Tempco-Pak Mineral Insulated Cable

Made in USA

Tempco's Metal Sheathed, Mineral Insulated Thermocouple Cable

Tempco-Pak Thermocouples and cable are manufactured using premium quality materials along with rigid quality control standards to ensure a reliable product that is state of the art. The metal outer sheath protects the thermocouple wires and insulation from contamination and mechanical damage as well as hostile and oxidizing environments while allowing the cable to be moisture proof, formable, weldable, compact and have fast response. The mineral insulation isolates the conductors from the sheath and each other while providing excellent high temperature insulation resistance.

Tempco offers a wide variety of sheath materials to choose from as there is no single sheath material that is suitable for all conditions. The most commonly stocked sheath materials are 304 SS, 316 SS and alloy 600. These are offered in all ANSI recognized thermocouple calibrations.

As a standard, Tempco-Pak Thermocouple cable is made with high purity 94% minimum MgO insulation. Other types and purities are available; however, when selecting a mineral insulation, the environment, temperature rating and cost must be taken into consideration.

Quality Assurance

All Tempco-Pak Thermocouple cable is inspected for appearance, physical and electrical characteristics, as well as conformity to calibration.

Each coil or batch of Tempco-Pak is made from the same production lot of raw materials and processed together. This eliminates the need to calibrate each length cut from the same coil. Samples from each coil are calibrated as shown in the chart.

Tempco-Pak Thermocouple Calibration Temperatures

ANSI Calibration	Standard Calibration Points	Optional Points
T	200°F (93°C), 400°F (204°C)	—
J	200°F (93°C), 500°F (260°C), 1000°F (537°C), 1500°F (815°C)	—
E	300°F (149°C), 500°F (260°C), 1000°F (537°C), 1600°F (871°C)	—
K	300°F (149°C), 500°F (260°C), 1000°F (537°C), 1600°F (871°C), 2000°F (1093°C)✳	2200°F (1204°C)✳
R	1000°F (537°C), 1600°F (871°C), 2000°F (1093°C)✳	2600°F (1426°C)✳
S	1000°F (537°C), 1600°F (871°C), 2000°F (1093°C)✳	2600°F (1426°C)✳
B	1600°F (871°C), 2000°F (1093°C)✳, 2600°F (1426°C)✳	
N	300°F (149°C), 500°F (260°C), 1000°F (537°C), 1600°F (871°C), 2000°F (1093°C)✳	2200°F (1204°C)✳

✳ These calibration points will be checked if the sheath and insulation are rated to this temperature.

Tempco-Pak

Thermocouple Data, Care and Handling

Calibration

Tempco-Pak Thermocouple Cable is normally supplied to ANSI standard limits (tolerances) of error as set forth in ANSI circular MC96.1–1982 and duplicated in ASTM E230. Special limits (tolerances) per ANSI MC96.1 are available at extra cost (See Table 1 on page 14-103).

Annealing

Unless otherwise specified all Tempco-Pak will be furnished in a fully annealed condition.

Formability

Because Tempco-Pak is fully annealed it can normally be formed around a mandrel 4 times the sheath diameter without loss of insulation resistance or the sheath's integrity.

Weldability

Tempco-Pak can be brazed, soldered or welded upon its sheath. However, because of the delicate nature of the fabricating of hot junctions, it is recommended they be done at the factory. Brazing or soldering material should not come in contact with the mineral insulation as the flux or resin will contaminate the insulation.

Insulation Resistance

Tempco-Pak should have a minimum insulation resistance wire to wire and wire to sheath at room temperature of 100 megohms at 50 VDC for 0.093" O.D. and smaller and 100 megohms at 100 VDC for .100" O.D. and larger.

Shipping and Packaging

Tempco-Pak is stocked in random lengths with the maximum stock lengths listed in the tables showing the varieties of commonly available material. Tempco reserves the right to supply random lengths of our choice unless specific lengths are specified on your order. Tempco-Pak can be furnished in coil form or in straight lengths. Normally .375" diameter and .312" diameter are shipped in straight lengths. Longer lengths are available on special order.

Handling and Storage

To prevent moisture from being absorbed by the hydroscopic insulation, both ends of the lengths of Tempco-Pak are sealed at the factory with a suitable sealer. Under some conditions, moisture absorption could take place that would lower the insulation resistance and may prove to be troublesome in subsequent assembly and welding, so it is advisable to store Tempco-Pak in a dry place. Slight moisture penetration can be remedied by removing approximately 3 inches from each end. Apply heat (approx. 300°F) 6 to 7 inches from the open end and slowly work heat toward and over the open end. Allow end to cool to approximately 180°F and reseal end. When pieces are cut from stock lengths, the exposed ends should be squared and resealed immediately to prevent contamination or moisture absorption. For deeper moisture penetration, bake entire length of material with both ends open for 24 hours at 250°F to 300°F to remove moisture and bring up insulation resistance. If baking does not bring the insulation resistance to acceptable levels, discard the material. As an option Tempco can provide Tempco-Pak with the ends seal welded.

