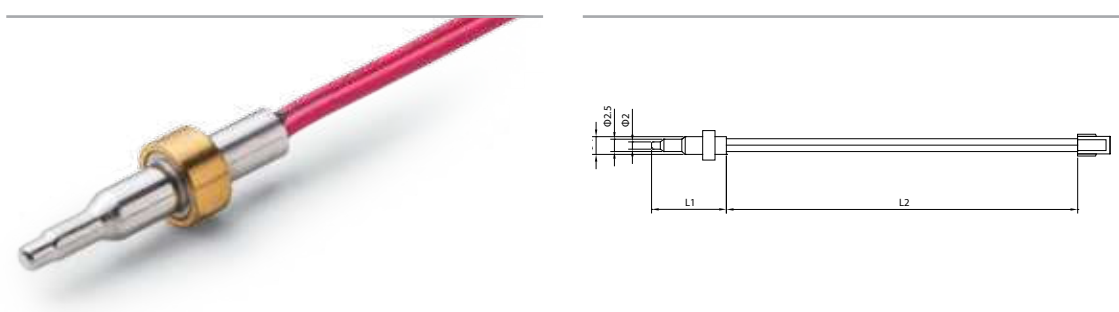
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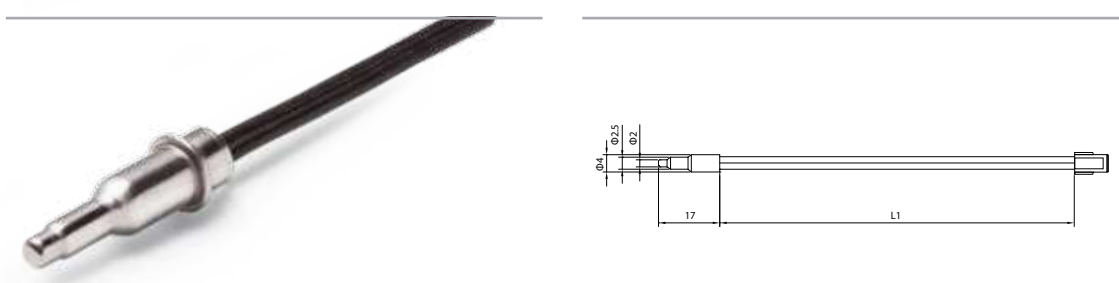
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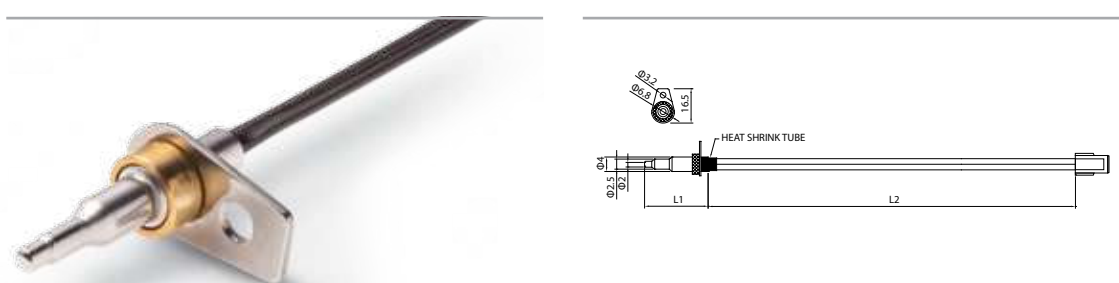
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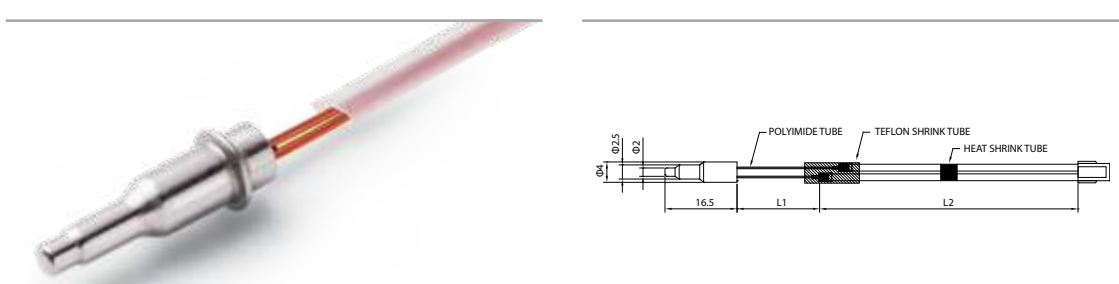
