

## Megopak Thermocouples

## Specification

### Overview

#### Function

Megopak Thermocouples are used for sensing temperatures from  $-200^{\circ}$  to  $1093^{\circ}\text{C}$  ( $-300^{\circ}$  to  $2000^{\circ}\text{F}$ ).

#### Description

Megopak is a combination of thermocouple wires, mineral insulation, and a protecting sheath drawn into a solid mass of small diameter.

These thermocouples are supplied in three forms:

- A. **Bulk Material**—The basic combination of wires, insulation, and protecting sheath.
- B. **Elements**—Consisting of the basic combination with the wires welded to form a measuring junction (three types of junctions are available).
- C. **Assemblies**—Complete thermocouples consisting of elements plus terminations (heads, plugs, jacks) and mounting attachments (Figures 1 and 2).

#### Accessories

- Mounting attachments (compression fittings in 1/8, 1/4, or 1/2 inch NPT).
- Brass or 316 stainless steel (not readjustable).
- 303 stainless steel (readjustable).

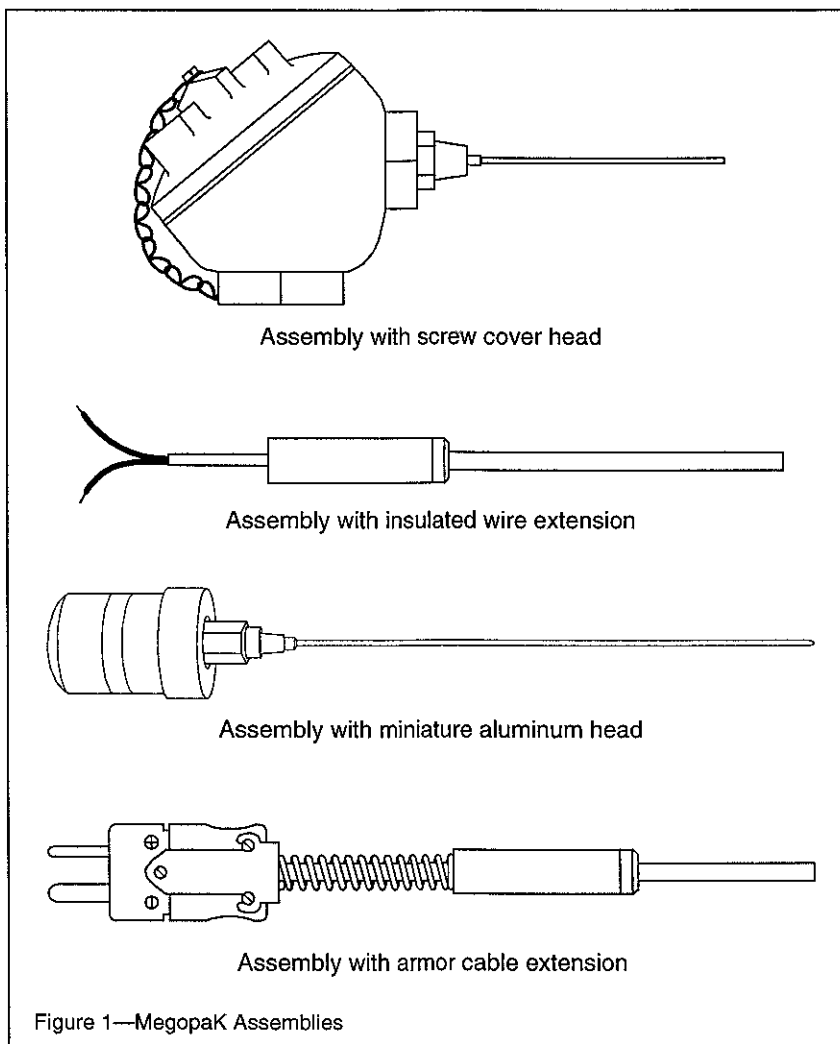


Figure 1—Megopak Assemblies

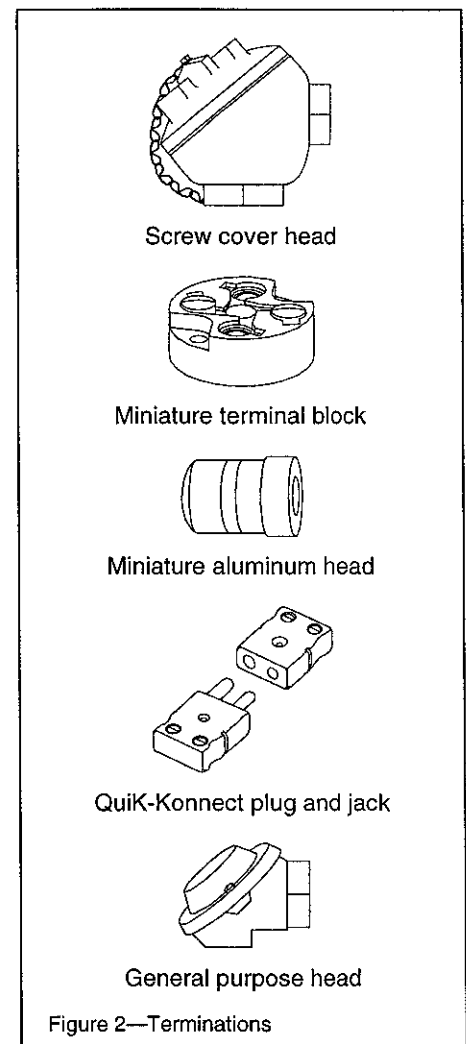


Figure 2—Terminations

## Specifications

Insulation Composition	99% magnesium oxide (minimum); 0.001% boron.							
Insulation Resistance (minimum)	2 megohms at 500 Vdc for 7.62-meter (25-foot) length at room temperature.							
Sheath Material	Type 310, 316 stainless steel or Inconel.							
Sheath Length	Any length up to 15.25 meters (50 feet) in increments of 25 mm (1 inch).							
Bending Radius	One sheath diameter (minimum).							
Speed of Response	The time for test thermocouples to respond to 63.2% of a step change in temperature.							
	Type of Junction	Sheath Diameter		Speed of Response (Seconds)				
		mm	inch	From Room Temp. to 100°C (212°F)	From Room Temp. to Salt Bath at 427°C (800°F)	From Still Air at 93°C (200°F) to Still Air at 815°C (1500°F)		