Selecting the Mineral Insulated Thermocouple Cable Suited to Your Requirement

Tempco offers a wide variety of sheathed, mineral insulated thermocouple cable. We stock many varieties of sheath diameters and materials in ANSI recognized thermocouple types and can manufacture a multitude of non-stock combinations of sheath materials, O.D.s, insulations, wire types and wire configurations on special request. Consult Tempco with your specific requirements.

When selecting a cable for an application there are four things that must be considered:

Sheath Material

The outer sheath protects the insulation and wires from physical damage, contamination and the environment, all of which affect the service life and cost. As there isn't any one particular sheath material that is appropriate for all conditions, Tempco offers you a choice.

Wire Types *(Calibration)*

Selecting the proper conductors can be crucial to the function the MI cable is to perform. Where thermocouple cable is concerned, selecting the appropriate calibration for the temperature to be measured, the instrumentation available, and the environment will be a significant factor in the accuracy, life and cost.

Insulation Material

The insulation material isolates the wires from each other and the sheath. Because the wires are used as conductors, the insulating material becomes important in preventing electrical shorts and dielectric breakdown, particularly at elevated temperatures.

Physical Parameters

The four main physical characteristics of the MI cable that should be taken into account are:

a. Sheath Diameter
b. Sheath Wall Thickness
c. Conductor Size
d. Conductor Location (4 and 6 wires)

These will directly affect service life, flexibility, time response, weldability, strength and cost.

The following pages will serve as a guide for sheath materials, insulation materials and the various ANSI thermocouple calibrations.

The following information is designed to be used as a guide and may not be correct in every application. If in doubt, consult with your Tempco sales engineer or the factory. Temperatures shown are maximum recommended operating temperatures.

Sheath Material

NOTE: Letters in parentheses following the sheath material are used with the Ordering Worksheet on page 14-119.

Alloy 600 (A)

Maximum temperature: 1177°C (2150°F). Most widely used thermocouple sheath material. Good high temperature strength, corrosion resistance, resistance to chloride-ion stress corrosion cracking and oxidation resistance to high temperatures. Do not use in sulfur-bearing environments. Good in nitriding environments.

304 SS (B)

Maximum temperature: 900°C (1650°F). Most widely used low temperature sheath material. Extensively used in food, beverage, chemical and other industries where corrosion resistance is required. Subject to damaging carbide precipitation in 482° to 871°C (900° to 1600°F) range. Lowest-cost corrosion resistant sheath material available.

316 SS (C)

Maximum temperature: 900°C (1650°F). Best corrosion resistance of the austenitic stainless steel grades. Good corrosion resistance in H_2S. Widely used in the food and chemical industry. Subject to damaging carbide precipitation in 482° to 871°C (900° to 1600°F) range.

304L (D)

Maximum temperature: 900°C (1650°F). Low-carbon version of 304 SS (B). Low carbon content allows this material to be welded and heated in the 482° to 871°C (900° to 1600°F) range without damage to corrosion resistance.

316L (E)

Maximum temperature: 900°C (1650°F). Same as 316 SS (C) except low-carbon version allows for better welding and fabrication.

CONTINUED

Sheath Material (continued)

NOTE: Letters in parentheses following the sheath material are used with the Ordering Worksheet on page 14-119.

310 SS (F)

Maximum temperature: 1150°C (2100°F). Mechanical and corrosion resistance, similar to but better than 304 SS. Very good heat resistance. This alloy contains 25% Cr, 20% Ni. Not as ductile as 304 SS.

321 SS (G)

Maximum temperature: 871°C (1600°F). Similar to 304 SS except titanium stabilized for intergranular corrosion. This alloy is designed to overcome susceptibility to carbide precipitation in the 482°C to 871°C (900°F to 1600°F) range. Used in aerospace and chemical applications.

347 SS (H)

Maximum temperature: 871°C (1600°F). Similar to 304 SS except nickel columbium stabilized. This alloy is designed to overcome susceptibility to carbide precipitation in the 482°C to 871°C (900°F to 1600°F) range. Used in aerospace and chemical applications.

446 SS (L)

Maximum temperature: 1150°C (2100°F). Ferritic stainless steel, which has good resistance to sulfurous atmospheres at high temperatures. Good corrosion resistance to nitric acid, sulfuric acid and most alkalies. 27% chromium content gives this alloy the highest heat resistance of any ferritic stainless steel.

Hastelloy X® (Q)

Maximum temperature: 1204°C (2200°F). Widely used in aerospace applications. Resistant to oxidizing, reducing and neutral atmospheric conditions. Excellent high temperature strength along with superior oxidation resistance. Resistant to stress corrosion cracking in petrochemical applications.

Incoloy® 800 (S)

Maximum temperature: 1093°C (2000°F). Widely used as heater sheath material. Minimal use in thermocouples. Superior to Alloy 600 in sulfur, cyanide salts and fused neutral salts. Susceptible to intergranular attack in some applications by exposure to the temperature range of 538°C to 760°C (1000° to 1400°F).

