

**Bare wires  
for**



**Thermocouples**



## General

Thermocouple is the most suitable method to measure temperature, sometimes the only method. Therefore Kamet not only offers Aeropak Mineral Insulated Cable, but bare thermocouple alloy with numerous combinations as well.

Kamet offers a wide range of most commonly used thermocouple alloys, with diameters 0.5 up to 3.26 mm or more. Not only the types E, J, K, N and T, also type C and D and noble metals like type S, R and B.

### Special manufacturing

For special applications or requirements on request. The minimum production quantity depends of the wire diameter.

## Non precious metals Type K

Type K has a better resistance to oxidation than other types of thermocouple (except type N) and is particularly recommended for oxidizing or inert atmospheres. Do not use this type without protection in sulphurous atmospheres, in reducing atmospheres or a long time in a vacuum. This can embrittle the wire, change the metallurgical structure of the thermocouple, or spoil quality of the E.M.F. couple by attacking the chromium. In reducing atmospheres, KP develops green oxide, called "green rot" which decreases the Chromium content. This phenomenon damages the metallurgical structure, resulting in reduction in E.M.F. output. In addition, KP becomes magnetic due to lower Cr content.

Pre-oxidized surface can be delivered in order to increase resistance to corrosion.

NiCr (KP) wire for thermocouple type K according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	3.5950	584.0	1.71
1.00	0.3600	141.4	7.07
1,30	0.5400	87.7	11.4
1,60	0.3380	55.0	18.2
2,00	0.2130	34.7	28.8
2,50	0.1440	23.3	42.8
3,00	0.0998	16.2	61.6
3,26	0.0850	13.8	72.3

Ni (KN) wire for thermocouple type K according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	1.487	592.0	1.69
1.00	0.360	143.4	6.97
1,30	0.223	88.9	11.2
1,60	0.140	55.7	17.9
2,00	0.0884	35.2	28.4
2,50	0.0595	23.7	42.2
3,00	0.0413	16.4	60.8
3,26	0.0351	14.0	71.4

### Theoretical maximum working temperature

Is largely depending on environment of use.

Wire diameter	3.2	1.6	0.5
Max. temperature	1260°C	1090°C	870°C

## Non precious metals Type N

Type N, has been developed with content of silicium which provides:

- Much longer life due to improved oxidation resistance of the negative NN leg
- Longer exposure to high temperature without gradual drift E.M.F.
- Less E.M.F. drift than type K

NiCrSi (NP) wire for thermocouple type N according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	5.092	597.0	1.75
1,30	0.765	89.0	11.24
1,60	0.479	56.5	17.71
2,00	0.302	35.3	28.35
2,50	0.204	23.9	41.80
3,00	0.141	16.5	60.30
3,26	0.1205	14.1	70.81

NiSi (NN) wire for thermocouple type N according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	1.8560	586.0	1.70
1,30	0.7080	226.0	11.30
1,60	0.2790	88.5	17.82
2,00	0.1750	56.1	28.51
2,50	0.0743	23.7	42.10
3,00	0.0516	16.5	60.60
3,26	0.0439	14.0	71.22

### Theoretical maximum working temperature

Is largely depending on environment of use.

Wire diameter	3.2	1.6	0.5
Max. temperature	1260°C	1090°C	870°C

## Non precious metals Type J

To be used in oxidizing environments up to 760 °C.  
We recommend the use of larger wire diameters for higher temperatures.

Fe (JP) wire for thermocouple type J according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	0.636	648.0	1.54
1,30	0.0994	97.3	10.24
1,60	0.0623	60.9	16.4
2,00	0.0394	38.6	25.9
2,50	0.0265	25.9	38.6
3,00	0.0184	18.0	55.5
3,26	0.0157	15.3	65.2

CuNi (JN) wire for thermocouple type J according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	5.092	572	1.75
1,30	0.375	85.9	11.6
1,60	0.235	53.2	18.6
2,00	0.148	34.0	29.3
2,50	0.0998	22.9	43.7
3,00	0.0693	15.9	62.9
3,26	0.0590	13.5	73.9

### Theoretical maximum working temperature

Is largely depending on environment of use.