	Integral (Grounded)	1.6	0.063	0.2	0.3	9.0		
		3.2	0.125	0.7	1.1	16.0		
		4.8	0.188	1.5	3.0	23.0		
		6.4	0.250	1.7	3.8	32.3		
		9.5	0.375	2.8	7.3	44.5		
	Exposed	1.6	0.063	0.1	0.1	8.3		
		3.2	0.125	0.1	0.1	13.0		
4.8		0.188	0.1	0.2	21.0			
6.4		0.250	0.1	0.2	27.0			
9.5		0.375	0.1	0.2	27.5			
Remote (Insulated)	1.6	0.063	0.8	0.8	9.7			
	3.2	0.125	2.2	2.8	22.0			
	4.8	0.188	4.8	7.8	31.5			
	6.4	0.250	7.8	9.5	42.0			
	9.5	0.375	13.5	17.6	76.0			
Calibration Accuracy	Type of Wire	Limit of Error (whichever is greater)		Temperature Range	Type of Wire	Limit of Error (whichever is greater)		Temperature Range
	Type T	±1°C or ±1.5%		-200 to 0°C 0 to 350°C	Type E	±1.7°C or ±0.5%		0 to 900°C 32 to 1600°F
		±1°C or ±0.75%			±3°F or ±0.5%			
		±1.5°F or ±2%		-300 to 32°F 32 to 700°F	Type K	±2.2°C or ±0.75%		0 to 1093°C 32 to 2000°F
	±1.5°F or ±0.75%		±4°F or ±0.75%					
NOTE: When the limit of error is given in % the percentage applies to the temperature being measured, not the range.								
Wire Size and Nominal Sheath Wall Thickness	Approx. Nominal Wire Gauge (B&S)	Sheath		Approx. Nominal Wire Gauge (B&S)	Sheath			
		Millimeters (Inches)			Millimeters (Inches)			
		O.D.	Wall Thickness		O.D.	Wall Thickness		
	29	1.6 (0.063)	0.25 (0.010)	20	4.8 (0.188)	0.63 (0.025)		
	23	3.2 (0.125)	0.45 (0.018)	18	6.4 (0.250)	0.89 (0.035)		
14				9.5 (0.375)	1.32 (0.053)			
Recommended Maximum Long-Term Service Temperatures		Sheath Diameter						
	Material	1.6 mm (0.063")	3.2 mm (0.125")	4.8 mm (0.188")	6.4 mm (0.25")	9.5 mm (0.375")		
	Type T	315°C/600°F	371°C/700°F	—	—	—		
	Type J	649°C/1200°F	760°C/1400°F	760°C/1400°F	871°C/1600°F	871°C/1600°F		
	Type K	871°C/1600°F	871°C/1600°F	871°C/1600°F	982°C/1800°F	982°C/1800°F		
	Type E	—	—	871°C/1600°F	927°C/1700°F	—		

