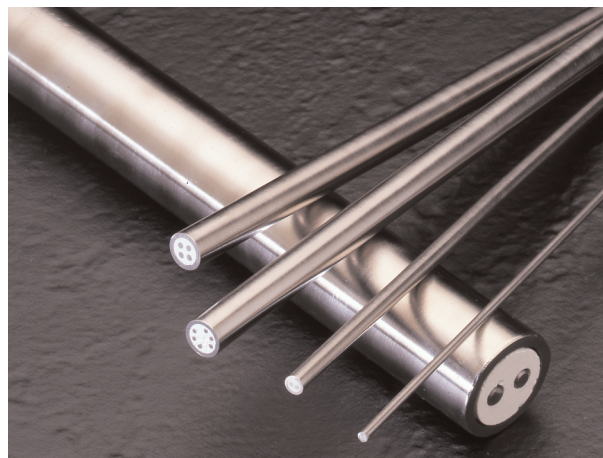


Mineral Insulated Metal-Sheathed Cable Products



Watlow helped pioneer XACTPAK® mineral insulated, metal-sheathed cable. The unique properties of XACTPAK make it ideally suited to solve a wide variety of problem applications. The outer sheath can be made from any malleable metal in a wide range of diameters, containing single or multiple wires. Easily formed or bent, it can accommodate virtually any configuration. The outer sheath protects thermocouple or thermocouple extension wires from oxidation and hostile environments that would quickly destroy unprotected wire.

The mineral insulations available provide excellent high temperature dielectric strength to ensure signals are carried faithfully to your instrumentation or controls.

Applications

- Atomic research
- Bearing temperature
- Blast furnaces
- Catalytic reformers
- Diesel engines
- Food and beverage
- Furnaces
- Glass and ceramic
- Heat treating
- Instrument cabling
- Jet engines and test cells
- Kilns
- Laboratory and research
- Medical
- Nuclear reactors
- Power stations and steam generators
- Refineries and oil processing
- Rocket engines
- Semiconductor processing
- Turbines
- Vacuum furnaces

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Features and Benefits

Fireproof

- Perform where conventional insulated wires burn and degrade

Fast and accurate

- Precisely measures temperature for a fast response

Tight moisture and gas seals

- Resists contamination

High pressure rating

- Allows use in pressure vessels and vacuum applications

Form flexibility

- Adapts to virtually any application

Thermal shock resistance

- Withstands thermal cycling

Corrosion, durable and corrosion resistant

- Long life performance with minimum constraints on applications

High temperature rating

- Meets demanding application needs



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How to Select XACTPAK Cable to Suit Your Requirements

The following items must be considered when selecting XACTPAK mineral insulated metal-sheathed cable:

Sheath Material

The sheath serves to isolate and protect the wires and insulation from contamination and mechanical damage. There is no sheath material that is appropriate for all conditions so Watlow offers a wide variety to choose from. Temperature, strength, corrosiveness, service life and cost must be considered when selecting a sheath material.

Calibration

Watlow stocks all ASTM recognized thermocouple types along with many that have been recognized, such as the full line of tungsten rhenium thermocouple.

We also manufacture cable with other wire alloys such as nickel, copper, nickel clad copper, 304 SS, Alloy 600 and virtually any malleable metal.

Insulation Material

The insulation separates the conductors from each other and the outer sheath. When selecting insulation, temperature rating, environment and cost must be taken into account.

High Purity Magnesium Oxide (MgO) 99.4 percent minimum purity

Alumina Oxide (Al_2O_3) 99.6 percent minimum purity

Magnesium Oxide (MgO) 96 percent minimum purity

Physical Characteristics

The diameter of the sheath and the wall thickness will directly affect the following:

- Time response
- Service life
- Flexibility
- Pressure rating
- Strength

Quality Control and Testing

To maintain quality and consistency, XACTPAK cable is manufactured under carefully controlled procedures and rigid standards of cleanliness. Quality checks are made at critical points throughout the manufacturing process.

All XACTPAK cable is inspected and tested for sheath condition, insulation density, conductor uniformity, electrical continuity, insulation resistance, calibration conformance and physical dimension. Special testing and certification—including helium leak, homogeneity, metallurgical examination and dye penetrant, among others—are available on request.

Care, Handling and Fabrication of XACTPAK Cable

To maximize the performance advantages made possible by XACTPAK cable's overall premium quality, the following instructions covering its storage, handling and further fabrication should be observed:

Storage

To prevent moisture from being absorbed by its hygroscopic mineral insulation, both ends of each length of XACTPAK cable are sealed at the factory. To further guard against moisture penetration, it is advisable to store XACTPAK material in a dry place.

Cutting

When pieces are cut off a length of XACTPAK cable, the exposed ends should immediately be squared and sealed to prevent moisture absorption.

Insulation Resistance

XACTPAK mineral insulated, metal-sheathed cable should have a minimum room temperature insulation resistance of 100 megohms when tested at 50V=(dc) both wires to sheath and wire to wire. All ceramics used in XACTPAK cable will decrease in resistance as temperature increases.

Shipping and Packaging

XACTPAK cable is stocked in random lengths. We reserve the right to supply random lengths of our choice unless specific cut lengths are specified on your order.

On request, XACTPAK cable can be furnished in other coil dimensions or shipped in straight form when necessary. Longer lengths are available on special order.

Stripping

After sheath removal the exposed conductors should be sandblasted or cleaned with emery cloth. The exposed ends should be resealed immediately after completion of the stripping operation.

Forming

Because XACTPAK cable's sheath is dead soft and bright annealed, it can be formed and shaped to most contours without risk of cracking. As a rule of thumb, the sheath can be formed around a mandrel twice the sheath diameter without damage. In other words, 0.125 inch diameter XACTPAK cable can be wound around a 0.250 inch diameter mandrel.