Incoloy® 800HT (T)

Maximum temperature: 1093°C (2000°F). Same as Incoloy 800® (S) except carbon content is limited to upper end of range. This provides significantly higher creep and rupture strength. Used in the chemical and petrochemical industry for long-term exposure to high temperatures.

Inconel® 601 (R)

Maximum temperature: 1177°C (2150°F) Continuous; 1260°C (2300°F) Intermittent. Similar to Alloy 600 with the addition of aluminum for outstanding oxidation resistance. Designed for high temperature corrosion resistance. This material is good in carburizing environments, and has good creep rupture strength. Do not use in vacuum furnaces! Susceptible to intergranular attack by prolonged heating in 538°C to 760°C (1000°F to 1400°F) temperature range.

Molybdenum (V)

Maximum temperature in air: 399°C (750°F). Melting point: 2610°C (4730°F). Refractory metal. Brittle; cannot be bent. Use only in inert, vacuum or reducing atmospheres. Most commonly used with BeO insulation and Tungsten Rhenium conductors. Uncompacted assemblies only.

Nickel 200 (J)

Maximum temperature: 315°C (600°F). Commercially pure wrought Nickel with good resistance to a wide range of corrosive materials. For temperatures above 600°F use Nickel 201 to prevent embrittlement by intergranular corrosion.

Nickel 201 (K)

Maximum temperature: 1093°C (2000°F). Commercially pure wrought nickel with low carbon. Used in molten salt bath furnaces. Offers good resistance to caustic alkalines and fluorine.

Platinum 10% Rhodium (N)

Maximum temperature: 1552°C (2825°F). Excellent oxidation resistance. Same type of uses as platinum 20% rhodium except lower cost and reduced operating range.

Platinum 20% Rhodium (P)

Maximum temperature: 1649°C (3000°F). Excellent oxidation resistance. Very expensive oxidation resistant alloy used in glass manufacturing and in research applications. Also used for gas turbine test thermocouples.

Pure Platinum (M)

Maximum temperature: 1482°C (2700°F). Platinum is the only metallic material capable of operating in an oxidizing atmosphere above 1260°C (2300°F) for extended periods of time. Normally used with type R, S or B conductors. Used in glass manufacturing, high temperature furnaces and as control standards.

Tantalum (U)

Maximum temperature in air: 482°C (900°F). Melting point: 2996°C (5425°F). Refractory metal. Very ductile. Use only in inert or very good vacuums—10-3 torr or better. Most commonly used with BeO and Tungsten Rhenium conductors. Do not use in environments containing nitrogen above 371°C (700°F).

Mineral Insulated Cable Calibration

NOTE: Letters in parentheses following the sheath material are used with the Ordering Worksheet on page 14-119.

ANSI Type (J) Standard; Special Tolerance (3)

Type J is composed of a positive leg (JP) which is iron and a negative leg (JN) which is approximately 45% nickel, 55% copper. When protected by the compacted mineral insulation and appropriate outer sheath, Type J is usable from 32°F to 1500°F. Type J is not susceptible to short range ordering in the 700 to 1000°F temperature range (+2°F to +4°F drift), which occurs with ANSI Type E and K. This low-cost, stable thermocouple calibration is primarily used with 94% minimum purity MgO insulation and a stainless steel sheath.

ANSI Type (K) Standard; Special Tolerance (4)

Type K is composed of a positive leg (KP) which is approximately 90% nickel, 10% chromium and a negative leg (KN) which is approximately 95% nickel, 2% aluminum, 2% manganese and 1% silicon. When protected by the compacted mineral insulation and appropriate outer sheath, Type K is usable from 32°F to 2300°F and is one of Tempco's most popular calibration types. If the application temperature is between 600°F and 1100°F, we recommend using Type J or Type N because of short range ordering that can cause drift of +2°F to +4°F in a few hours' time. Type K is relatively stable to radiation transmutation and is used in nuclear environments. For applications below 32°F, special alloy selections are usually required.

ANSI Type (E) Standard; Special Tolerance (5)

Type E is composed of a positive leg (EP) which is approximately 90% nickel, 10% chromium and a negative leg (EN) which is approximately 45% nickel, 55% copper. When protected by the compacted mineral insulation and appropriate outer sheath, Type E is usable from 32°F to 1650°F. This thermocouple has the highest EMF output per degree of all ANSI recognized thermocouples. If the application temperature is between 600°F and 1100°F, we recommend using Type J or Type N because of short range ordering that can cause drift of +2°F to +4°F in a few hours' time. For applications below 32°F, special alloy selections may be required.

ANSI Type (T) Standard; Special Tolerance (6)

Type T is composed of a positive leg (TP) which is pure copper and a negative leg (TN) which is approximately 45% nickel, 55% copper. When protected by the compacted mineral insulation and appropriate outer sheath, Type T is usable from 32°F to 662°F. Type T is very stable and is used in a wide variety of cryogenic and low temperature applications. For applications below 32°F special alloy selections may be required.