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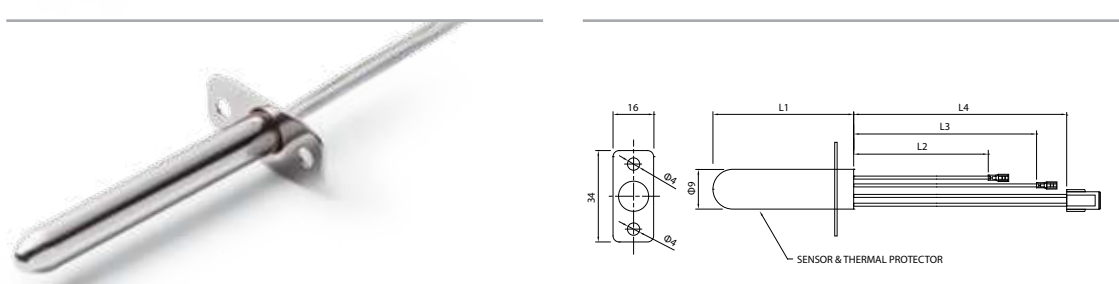
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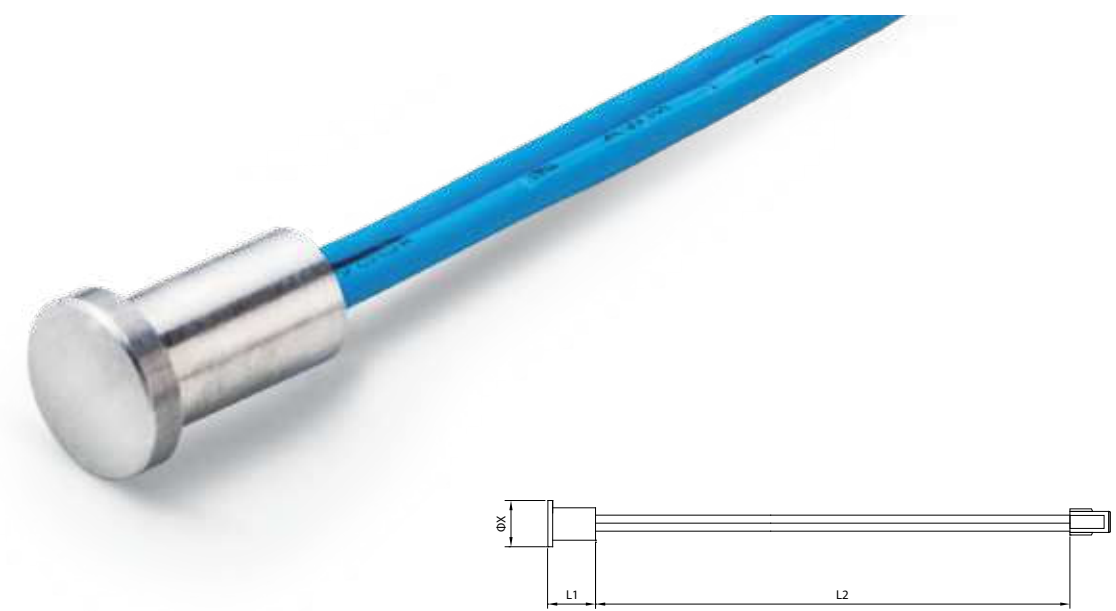
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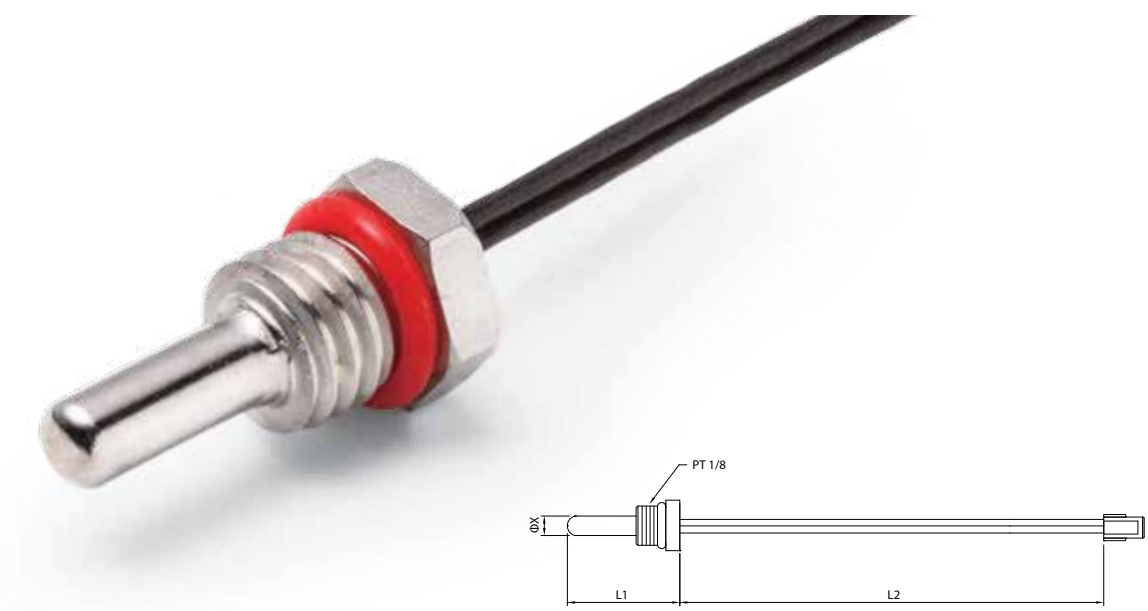
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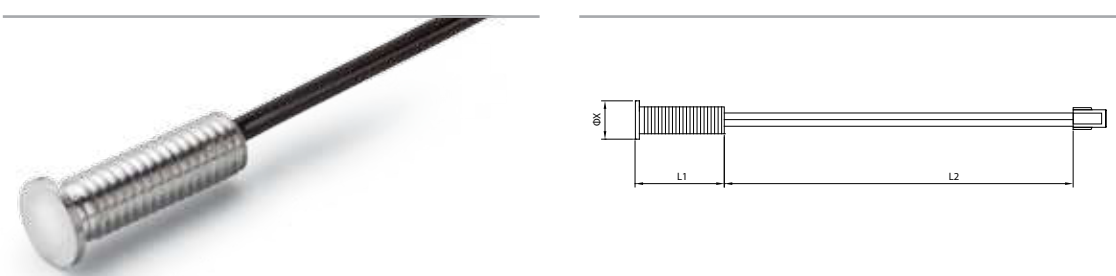
