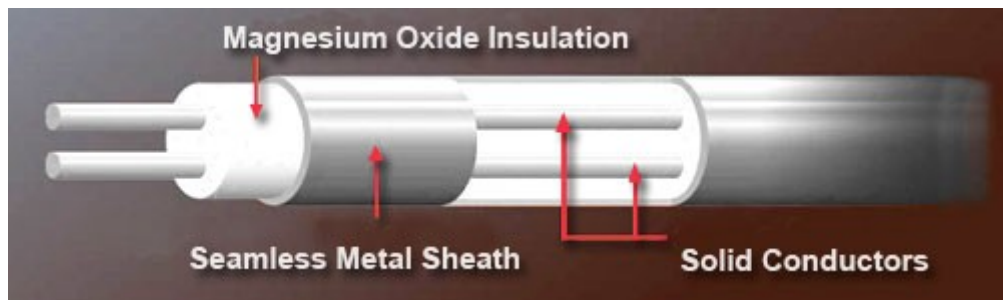




AerOpak® Mineral Insulated Thermocouples Cable



Selection guide

AerOpak® Mineral insulated Thermocouple Cable

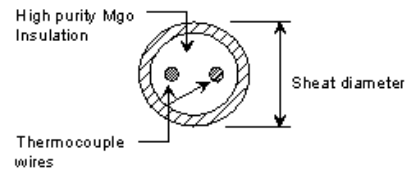
AerOpak® is a trade mark for our metal sheathed ceramic insulated cable and thermocouples. The AerOpak® construction result in thermocouple wires that are surrounded by a compacted mineral insulated (MgO) and contained in a sheath such as stainless steel or heat resistance steel. On basis of this AerOpak construction , a wide variety of otherwise difficult applications are possible. Compared with general purpose (Protection tube type) thermocouples. Sheathed thermocouples have many advantage.

Our product line of AerOpak® Mineral Insulated cable can be used under the most severe conditions that can destroy other types of thermocouple cable. Based on our rugged construction and with a large variety of sheath materials available, AerOpak® cable can be used in corrosive conditions up to the maximum range of the materials selected.

With our manufacturing capabilities, we can produce high quality AerOpak mineral insulated cable with outside sheath diameters from 0.010" to 0.750". Metric sizes, custom sizes, and heavy wall thickness cable is available on request.

General specification

Outside Sheath Diameter	±0.002" (±0.05mm) or ±1% of nominal diameter, whichever is greater
Wall Thickness	±0.001" (±0.03mm) or 10% of nominal wire diameter, whichever is greater, 15% of sheath diameter as a minimum
Wire Diameter	±0.0015" (±0.04mm) or ±15% of nominal wall thickness, whichever is greater, 10% of sheath diameter as a minimum
Calibration	To meet special limits of error as defined in ASTM-E230 and DIn IEC 60584-2



AerOpak® cables are produced according to DIN EN60515

Partnumber breakdown

Symbol	(1)	-	(2)	(3)	-	(4)	(5)	(6)
Example	120	-	4	M	-	B	K	S

With our manufacturing capabilities, we can produce high quality AerOpak® mineral insulated cable with outside sheath diameters from 0.004" (0.1mm) up to 0.750" (19 mm).

- (1) Sheath diameter Table 1
- (2) Number of wires Table 2
- (3) Insulation material Table 3
- (4) Sheath material Table 4
- (5) Thermocouple wire type Table 5
- (6) Special limits of error Table 6

Custom sizes, and heavy wall thickness cable is available on request.

Sheath diameter

Table 1

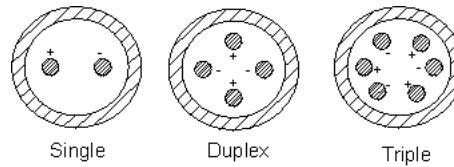
Symbols standard diameters (inches)	010	020	040	060	062	079	120	125	177	188	236	250	313	354	393	500	750
Metric sizes (mm)	0,25	0,50	1,0	1,5	1,6	2,0	3,0	3,2	4,5	4,8	6,0	6,4	8,0	9,0	10,0	12,7	19,0

For non standard sheath diameters write down the diameter in Inches Example : .375 for a 9.5 mm

Number of conductors

Table 2

Symbol	Number of thermocouple wires
2	Single
4	Duplex
6	Triple
9	Other



Insulation Materials

Table 3

Insulation type	symbol	Recommended max. operating temperature	Approx melting temperature	Comments
Magnesium Oxide (MgO)	M	1700°C	2800°C	Very hygroscopic and used mostly in compacted sheaths (99.4% pure)
Magnesium Oxide (MgO)	N	1700°C	2800°C	Very hygroscopic and used mostly in compacted sheaths (96.4% pure)