Wire diameter	3.2	1.6	0.5
Max. temperature	760°C	590°C	370°C

## Non precious metals Type T

Type T is used in laboratory and in industry for temperature range – 185°C to + 370°C when high temperature accuracy is required (like car temperature probes). In case of usage at < 0°C, cryogenic quality is required

Cu (TP) wire for thermocouple type T according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	0.087599	1.75	1.75
1,30	0.013160	11.66	11.66
1,60	0.008243	18.61	18.61
2,00	0.005211	29.44	29.44
2,50	0.003504	43.79	43.79
3,00	0.002433	63.05	63.05
3,26	0.002061	74.45	74.45

CuNi (tN) wire for thermocouple type T according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	5.092	572	1.75
1,30	0.375	85.9	11.6
1,60	0.235	53.2	18.6
2,00	0.148	34.0	29.3
2,50	0.0998	22.9	43.7
3,00	0.0693	15.9	62.9
3,26	0.0590	13.5	73.9

### Theoretical maximum working temperature

Is largely depending on environment of use.

Wire diameter	3.2	1.6	0.5
Max. temperature	360°C	360°C	200°C

## Non precious metals Type E

Type E has the highest E.M.F. output of all the referenced thermocouples. It allows usage in applications requiring high E.M.F. output and superior resistance to oxidation in the operating range from 150°C to 870°C. It is sometimes used in thermal-generators (thermopiles). Arranged in series, a thermopile allows measuring accurately very small temperature differences.

NiCr (EP) wire for thermocouple type E according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	3.595	584.0	1.71
1,30	0.540	87.7	11.4
1,60	0.338	54.9	18.2
2,00	0.213	34.7	28.8
2,50	0.144	23.3	42.8
3,00	0.0998	16.2	61.6
3,26	0.0850	13.8	72.3

CuNi (EN) wire for thermocouple type E according to DIN EN 60584-1

Diameter (mm)	Ohm/m	~m/kg	~g/m
0,50	5.092	572	1.75
1,30	0.375	85.9	11.6
1,60	0.235	53.2	22.6
2,00	0.148	34.0	29.3
2,50	0.0998	22.9	43.7
3,00	0.0693	15.9	62.9
3,26	0.0590	13.5	73.9

### Theoretical maximum working temperature

Is largely depending on environment of use.

Wire diameter	3.2	1.6	0.5
Max. temperature	870°C	650°C	430°C

## Non precious metals Type C & D

Type C & D thermocouples are suited for measurements in the 0 °C to 2320 °C range. These thermocouples are well-suited for vacuum furnaces at extremely high temperatures. It must never be used in the presence of oxygen at temperatures above 260 °C.

W5%Re - W26%Re wire for thermocouple type C according to ASTM E 230

W3%Re - W25%Re wire for thermocouple type D according to ASTM E 230

Diameter (mm)	<b>Stock sizes are .0005, .0008, 0.003, 0.005, 0.010, 0.015, 0.020, .032 and .040 inch diameter.</b>
Length	On customer request ( <b>No Minimum Order</b> )

## Precious (Noble) metals Type R, S & B

Pt wire for thermocouple type S and R according to DIN EN 60584-1

Diameter (mm)	Ohm/m (20°C)	gr/m	Max temperature	1) Recommended continuous temperature
0,3	1.56	1,50	1600	1300
0,35	1.15	2,05	1600	1400
0,5	0.55	4,20	1600	1600

Pt10%Rh wire for thermocouple type S according to DIN EN 60584-1

Diameter (mm)	Ohm/m (20°C)	gr/m	Max temperature	1) Recommended continuous temperature
0,3	3.00	1,40	1600	1300
0,35	2.10	1,95	1600	1400
0,5	1.02	3,90	1600	1450

Pt13% wire for thermocouple type R according to DIN EN 60584-1

Diameter (mm)	Ohm/m (20°C)	gr/m	Max temperature	1) Recommended continuous temperature
0,3	2.91	1,37	1600	1300
0,35	2.04	1,87	1600	1400
0,5	0.98	3,83	1600	1450

Pt30%Rh wire for thermocouple type B according to DIN EN 60584-2

Diameter (mm)	Ohm/m (20°C)	gr/m	Max temperature	1) Recommended continuous temperature
0,5	1.01	3,44	1800	600-1700

Pt6%Rh wire for thermocouple type B according to DIN EN 60584-2

Diameter (mm)	Ohm/m (20°C)	Gr/m	Max temperature	1) Recommended Continuous temperature
0,5	0.92	3.98	1800	600-1700

Availability

Type		Class 1	Class 2
Pt-Pt10%Rh	(type S)	X	X
Pt-Pt13%Rh	(type R)	X	X
Pt6%Rh-Pt30%Rh	(type B)		X

1) The temperature limits depends on the furnace atmosphere and other factors. The values stated are to be regarded as approximates values.



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