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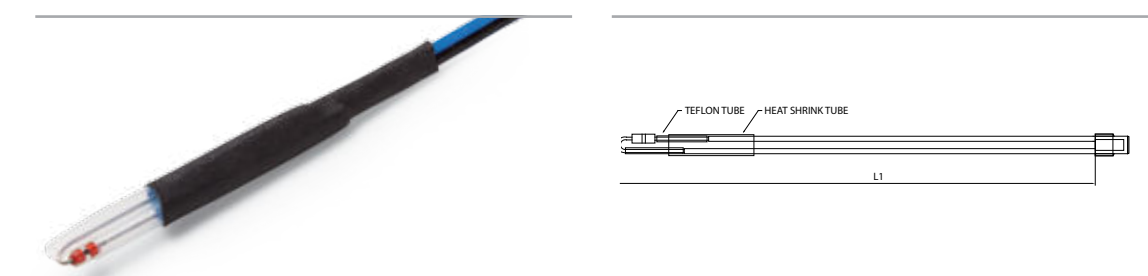
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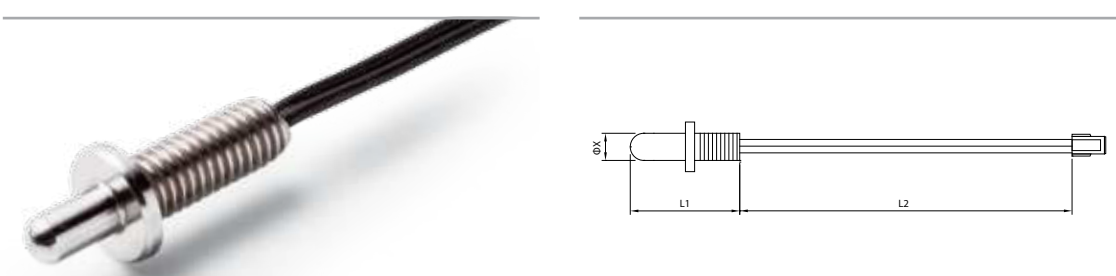
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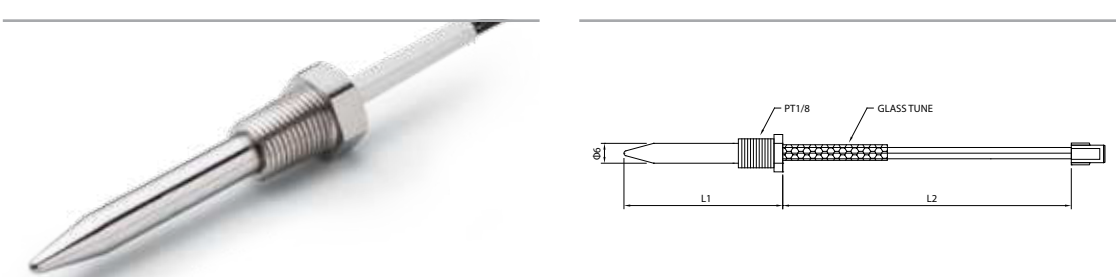
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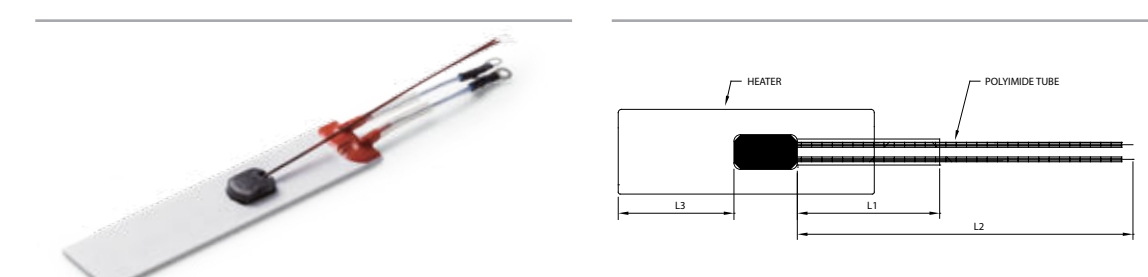