### Ordering Information

**For Bulk MegopaK Material**, select model number from Table I, and specify length in inches. Longest length available depends on sheath diameter.

EXAMPLE: 2T1M15-60 = Type T with 316 SS sheath 1.6 mm (0.063") diameter and 60 inches long.

**For Thermocouple Elements**, select model number from Table I followed by a letter selection from Table II plus desired length equal to the specified length plus 2 inches (51 mm) of exposed bare thermocouple wire.

EXAMPLE: 2K3M22-R48 = Type K with Inconel sheath 4.8 mm (0.188") diameter, remote junction and 48 inches long.

**For Assemblies**, select model number from Table I followed by a letter selection from Table II plus desired length of element in inches and the cold end termination designation from Table III. If mounting attachments and wire extension terminations are needed, make selections from Tables IV and V. Select the required length of insulated extension wire in inches from Table VI.

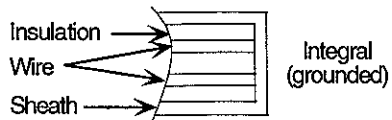
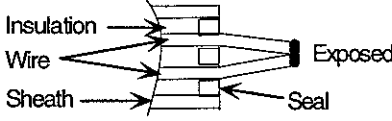
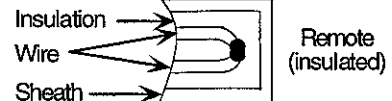
EXAMPLE: 2J1M15-G24-9S-D12-R0000 = Type J with 316 SS sheath 1.6 mm (0.063") diameter integral junction, 24 inch sheath length, 12-inch wire extension length, 316 SS compression fitting, 20 gauge insulated extension wire with fiberglass insulation and armor cable, Quik-Konnect jack termination on extension wire.

**TABLE I—MegopaK Bulk Material**

Element	Sheath Material	Sheath Diameter				
		1.6 mm (0.063")	3.2 mm (0.125")	4.8 mm (0.188")	6.4 mm (0.250")	9.5 mm (0.375")
Type T	316 Stainless Steel	2T1M15	2T2M15	—	—	—
Type J	Inconel	2J1M22	2J2M22	2J3M22	2J4M22	2J6M22
	310 Stainless Steel	2J1M14	2J2M14	2J3M14	2J4M14	2J6M14
	316 Stainless Steel	2J1M15	2M2M15	2J3M15	2J4M15	2J6M15
Type K	Inconel	2K1M22	2K2M22	2K3M22	2K4M22	2K6M22
	310 Stainless Steel	2K1M14	2K2M14	2K3M14	2K4M14	2K6M14
	316 Stainless Steel	2K1M15	2K2M15	2K3M15	2K4M15	2K6M15
Type E	316 Stainless Steel	—	—	2E3M15	2E4M15	—

Other types including special sheathing, 4-wire (duplex) type, and special calibrations are available. Consult Honeywell, Fort Washington, PA for complete information.