Sheath material

Table 4

Sheath type	symbol	Recomanded Max temperature.	Melting temperatur	Standard sheath diameters
AISI 304	A	900°C	1400°C	040, 060, 062, 079, 120, 125, 157, 177, 188, 236, 250, 313"
AISI 310	D	1090°C	1400°C	
AISI 316	C	900°C	1370°C	
AISI 321	E	1090°C	1350°C	
AISI 347	F	900°C	1400°C	125"
AISI 446	AG	1090°C	1400°C	120, 188, 236, 313, 500"
Inconel 600	B	1175°C	1345°C	020, 031, 040, 060, 062, 079, 120, 125, 157, 177, 188, 236, 250, 313, 500"
Inconel 601	BM	1200°C	1345°C	079, 120, 236"
* Pyrotenax Pyrosil®	PS	1250°C	1380°C	040, 060, 062, 079, 120, 125, 157, 177, 188, 236, 250, 313, 500"
Hastelloy x	V	1200°C	1260°C	120, 236, 313, 500"
Pt10%Rh	AH	1550°C	1850°C	On request (max .120")
Tantalum	N	2200°C	2995°C	On request
Alloy 825	BS	1200°C	1380°C	On request
** Haynes Alloy HR-160	HR-160	1200°C	-	On request

* Pyrotenax and Pyrosil® are trademarks of Tyco Thermal Controls LLC and its affiliates in designated countries

** High-temperature corrosion resistance Alloys. Life extensions HR-160 greater than 10x compared to Ni-Cr Alloys and stainless steels are common.

Thermocouple Wire type

Table 5

Symbol	Thermocouple	Recommended max. temperature	Recom. Temperature range
E	Cu-CuNi	850 °C	Oxidizing and reducing atmospheres
J	Fe-CuNi	750 °C	Oxidizing, reducing and vacuum atmospheres
K	NiCr-Ni	1200 °C	Oxidizing and inert atmospheres
N	NiCrSi-NiSi	1200 °C	Same general as typ K, but more stable. Less affect by Sulfurous atmospheren because of the Silicon addition
T	Cu-Ni	350 °C	Oxidizing, reducing, inert or vacuum atmospheres
S	Pt10%Rh—Pt	1450°C	Oxidizing or inert atmospheres
R	Pt13%Rh—Pt	1450°C	
B	Pt30%Rh—Pt6%Rh	870—1700°C	

Special limits of error

Table 6

Symbol	Limits of error (tolerance)
S	Class 1 according to IEC60584 or ASTM E230
-	Class 2

Note : Standard Aeropak® cable will be supplied as IEC60584-2 Class 1.

AeroSeal®

prevents penetration of moisture into ceramic insulation

AeroSeal® is specially developed inorganic liquid that prevents penetration of moisture into ceramic insulation. It is effective on magnesium oxide (MgO), aluminium oxide and similar materials used in thermocouples, metal-sheathed conductors and electric heating components.

AeroSeal® forms a positive moisture barrier!

Characteristics

Operating temperature : -240...+537°C continous

Thermal shock : Unaffected from +537°C to -185°C in two seconds



Order code
LDA-004

Bottle 0.88 L.

welding caps

for AeroOpak mineral insulated cable

Material	DIN	Order symbol (AWW-xxx)									
		040-	060-	062-	079-	120-	125-	177-	188-	236-	313-
Inconel600	2.4816	000	005	010	015	020	025	030	035	040	050
AISI 304	1.4301	100	105	110	115	120	125	130	135	140	150
AISI 310	1.4841	200	205	210	215	220	225	230	235	240	250
AISI 316	1.4401	300	305	310	315	320	325	330	335	340	350
AISI 321	1.4541	400	405	410	415	420	425	430	435	440	450
AISI 446	1.4762					520	525	530	535	540	550

Custom dimensions and material available on request

Weight and Coil length

Sheath diameter (inch)	Metric Equivalent (mm)	Average Weight (gr)	Average Length (m)
.313	8.0	319	40
.250	6.4	272	80
.236	6.0	174	90
.188	4.8	144	145
.177	4.5	99.8	165
.125	3.2	45	130
.120	3.0	40.8	150
.079	2.0	36.6	340
.062	1.6	17.5	165
.060	1.5	11.5	190
.040	1.0	9.7	430
.031	0.5	4.3	300



Sheath diameter according to operation temperature

Sheath diameter	Type K + N	Type E	Type J	Type T
Ø 0.10 mm	400°C	400	450°C	300°C
Ø 0.15 mm				
Ø 0.25 mm	500°C	450°C		
Ø 0.50 mm	600°C			
Ø 1.0 mm	650°C			
Ø 1.5 mm				
Ø 3.2 mm	750°C	650°C	350°C	
Ø 4.8 mm	800°C	800°C		
Ø 6.4 mm	1000°C			
Ø 8.0 mm	1050°C			

Insulation resistance

OD of AerOpak (mm)	Characteristics
Ø 0.1 < O.D. ≤ Ø 0.15	1MΩ/3 VDC
Ø 0.25 < O.D. ≤ Ø 0.50	5MΩ/50 VDC
Ø 0.50 < O.D. ≤ Ø 3.0	20MΩ/100 VDC
Ø 3.00 > O.D.	100MΩ/500 VDC

The insulation Resistance (IR) test is a test required by the electrical safety testing standards. The insulation resistance test consists in measuring the insulation resistance of a device under test, while phase and neutral are short circuited together.

A megohmmeter is used to measure the ohmic value of an insulator under a direct voltage of great stability. Insulation resistance of sheath thermocouple material, the electric shunting resistance between a pair.



kamet
thermoccomponents

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