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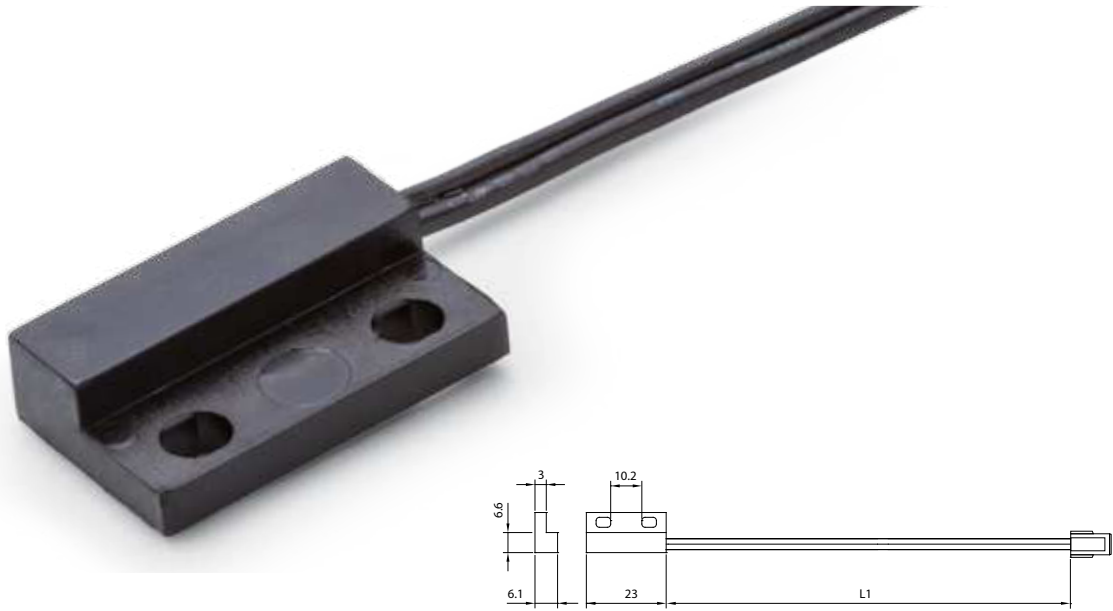
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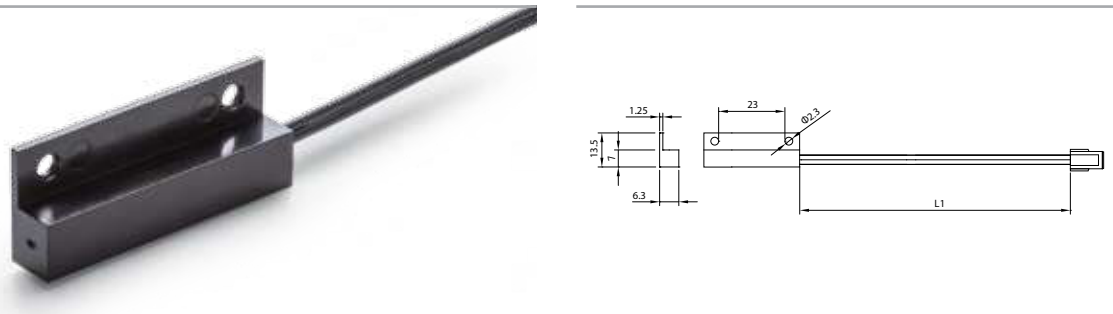
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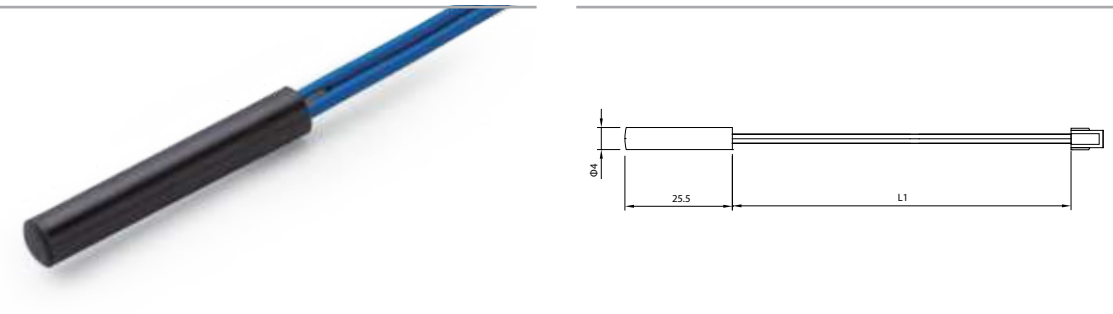
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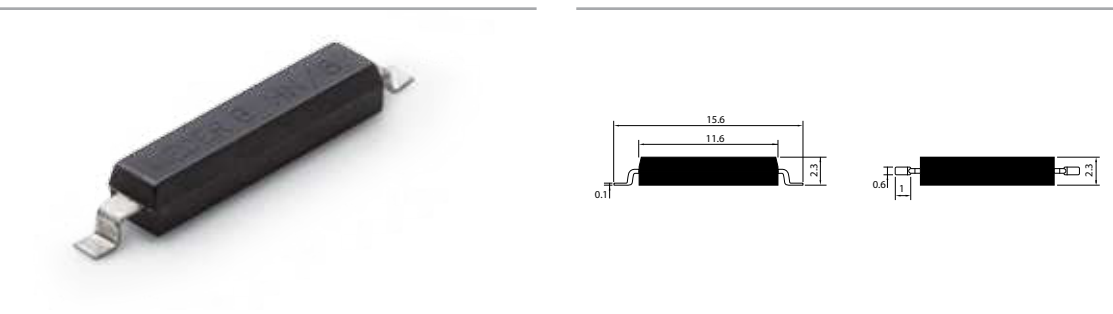
RS0002