ANSI Type (N) Standard; Special Tolerance (7)

Type N is composed of a positive leg (Nicrosil) which is approximately 14% chromium, 1.4% silicon, 84.6% nickel and a negative leg (Nisil) which is approximately 4.4% silicon, 95.6% nickel. When protected by compacted mineral insulation and appropriate outer sheath, Type N is usable from 32°F to 2300°F. Type N was designed to overcome several problems inherent in Type K thermocouples. Short range ordering (+2°F to +4°F drift) in the 600°F to 1100°F temperature range is greatly reduced, and the drift rate at high temperatures is considerably less. Type N has also been found to be more stable than Type K in nuclear environments.

ANSI Type (R) Standard Tolerance

Type R is composed of a positive leg (RP), which is 87% platinum, 13% rhodium and a negative leg (RN), which is 100% platinum. When protected by compacted mineral insulation and appropriate outer sheath, Type R is usable from 32°F to 2700°F. Type R is available as standard limits only, ITS90.

ANSI Type (S) Standard Tolerance

Type S is composed of a positive leg (SP), which is 90% platinum, 10% rhodium and a negative leg (SN), which is 100% platinum. When protected by compacted mineral insulation and appropriate outer sheath, Type S is usable from 32°F to 2700°F. Type S has a lower EMF output than Type R and is available as standard limits only, ITS90.

ANSI Type (B) Standard Tolerance

Type B is composed of a positive leg (BP) which is approximately 70% platinum, 30% rhodium and a negative leg (BN) which is approximately 94% platinum, 6% rhodium. When protected by compacted mineral insulation and appropriate outer sheath, Type B is usable from 1600°F to 3100°F. Type B is available as standard limits only, IPTS 1968 scale.

Tungsten—5% Re/Tungsten, 26% Re (C)

This calibration has not been given a letter designation by ANSI. When this calibration is protected by mineral insulation and appropriate outer sheath, it is usable from 32°F to 4200°F. Calibration is used most often with Beryllium Oxide insulation and either molybdenum or tantalum sheath. These combinations can only be used in an inert or vacuum environment.

Miscellaneous (O)

Consult Tempco with your requirements.

Mineral Insulated Thermocouple Cable

Made in USA

Insulation

NOTE: **Letters in parentheses following the sheath material are used with the Ordering Worksheet on page 14-119.**

Magnesium Oxide — MgO 96% Typical **(M)**

This insulation is widely used in thermocouple and heater applications below 2000°F. SiO_2 is the major impurity that provides excellent insulation resistance. Do not use with platinum or in nuclear application.

High Purity Magnesium Oxide — MgO 99.4% Minimum Purity **(H)**

Low impurity levels make this insulation very useful for all thermocouple calibrations up to 2500°F. Above 2500°F we recommend using Hafnia Oxide (HfO_2) insulation because of MgO's low resistivity. This material meets the requirements established in ASTM E-235-82.

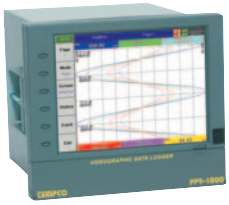
Alumina Oxide — Al_2O_3 99.6% Minimum Purity **(A)**

Although this material is comparable to MgO in its electrical properties and cost, it does not compact as well and tends to "powder out." This undesirable characteristic has made this insulation unpopular in industry so cable with this type of insulation is available only as a "special."

Complete Your Thermal Loop System

Instrumentation

Videographic Data Loggers and Paper Chart Recorders



Complete details can be found in Section 12 of this catalog.

TEC Temperature Controllers

Complete details can be found in Section 13 of this catalog.

Mineral Insulated Thermocouple Cable Ordering Worksheet

Ordering Code: MTC – [1] [2] [3] [4] [5]

Designates **TEMPCO-PAK** Sheathed Mineral Insulated Thermocouple Cable

Ordering Worksheet

Note: For a complete description of Worksheet options see pages 14-115 through 14-118.

Calibration Code — See page 14-117

ANSI Standard Tolerances	Special Tolerances
J = (Iron/Constantan)	**3**
K = (Chromel®/Alumel)	**4**
E = (Chromel®/Constantan)	**5**
T = (Cu/Constantan)	**6**
N = (Nicrosil/Nisil)	**7**
R = (Pt/Pt-13% Rh) PER ITS-90	
S = (Pt/Pt-10% Rh) PER ITS-90	
B = (Plat-6% Rh/Plat-30% Rh)	
C = (W-5% Re/W-26% Re)	
O = Miscellaneous (Consult Factory)	

Number of Conductors

2 = 2-wire construction (Single Element)
4 = 4-wire construction (Duplex Element)

Insulation — See page 14-118

M = 96% min. MgO
H = 99.4% min. MgO
A = 99.6% Alumina

Sheath O.D.