Made-to-Order Mineral-Insulated (MI) Cable

In addition to our full line of metal-sheathed, mineral-insulated thermocouple cable, we will also manufacture metal-sheathed, mineral-insulated signal cable with copper, stainless steel or other conductor materials to meet many specialized requirements. (MI) cable incorporating one or more conductors can be made from a large variety of sheath and insulation materials. Properly selected combinations of materials provide (MI) cable with these outstanding performance features:

- It is totally impervious to moisture.
- It can withstand extremes of temperature and pressure.
- It can endure highly oxidizing or corrosive conditions.
- It adapts well to nuclear applications because of its low neutron capture cross section which is unaffected by radiation heating. (Selected sheaths and calibrations)
- It can be easily formed to a radius equal to approximately twice its diameter without insulation breakdown. It maintains its shape after forming.

Single Element

Code* No.	Sheath Diameter	Sheath Material	Callbration	Insulation	Nominal AWG Gauge	Nominal Wall Thickness in.	Maximum Stock Length ft	Maximum Recommended Operating Temperature °C (°F)	
401/2101	0.020	Alloy 600	K	99.4% MgO	38	0.003	100	871	(1600)
402/2101	0.020	304 SS	K	99.4% MgO	38	0.003	100	871	(1600)
401/2102	0.032	Alloy 600	K	99.4% MgO	34	0.004	150	871	(1600)
401/1103	0.040	Alloy 600	J	99.4% MgO	32	0.006	250	816	(1500)
401/2103	0.040	Alloy 600	K	99.4% MgO	32	0.006	250	871	(1600)
402/1103	0.040	304 SS	J	99.4% MgO	32	0.006	250	816	(1500)
404/2103	0.040	316 SS	K	99.4% MgO	32	0.006	250	871	(1600)
401/2104	0.063	Alloy 600	K	99.4% MgO	28	0.009	1000	1093	(2000)
401/2107	0.125	Alloy 600	K	99.4% MgO	22	0.017	900	1177	(2150)
401/2507	0.125	Alloy 600	K	96% MgO	22	0.017	900	1093	(2000)
401/8107	0.125	Alloy 600	N	99.4% MgO	22	0.017	900	1177	(2150)
402/1507	0.125	304 SS	J	96% MgO	22	0.017	900	816	(1500)
402/2107	0.125	304 SS	K	99.4% MgO	22	0.017	900	871	(1600)
402/2507	0.125	304 SS	K	96% MgO	22	0.017	900	871	(1600)
402/3507	0.125	304 SS	T	96% MgO	22	0.017	500	350	(662)
403/2507	0.125	310 SS	K	96% MgO	22	0.017	900	1093	(2000)
404/2507	0.125	316 SS	K	96% MgO	22	0.017	900	871	(1600)
404/3507	0.125	316 SS	T	96% MgO	22	0.017	500	350	(662)
404/4507	0.125	316 SS	E	96% MgO	22	0.017	900	871	(1600)
418/2107	0.125	Hastelloy® X	K	99.4% MgO	22	0.014	125	1204	(2200)
401/2108	0.188	Alloy 600	K	99.4% MgO	19	0.025	350	1177	(2150)
401/2508	0.188	Alloy 600	K	96% MgO	19	0.025	350	1093	(2000)
402/1508	0.188	304 SS	J	96% MgO	19	0.025	350	816	(1500)
402/2508	0.188	304 SS	K	96% MgO	19	0.025	350	871	(1600)
403/2508	0.188	310 SS	K	96% MgO	19	0.025	350	1093	(2000)
404/1508	0.188	316 SS	J	96% MgO	19	0.025	350	816	(1500)
404/2508	0.188	316 SS	K	96% MgO	19	0.025	350	871	(1600)
401/1511	0.250	Alloy 600	J	96% MgO	16	0.033	220	816	(1500)
401/2111	0.250	Alloy 600	K	99.4% MgO	16	0.033	220	1177	(2150)
401/2511	0.250	Alloy 600	K	96% MgO	16	0.033	220	1093	(2000)
402/1511	0.250	304 SS	J	96% MgO	16	0.033	220	816	(1500)
402/2511	0.250	304 SS	K	96% MgO	16	0.033	220	871	(1600)
403/2511	0.250	310 SS	K	96% MgO	16	0.033	220	1093	(2000)
404/1511	0.250	316 SS	J	96% MgO	16	0.033	220	816	(1500)
404/2511	0.250	316 SS	K	96% MgO	16	0.033	220	871	(1600)
401/2512	0.313	Alloy 600	K	96% MgO	14	0.041	150	1093	(2000)
401/2513	0.375	Alloy 600	K	96% MgO	13	0.052	100	1093	(2000)

*To specify special limits add to code number: /SP

Double Element—Adjacent Conductors

Code* No.	Sheath Diameter	Sheath Material	Callbration	Insulation	Nominal AWG Gauge	Nominal Wall Thickness in.	Maximum Stock Length ft	Maximum Recommended Operating Temperature °C (°F)	
401/2507/050	0.125	Alloy 600	K	96% MgO	24	0.017	900	1093	(2000)
404/1507/050	0.125	316 SS	J	96% MgO	24	0.017	900	816	(1500)
402/1508/050	0.188	304 SS	J	96% MgO	21	0.025	350	816	(1500)
401/2511/050	0.188	Alloy 600	K	96% MgO	18	0.033	220	1093	(2000)
401/4511/050	0.250	Alloy 600	E	96% MgO	18	0.033	220	871	(1600)
404/1511/050	0.250	316 SS	J	96% MgO	18	0.033	220	816	(1500)

*To specify special limits add to code number: /SP