RS0003



RS0004



THERMISTOR GLOSSARY

Dissipation Constant (δ)

The Dissipation constant is the ratio, normally expressed in milliwatts per degree C(mW / °C), at a specified ambient temperature, of a change in power dissipation in a thermistor to the resultant body temperature change.

Material Constant (β)

The material constant of a thermistor is a measure of its resistance at one temperature compared to its resistance at a different temperature. Its value may be calculated by the formula shown below and is expressed in degree kelvin (°K)

$$\beta = \frac{\log_{10} \left(\frac{R_0 T_1}{R_0 T_2} \right)}{\left(\frac{1}{T_1} - \frac{1}{T_2} \right) \log_e}$$

- R0T1 is the zero-power resistance at absolute temperature T1.
- R0T2 is the zero-power resistance at absolute temperature T2.
- e is the naperianbase 2.71828.
- T1 is temperature 1, experssed in degree kelvin.
- T2 is temperature 2, experssed in degree kelvin.

Maximum Operating Temperature

The maximum operating temperature is the maximum body temperature at which the thermistor will operate for an extended period of time with acceptable stability of its characteristics. This temperature can be the result of internal or external heating, or both, and should not exceed the maximum value specified.

Maximum Steady-state Current (Imax)

The maximum steady-state current is the rating of the maximum current, normally expressed in ampere(A), allowable to be conducted by an inrush limiting thermistor for extended period of time.

Negative Temperature Coefficient (NTC)

A NTC thermistor is one whose zero-power resistance decreases with an increase in temperature.

Resistance Ratio (RT1/RT2)

The resistance ratio of measured resistance at any two reference temperature points. There is no industry standard ratio, although three particular temperature ranges are most common.

$\frac{R\ 0^{\circ}C}{R\ 50^{\circ}C}$	$\frac{R\ 25^{\circ}C}{R\ 85^{\circ}C}$	$\frac{R\ 25^{\circ}C}{R\ 125^{\circ}C}$
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The Dae Kwang standard resistance ratio is R@25°C / R@85°C.

Resistance - Temperature Characteristic

The resistance-temperature characteristic is the relationship between the zero-power resistance of a thermistor and its body temperature.

Stability

The stability of a thermistor is the ability of it to retain specified characteristics after being subjected to designated environmental or electrical test conditions.

Standard Reference Temperature

The standard reference temperature is the thermistor body temperature at which nominal zero-power resistance is specified and is usually 25°C

Thermal Time Constant (T)

The thermal time constant is the time required for a thermistor to change 63.2percent of the total difference between its initial and final body temperature when subjected to a step function change in temperature under zero-power conditions and is normally expressed in seconds.

Thermistor

A thermistor is a thermally sensitive resistor whose primary function is to exhibit a change in electrical resistance with a change in body temperature.

Zero-Power Resistance @ 25°C (Ro)

The zero -power resistance is the DC resistance value of a thermistor measured at a specified temperature with power dissipated by the thermistor low enough that any further decrease in power will result in not more than 0.1% change in resistance.

Zero-Power Temperature Coefficient of Resistance (αT)

Zero-power coefficient of resistance is the radio at the specified temperature (T) of the rate of change of zeropower resistance with temperature to the zero-power resistance of the thermistor. The temperature coefficient is commonly expressed in percent per degree C (% / °C).