A = .020" ±.001	**L** = 1.0 mm ±.03
B = .032" ±.001	**N** = 1.5 mm ±.03
C = .040" ±.001	**P** = 2.0 mm ±.03
D = .063" ±.001	**Q** = 3.0 mm ±.05
E = .093" ±.002	**R** = 4.5 mm ±.05
F = .125" ±.002	**S** = 6.0 mm +.07/–.05
G = .188" ±.002	**T** = 8.0 mm +.07/–.05
H = .250" +.003/–.002	**V** = 9.0 mm +.07/–.05
J = .313" +.003/–.002	
K = .375" +.003/–.002	

Sheath Material — See pages 14-115 and 14-116

A = Alloy 600	**L** = 446 SS
B = 304 SS	**M** = Pure platinum
C = 316 SS	**N** = Platinum 10% rhodium
D = 304L SS	**P** = Platinum 20% rhodium
E = 316L SS	**Q** = Hastelloy X®
F = 310 SS	**R** = Inconel® 601
G = 321 SS	**S** = Incoloy® 800
H = 347 SS	**T** = Incoloy® 800HT
J = Nickel 200	**U** = Tantalum
K = Nickel 201	**V** = Molybdenum

Made in USA

Single Element Standard Size List

O.D. (in.)	Part Number	ANSI Calibration	Insulation (Min. Purity)	Sheath Material	Nom. Wall Thickness (in.)	Nom. B&S Wire ga.	Max. Operating Temp. (°F)	Max. Stock Length (ft.)
.020 ±.001	MTC00001	J	99.4% MgO	Alloy 600	.003	39	1500	50
	MTC00002	K	99.4% MgO	Alloy 600	.003	39	1650	50
	MTC00003	J	99.4% MgO	304	.003	39	1500	50
	MTC00004	K	99.4% MgO	304	.003	39	1650	50
.032 ±.001	MTC00005	J	99.4% MgO	Alloy 600	.005	36	1500	150
	MTC00006	K	99.4% MgO	Alloy 600	.005	36	1800	150
	MTC00007	J	99.4% MgO	304	.005	36	1500	150
	MTC00008	K	99.4% MgO	304	.005	36	1650	150
.040 ±.001	MTC00009	J	99.4% MgO	Alloy 600	.006	33	1500	175
	MTC00010	K	99.4% MgO	Alloy 600	.006	33	2000	175
	MTC00011	J	99.4% MgO	304	.006	33	1500	175
	MTC00012	K	99.4% MgO	304	.006	33	1650	175
	MTC00013	E	99.4% MgO	304	.006	33	1600	175
	MTC00014	T	99.4% MgO	304	.006	33	650	175
	MTC00015	J	99.4% MgO	316	.006	33	1500	175
	MTC00016	K	99.4% MgO	316	.006	33	1650	175
.062 ±.001	MTC00017	J	96.0% MgO	Alloy 600	.008	30	1500	500
	MTC00018	J	99.4% MgO	Alloy 600	.008	30	1500	500
	MTC00019	K	96.0% MgO	Alloy 600	.008	30	2000	500
	MTC00020	K	99.4% MgO	Alloy 600	.008	30	2000	500
	MTC00021	J	96.0% MgO	304	.008	30	1500	500
	MTC00022	J	99.4% MgO	304	.008	30	1500	500
	MTC00023	K	96.0% MgO	304	.008	30	1650	500
	MTC00024	K	99.4% MgO	304	.008	30	1650	500
	MTC00025	E	96.0% MgO	304	.008	30	1600	500
	MTC00026	T	99.4% MgO	304	.008	30	650	500
	MTC00027	J	96.0% MgO	316	.008	30	1500	500
	MTC00028	J	99.4% MgO	316	.008	30	1500	500
	MTC00029	K	96.0% MgO	316	.008	30	1650	500
	MTC00030	K	99.4% MgO	316	.008	30	1650	500
.093 ±.002	MTC00031	J	96.0% MgO	Alloy 600	.010	27	1500	450
	MTC00032	J	99.4% MgO	Alloy 600	.010	27	1500	450
	MTC00033	K	96.0% MgO	Alloy 600	.010	27	2000	450
	MTC00034	K	99.4% MgO	Alloy 600	.010	27	2150	450
	MTC00035	J	96.0% MgO	304	.010	27	1500	450
	MTC00036	J	99.4% MgO	304	.010	27	1500	450
	MTC00037	K	96.0% MgO	304	.010	27	1650	450
	MTC00038	K	99.4% MgO	304	.010	27	1650	450
.125 ±.002	MTC00039	J	96.0% MgO	Alloy 600	.014	24	1500	250
	MTC00040	J	99.4% MgO	Alloy 600	.014	24	1500	250
	MTC00041	K	96.0% MgO	Alloy 600	.014	24	2000	250
	MTC00042	K	99.4% MgO	Alloy 600	.014	24	2150	250
	MTC00043	J	96.0% MgO	304	.014	24	1500	250
	MTC00044	J	99.4% MgO	304	.014	24	1500	250
	MTC00045	K	96.0% MgO	304	.014	24	1650	250
	MTC00046	K	99.4% MgO	304	.014	24	1650	250
	MTC00047	E	96.0% MgO	304	.014	24	1600	250
	MTC00048	T	96.0% MgO	304	.014	24	650	250
	MTC00049	J	96.0% MgO	316	.014	24	1500	250
	MTC00050	J	99.4% MgO	316	.014	24	1500	250
	MTC00051	K	96.0% MgO	316	.014	24	1650	250
	MTC00052	K	99.4% MgO	316	.014	24	1650	250
	MTC00053	E	96.0% MgO	316	.014	24	1600	250
	MTC00054	T	96.0% MgO	316	.014	24	650	250
	MTC00055	J	96.0% MgO	310	.014	24	1500	250
	MTC00056	K	96.0% MgO	310	.014	24	2000	250
	MTC00057	R	99.4% MgO	Alloy 600	.020	24	2150	250
	MTC00058	S	99.4% MgO	Alloy 600	.020	24	2150	250