**TABLE II—Types of Measuring Junctions**

Specify Junction Symbol		Description
G*		Junction welded to tip of sheath provides faster response time than Type R junction.
E*		Sheath end is left open. Wires are welded and exposed for a length of one sheath diameter. Sheath end is sealed with cement. Seal is effective up to 538°C (1000°F).
R*		Junction is insulated from sheath.

\*Add length in inches.

**TABLE III—Cold End Terminations**

Type	Specify	Description
Heads	-1	General purpose head with 1/2" NPT conduit connection
	-3	Screw cover head with 1/2" NPT conduit connection
	-4	Screw cover head with 3/4" NPT conduit
	-11*	Miniature aluminum head without mounting bushing
	-12*	Miniature aluminum head with 1/4" NPT mounting bushing
Terminal Block	-13*	Miniature terminal block without mounting bushing
	-14*	Miniature terminal block with 1/4" NPT mounting bushing
Plug or Jack	-5*	QuiK-Konnect plug
	-6*	QuiK-Konnect jack
Insulated Wire Extension	-8†	Insulated wire extension
	-9†	Insulated wire extension, armored tubing
	-10†	Insulated wire extension, with armored tubing and junction box connector

\*Not available with 9.5 mm (0.375") O.D. sheath.

†These items require selections from Tables V and VI. Maximum temperature rating for standard transition sealant is 204°C (400°F).

**TABLE IV—  
Mounting Attachments (Compression Fittings)**

Specify	Material	Used with Tube Size		Mounting Thread (NPT)
		mm	inch	
R*	Brass (not readjustable)	1.6	0.063	1/8
		3.2	0.125	1/8
S*	316 S.S. (not readjustable)	4.8	0.188	1/8
		6.4	0.250	1/4
T†	303 S.S. (readjustable)	9.5	0.375	1/2

\*Fitting is assembled loosely on sheath and can be adjusted as required. After tightening, fitting cannot be relocated.

†Fitting can be readjusted on sheath at any time.

**TABLE V—Wire Extension Terminations**

Specify	Description	Available only with Table III Designations
A*	No end terminal ... wires bared 13 mm (0.5 in)	8, 9, 10
B*	Spade lug terminals	8, 9, 10
C*	QuiK-Konnect plug	8, 9
D*	QuiK-Konnect jack	8, 9

\*Specify desired length of extension wire, in 152 mm (6-inch) increments. Minimum length: 305 mm (12 inches).

**TABLE VI—Insulated Extension Wire**

Ordering Number*			Insulation	Maximum Temperature Limits**		Wire Size (B&S Gauge)
Type J	Type K	Type T		°C	°F	
3W2P6	5W2P16	1W2P6	Polyvinyl over Polyvinyl	105	221	20
9B3C6	9B2C6	—	Tempered Fiberglass	649	1200	20
9B3C7	9B2C7	—				24
A0000			Fiberglass	480	900	20
J0000			Glass and Metal Braid	480	900	20
R0000			Glass and Armor	480	900	20
C0000			Teflon	200	400	20
L0000			Teflon and Metal Braid	200	400	20
T0000			Teflon and Armor	200	400	20

\*Specify length of wire required in inches.

\*\*These limits apply to the insulation of the wire extension. The temperature at the transition between thermocouple and wire extension, however, must not exceed 204°C (400°F) unless specifically requested.

*Specifications are subject to change without notice.*