$$\alpha_T = \frac{1}{RT} - \frac{(D\ RT)}{(D\ T)}$$

RADIAL TYPE THERMISTOR

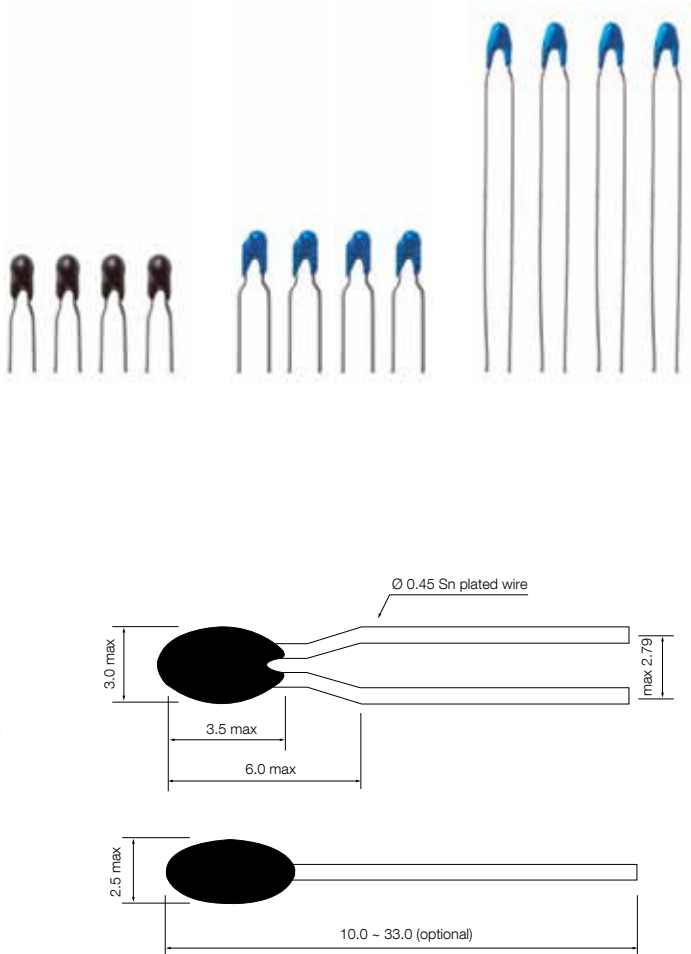
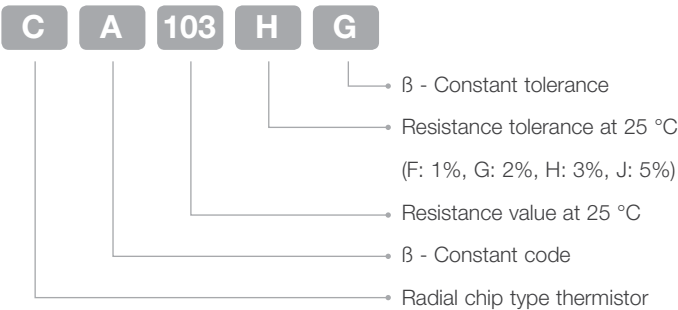
The precision interchangeable themistors are small high quality, low cost, epoxy encapsulated, precision curve matched devices which are available in a variety of electrical parameters. These thermistors provide highly accurate and stable temperature sensing capability for applications such as temperature measurement or compensation.

- Dissipation constant : 3 mW / °C
- Thermal time constant : Max. 12 sec
- Maximum power rating : 30 mW (at 25 °C)
- Operating temperature : -30 °C ~ +120 °C

Options

- Special encapsulants or probe housings
- Tape and reel packing
- Non-standard resistance value and tolerances

Part Number Designation



Specifications

Part No.	Resistance at 25°C(Ω)	β-Constant 25°C / 85°C(°K)
CL202JG	2,000	3520
CA502JG	5,000	3970
CB502JG	5,000	3330
CK103JG	10,000	3435
CA103JG	10,000	3970
CF103JG	10,000	4145
CE10,74JG	10,740	3520
CA153JG	15,000	3970
CH203JG	20,000	4200
CH303JG	30,000	4200
CG503JG	50,000	4040
CI104JG	100,000	4390

* Other resistance tolerance and specifications are available.

DIODE TYPE THERMISTOR

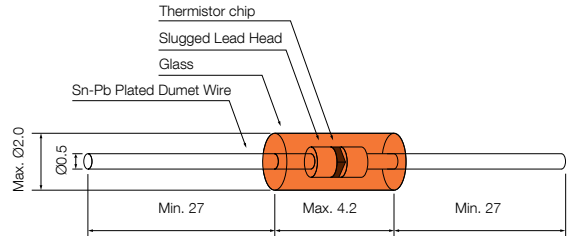
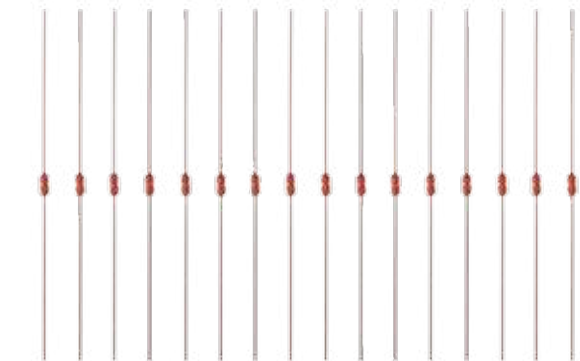
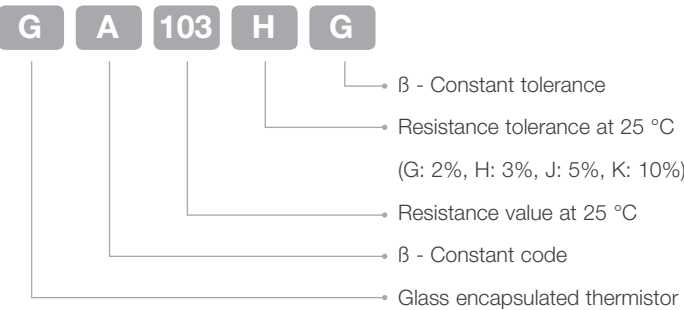
The glass encapsulated thermistors are small, hermetically sealed, glass encapsulated(DO-35 package) devices. Their high sensitivity makes them especially useful in applications such as temperature measurement, temperature control, liquid level indication, flow measurement and temperature compensation. These low cost devices exhibit excellent long term stability and repeatability.