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Single Element Standard Size List

Continued from previous page…

O.D. (in.)	Part Number	ANSI Calibration	Insulation (Min. Purity)	Sheath Material	Nom. Wall Thickness (in.)	Nom. B&S Wire ga.	Max. Operating Temp. (°F)	Max. Stock Length (ft.)
	MTC00059	J	96.0% MgO	Alloy 600	.022	21	1500	120
	MTC00060	J	99.4% MgO	Alloy 600	.022	21	1500	120
	MTC00061	K	96.0% MgO	Alloy 600	.022	21	2000	120
	MTC00062	K	99.4% MgO	Alloy 600	.022	21	2150	120
	MTC00063	J	96.0% MgO	304	.022	21	1500	120
	MTC00064	J	99.4% MgO	304	.022	21	1500	120
	MTC00065	K	96.0% MgO	304	.022	21	1650	120
	MTC00066	K	99.4% MgO	304	.022	21	1650	120
.188 ±.002	MTC00067	E	96.0% MgO	304	.022	21	1600	120
	MTC00068	T	96.0% MgO	304	.022	21	650	120
	MTC00069	J	96.0% MgO	316	.022	21	1500	120
	MTC00070	J	99.4% MgO	316	.022	21	1500	120
	MTC00071	K	96.0% MgO	316	.022	21	1650	120
	MTC00072	K	99.4% MgO	316	.022	21	1650	120
	MTC00073	E	96.0% MgO	316	.022	21	1600	120
	MTC00074	T	96.0% MgO	316	.022	21	650	120
	MTC00075	J	96.0% MgO	310	.022	21	1500	120
	MTC00076	K	96.0% MgO	310	.022	21	2000	120
	MTC00077	J	96.0% MgO	Alloy 600	.029	18	1500	70
	MTC00078	J	99.4% MgO	Alloy 600	.029	18	1500	70
	MTC00079	K	96.0% MgO	Alloy 600	.029	18	2000	70
	MTC00080	K	99.4% MgO	Alloy 600	.029	18	2150	70
	MTC00081	J	96.0% MgO	304	.029	18	1500	70
	MTC00082	J	99.4% MgO	304	.029	18	1500	70
	MTC00083	K	96.0% MgO	304	.029	18	1650	70
	MTC00084	K	99.4% MgO	304	.029	18	1650	70
.250 +.003 −.002	MTC00085	E	96.0% MgO	304	.029	18	1600	70
	MTC00086	T	96.0% MgO	304	.029	18	650	70
	MTC00087	J	96.0% MgO	316	.029	18	1500	70
	MTC00088	J	99.4% MgO	316	.029	18	1500	70
	MTC00089	K	96.0% MgO	316	.029	18	1650	70
	MTC00090	K	99.4% MgO	316	.029	18	1650	70
	MTC00091	E	96.0% MgO	316	.029	18	1600	70
	MTC00092	T	96.0% MgO	316	.029	18	650	70
	MTC00093	J	96.0% MgO	310	.029	18	1500	70
	MTC00094	K	96.0% MgO	310	.029	18	2000	70
	MTC00095	J	96.0% MgO	Alloy 600	.036	17	1500	40
	MTC00096	J	96.0% MgO	304	.036	17	1500	40
	MTC00097	K	96.0% MgO	Alloy 600	.036	17	2000	40
.313	MTC00098	K	96.0% MgO	304	.036	17	1650	40
+.003	MTC00099	E	96.0% MgO	304	.036	17	1600	40
−.002	MTC00100	E	96.0% MgO	316	.036	17	1600	40
	MTC00101	J	96.0% MgO	316	.036	17	1500	40
	MTC00102	K	96.0% MgO	316	.036	17	1650	40
	MTC00103	J	96.0% MgO	Alloy 600	.045	15	1500	30
	MTC00104	J	96.0% MgO	304	.045	15	1500	30
.375	MTC00105	K	96.0% MgO	Alloy 600	.045	15	2000	30
+.003	MTC00106	K	96.0% MgO	304	.045	15	1650	30
−.002	MTC00107	J	96.0% MgO	316	.045	15	1500	30
	MTC00108	K	96.0% MgO	316	.045	15	1650	30