- Dissipation constant : 2.4mW / °C
- Thermal time constant : Max. 15 sec
- Maximum power rating : 25mW (at 25 °C)
- Operating temperature range : -30 °C ~ +250 °C

Options

- Special encapsulants or probe housings
- Tape and reel packing
- Non-standard resistance value and tolerances

Part Number Designation



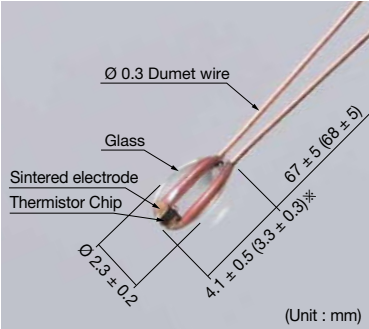
Specifications

Part No.	Resistance at 25°C(Ω)	β-Constant 25°C / 85°C(°K)
GE542J	5,369	3520
GU103J	10,000	3720
GA103J	10,000	3970
GT203J	20,000	4080
GT303J	30,000	4080
GT473J	47,000	4080
GT503J	50,000	4080
GS104J	100,000	4100

* Other resistance tolerance and specifications are available.

CHIP IN GLASS TYPE THERMISTOR

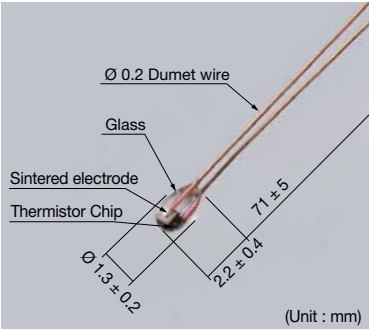
S1 Type Thermistor



Standard Specifications

Item	Gold electrode type	Silver palladium electrode type
Insulation resistance (Between lead and glass)	Min. 50 MΩ (500V d.c.)	Min. 50 MΩ (500V d.c.)
Thermal time constant (in still air)	12 sec. (10 sec. ~ 17 sec.)	12 sec. (10 sec. ~ 17 sec.)
Dissipation constant (in still air)	1.1 ~ 1.3 mW/°C	1.1 ~ 1.6 mW/°C
Operating temperature range	-50 °C ~ +300 °C	-50 °C ~ +120 °C

S3 Type Thermistor



Standard Specifications

Item	Gold electrode type	Silver palladium electrode type
Insulation resistance (Between lead and glass)	Min. 10 MΩ (50V d.c.)	Min. 10 MΩ (50V d.c.)
Thermal time constant (in still air)	5 sec. (3.5 sec. ~ 6.5 sec.)	5 sec. (3.5 sec. ~ 6.5 sec.)
Dissipation constant (in still air)	0.7 ~ 0.9 mW/°C	0.7 ~ 0.9 mW/°C
Operating temperature range	-50 °C ~ +300 °C	-50 °C ~ +120 °C

Nominal zero-power resistance	b-value	Nominal zero-power resistance	b-value
R 0 = 6 KΩ ± 1.0 %	B 0 / 100 = 3390 K ± 2.0 %	R 200 = 0.55 KΩ ± 1.0 %	B 100 / 200 = 4300 K ± 3.0 %
R 0 = 6 KΩ ± 2.5 %		R 200 = 0.55 KΩ ± 2.5 %	
R 0 = 6 KΩ ± 5.0 %		R 200 = 0.55 KΩ ± 5.0 %	
R 25 = 2.186 KΩ ± 1.0 %		R 100 = 6.282 KΩ ± 1.0 %	
R 25 = 2.186 KΩ ± 2.5 %		R 100 = 6.282 KΩ ± 2.5 %	
R 25 = 2.186 KΩ ± 5.0 %		R 100 = 6.282 KΩ ± 5.0 %	
R 0 = 30 KΩ ± 1.0 %	B 0 / 100 = 3450 K ± 2.0 %	R 200 = 1 KΩ ± 1.0 %	B 100 / 200 = 4537 K ± 3.0 %
R 0 = 30 KΩ ± 2.5 %		R 200 = 1 KΩ ± 2.5 %	
R 0 = 30 KΩ ± 5.0 %		R 200 = 1 KΩ ± 5.0 %	
R 25 = 10.74 KΩ ± 1.0 %		R 100 = 13.06 KΩ ± 1.0 %	
R 25 = 10.74 KΩ ± 2.5 %		R 100 = 13.06 KΩ ± 2.5 %	
R 25 = 10.74 KΩ ± 5.0 %		R 100 = 13.06 KΩ ± 5.0 %	
R 100 = 3.3 KΩ ± 1.0 %	B 0 / 100 = 3970 K ± 2.0 %	Nominal zero-power resistance	b-value
R 100 = 3.3 KΩ ± 2.5 %		R 200 = 4 KΩ ± 1.0 %	B 150 / 250 = 5014 K ± 3.0 %
R 100 = 3.3 KΩ ± 5.0 %		R 200 = 4 KΩ ± 2.5 %	
R 25 = 49.12 KΩ ± 1.0 %		R 200 = 4 KΩ ± 5.0 %	
R 25 = 49.12 KΩ ± 2.5 %		R 150 = 13.80 KΩ ± 1.0 %	
R 25 = 49.12 KΩ ± 5.0 %		R 150 = 13.80 KΩ ± 2.5 %	
		R 150 = 13.80 KΩ ± 5.0 %	

RESISTANCE vs TEMPERATURE TABLE

Temp (°C)	A	B	D	E	F	G	H	I	J	K	L
-40	34.8497	16.6173	33.1038	21.7299	37.8014	30.8654	40.3170	45.762	29.5720	19.3816	21.3567
-35	24.9517	13.0639	23.8741	16.3291	26.9481	22.5678	28.6268	32.173	21.7030	14.7709	16.1368
-30	18.0861	10.2682	17.4153	12.3909	19.4417	16.6477	20.5562	22.873	16.0740	11.3524	12.2910
-25	13.2628	8.0847	12.8422	9.4897	14.1850	12.3887	14.9207	16.437	12.0100	8.7957	9.4365
-20	9.8330	6.3866	9.5681	7.3316	10.4601	9.2993	10.9425	11.935	9.0514	6.8677	7.3018
-15	7.3662	5.0681	7.1988	5.7116	7.7911	7.0397	8.1046	8.7522	6.8784	5.4022	5.6936
-10	5.5726	4.0439	5.4670	4.4847	5.8584	5.3733	6.0598	6.4795	5.2693	4.2797	4.4730
-5	4.2551	3.2467	4.1889	3.5479	4.4449	4.1345	4.5721	4.4100	4.0682	3.4137	3.5398
0	3.2778	2.6239	3.2369	2.8269	3.4012	3.2061	3.4798	3.6486	3.1646	2.7408	2.8212
5	2.5462	2.1350	2.5216	2.2679	2.6238	2.5049	2.6705	2.7732	2.4797	2.2143	2.2639
10	1.9936	1.7492	1.9796	1.8313	2.0396	1.9712	2.0659	2.1249	1.9567	1.7999	1.8287
15	1.5728	1.4426	1.5656	1.4880	1.5972	1.5619	1.6104	1.6408	1.5544	1.4715	1.4865
20	1.2498	1.1975	1.2470	1.2164	1.2596	1.2459	1.2646	1.2764	1.2429	1.2098	1.2157
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
30	0.8054	0.8397	0.8072	0.8267	0.7990	0.8075	0.7961	0.7888	0.8094	0.8309	0.8271
35	0.6528	0.7087	0.6556	0.6870	0.6424	0.6557	0.6380	0.6263	0.6588	0.6938	0.6877
40	0.5323	0.6007	0.5357	0.5739	0.5195	0.5354	0.5144	0.5004	0.5392	0.5822	0.5747
45	0.4365	0.5112	0.4403	0.4817	0.4226	0.4394	0.4172	0.4023	0.4436	0.4907	0.4825
50	0.3600	0.4364	0.3639	0.4063	0.3457	0.3624	0.3404	0.3252	0.3668	0.4155	0.4070
55	0.2985	0.3737	0.3023	0.3442	0.2842	0.3002	0.2792	0.2644	0.3046	0.3534	0.3447
60	0.2488	0.3207	0.2525	0.2929	0.2349	0.2499	0.2303	0.2161	0.2541	0.3018	0.2932
65	0.2084	0.2759	0.2119	0.2503	0.1952	0.2089	0.1909	0.1776	0.2129	0.2587	0.2504
70	0.1754	0.2377	0.1787	0.2147	0.1629	0.1753	0.1590	0.1466	0.1790	0.2227	0.2147
75	0.1483	0.2052	0.1514	0.1849	0.1366	0.1478	0.1330	0.1216	0.1511	0.1924	0.1848
80	0.1260	0.1775	0.1289	0.1598	0.1151	0.1251	0.1118	0.1014	0.1279	0.1668	0.1596
85	0.1074	0.1539	0.1101	0.1386	0.0974	0.1063	0.0944	0.0848	0.1087	0.1452	0.1383
90	0.0920	0.1339	0.0945	0.1205	0.0828	0.0907	0.0801	0.0713	0.0926	0.1267	0.1204
95	0.0791	0.1169	0.0814	0.1052	0.0706	0.0777	0.0682	0.0602	0.0791	0.1110	0.1052
100	0.0683	0.1026	0.0704	0.0920	0.0605	0.0670	0.0583	0.0511	0.0677	0.0975	0.0922
105	0.0592	0.0906	0.0611	0.0807	0.0520	0.0579	0.0500	0.0435	0.0580	0.0859	0.0812
110	0.0514	0.0807	0.0532	0.0709	0.0449	0.0504	0.0430	0.0371	0.0499	0.0759	0.0718
115	0.0449	0.0726	0.0465	0.0624	0.0388	0.0441	0.0372	0.0319	0.0429	0.0672	0.0638
120	0.0392	0.0662	0.0407	0.0550	0.0337	0.0388	0.0322	0.0274	0.0370	0.0597	0.0570
B(25/85)	3970	3330	3925	3520	4145	3990	4200	4390	3950	3435	3520
B(25/50)	3930	3230	3890	3470	4100	3930	4155	4330	3865	3390	3465
B(0/50)	3885	3210	3835	3430	4055	3865	4100	4270	3805	3330	3418

* Please consult us for availability of special spec.