Mineral Insulated Thermocouple Cable

Made in USA

Duplex Element — Diagonal Standard Size List

O.D. (in.)	Part Number	ANSI Calibration	Insulation (Min. Purity)	Sheath Material	Nom. Wall Thickness (in.)	Nom. B&S Wire Ga.	Max. Operating Temp. (°F)	Max. Stock Length (ft.)
.063 ±.001	MTC00109	J	99.4% MgO	Alloy 600	.009	30	1500	500
	MTC00110	K	99.4% MgO	Alloy 600	.009	30	2000	500
	MTC00111	J	99.4% MgO	304	.009	30	1500	500
	MTC00112	K	99.4% MgO	304	.009	30	1650	500
.125 ±.002	MTC00113	J	96.0% MgO	Alloy 600	.016	24	1500	250
	MTC00114	K	96.0% MgO	Alloy 600	.016	24	2000	250
	MTC00115	J	96.0% MgO	304	.016	24	1500	250
	MTC00116	K	96.0% MgO	304	.016	24	1650	250
	MTC00117	E	96.0% MgO	304	.016	24	1600	250
	MTC00118	J	96.0% MgO	316	.016	24	1500	250
	MTC00119	K	96.0% MgO	316	.016	24	1650	250
.188 ±.002	MTC00120	J	96.0% MgO	Alloy 600	.024	21	1500	120
	MTC00121	K	96.0% MgO	Alloy 600	.024	21	2000	120
	MTC00122	J	96.0% MgO	304	.024	21	1500	120
	MTC00123	K	96.0% MgO	304	.024	21	1650	120
	MTC00124	E	96.0% MgO	304	.024	21	1600	120
	MTC00125	T	96.0% MgO	304	.024	21	650	120
	MTC00126	J	96.0% MgO	316	.024	21	1500	120
	MTC00127	K	96.0% MgO	316	.024	21	1650	120
.250 +.003 –.002	MTC00128	J	96.0% MgO	Alloy 600	.031	19	1500	70
	MTC00129	K	96.0% MgO	Alloy 600	.031	19	2000	70
	MTC00130	J	96.0% MgO	304	.031	19	1500	70
	MTC00131	K	96.0% MgO	304	.031	19	1650	70
	MTC00132	E	96.0% MgO	304	.031	19	1600	70
	MTC00133	T	96.0% MgO	304	.031	19	650	70
	MTC00134	J	96.0% MgO	316	.031	19	1500	70
	MTC00135	K	96.0% MgO	316	.031	19	1650	70
.313 +.003 –.002	MTC00136	J	96.0% MgO	Alloy 600	.039	17	1500	40
	MTC00137	K	96.0% MgO	Alloy 600	.039	17	2000	40
	MTC00138	J	96.0% MgO	304	.039	17	1500	40
	MTC00139	K	96.0% MgO	304	.039	17	1650	40
	MTC00140	E	96.0% MgO	304	.039	17	1600	40
	MTC00141	T	96.0% MgO	304	.039	17	650	40
.375 +.003 –.002	MTC00142	J	96.0% MgO	Alloy 600	.047	15	1500	30
	MTC00143	K	96.0% MgO	Alloy 600	.047	15	2000	30
	MTC00144	J	96.0% MgO	304	.047	15	1500	30
	MTC00145	K	96.0% MgO	304	.047	15	1650	30
	MTC00146	E	96.0% MgO	304	.047	15	1600	30
	MTC00147	T	96.0% MgO	304	.047	15	650	30

Metric — Single Element Standard Size List

O.D. (mm.)	Part Number	ANSI Calibration	Insulation (Min. Purity)	Sheath Material	Nom. Wall Thickness (mm.)	Nom. Wire Dia. (mm)	Max. Operating Temp. (°C)	Max. Stock Length (m.)
1.5 ±.03	MTC00148	J	99.4% MgO	Alloy 600	0.20	0.28	815	167
	MTC00149	K	99.4% MgO	Alloy 600	0.20	0.28	1093	167
	MTC00150	J	99.4% MgO	304	0.20	0.28	815	167
	MTC00151	K	99.4% MgO	304	0.20	0.28	898	167
2.0 ±.03	MTC00152	J	96.0% MgO	Alloy 600	0.25	0.36	815	93
	MTC00153	K	96.0% MgO	Alloy 600	0.25	0.36	1093	93
	MTC00154	J	96.0% MgO	304	0.25	0.36	815	93
	MTC00155	K	96.0% MgO	304	0.25	0.36	898	93
	MTC00156	J	96.0% MgO	316	0.25	0.36	815	93
	MTC00157	K	96.0% MgO	316	0.25	0.36	898	93
3.0 ±.05	MTC00158	J	96.0% MgO	Alloy 600	0.33	0.46	815	84
	MTC00159	K	96.0% MgO	Alloy 600	0.33	0.46	1093	84
	MTC00160	J	96.0% MgO	304	0.33	0.46	815	84
	MTC00161	K	96.0% MgO	304	0.33	0.46	898	84
	MTC00162	E	96.0% MgO	304	0.33	0.46	871	84
	MTC00163	T	96.0% MgO	304	0.33	0.46	343	84
	MTC00164	J	96.0% MgO	316	0.33	0.46	815	84
	MTC00165	K	96.0% MgO	316	0.33	0.46	898	84
4.5 ±.05	MTC00166	J	96.0% MgO	Alloy 600	0.53	0.69	815	37
	MTC00167	K	96.0% MgO	Alloy 600	0.53	0.69	1093	37
	MTC00168	J	96.0% MgO	304	0.53	0.69	815	37
	MTC00169	K	96.0% MgO	304	0.53	0.69	898	37
6.0 +.07 −.05	MTC00170	J	96.0% MgO	Alloy 600	0.69	0.94	815	21
	MTC00171	K	96.0% MgO	Alloy 600	0.69	0.94	1093	21
	MTC00172	J	96.0% MgO	304	0.69	0.94	815	21
	MTC00173	K	96.0% MgO	304	0.69	0.94	898	21
8.0 +.07 −.05	MTC00174	J	96.0% MgO	Alloy 600	0.91	1.22	815	12
	MTC00175	K	96.0% MgO	Alloy 600	0.91	1.22	1093	12
	MTC00176	J	96.0% MgO	304	0.91	1.22	815	12
	MTC00177	K	96.0% MgO	304	0.91	1.22	898	12

Ordering Information

Standard Thermocouple Cable

Order by Part Number from the Lists on Pages 14-120 through 14-123.

Thermocouple wire is sold by the foot and is subject to minimum billing.

Tempco-Pak is stocked in random lengths with the maximum stock lengths listed in the tables showing the varieties of commonly available material. Tempco reserves the right to supply random lengths of our choice unless specific lengths are indicated on your order. Tempco-Pak can be furnished in coil form or in straight lengths. Normally .375" diameter and .312" diameter are shipped in straight lengths. Longer lengths are available on special order.

Custom Manufactured Thermocouple Cables

For sizes and specifications not listed, Tempco will design and manufacture a Mineral Insulated Thermocouple Cable to meet your requirements. Please refer to the ordering worksheet on page 14-119 and follow the model as diagrammed to specify your requirements with the Tempco code number.

In addition, refer to page 14-124 and ***specify the following***:

- ❑ Configuration type
- ❑ Conductor Configuration and Size
- ❑ Sheath wall thickness
- ❑ Minimum acceptable lengths and total length required

Mineral Insulated Thermocouple Cable

Made in USA

Made-To-Order Mineral-Insulated Cable

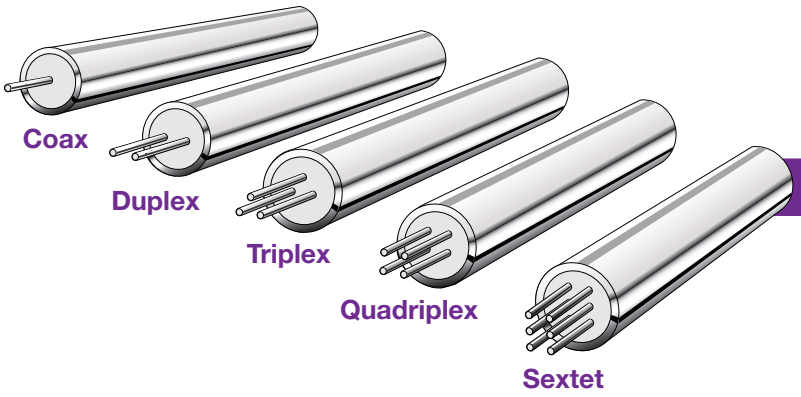
In addition to the standard line of Tempco-Pak Thermocouple Cables, we can also manufacture metal sheathed, mineral insulated cable in special configurations using a wide variety of sheath materials and conductor alloys such as copper, nickel, alloy 600, CHROMEL-A®, nickel clad copper, 304 SS and virtually any other malleable metal.

Properly selected combinations of materials (sheath, insulation and wire) will exhibit the same outstanding qualities and performance as our standard Tempco-Pak.

Shown below are standard and special Tempco-Pak configurations.

Consult Tempco with your specific requirements.

Standard Tempco-Pak Configurations



Special Tempco-Pak Configurations

Ordering Information

Made-To-Order Mineral-Insulated Cable

Custom Manufactured Mineral-Insulated Cable

Supply the following information when requesting a quotation on made-to-order mineral-insulated cable:

- ❑ Configuration type
- ❑ Sheath material
- ❑ Insulation type and purity
- ❑ Calibration type or conductor material
- ❑ Conductor configuration and size
- ❑ Sheath wall thickness
- ❑ Minimum acceptable lengths and total length required

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.