

Thermocouple Grade Alloys

Wire • Strip • Ribbon

JLC produces a wide range of alloys that are used to manufacture thermocouples, extension and compensating wires/cables. Thermocouples are formed by joining two dissimilar alloys that will produce a thermal EMF when the junctions are at different temperatures. Different grades of thermocouple alloys are used depending upon the temperature being measured.

Forms of Supply

Cold Drawn, Annealed.

Oxidized wire surface is also available for applications where corrosive atmosphere is present.

Specifications

JLC range of thermocouple alloys meets the specification of **ASTM E 230 and ANSI MC 96.1**.

JLC can also manufacture thermocouple alloys to conform to any of the following specifications: IS, IEC, DIN, BS, NF, UNI, ENI, JIS, ENEL, or GOST. Special tolerances and properties can be made available upon customer request.

JLC Thermocouple Alloys (According to ASTM E230 and ANSI MC96.1)

Type of Thermocouple	K KP-KN			J JP-JN			E EP-EN			T TP-TN			N NP-NN		
	Temp	EMF	Tolerance	EMF	Tolerance	EMF	Tolerance	EMF	Tolerance	EMF	Tolerance	EMF	Tolerance		
	°C	mV	°C %	mV	°C %	mV	°C %	mV	°C %	mV	°C %	mV	°C %		
	-200	-	± 2.2 ± 2	-	-	-	-	-	-	-5.603			-	-	
	-100	-		-		-		-		-3.378			-	-	
	0	0		0		0		0		0		0			
	100	4.095		5.268		6.317		4.277		2.773					
	200	8.137		10.777		13.419		9.286	± 1 ± 0.75	5.911					
	300	12.207		16.325		21.033		14.860		9.340					
	400	16.395		21.846	± 2.2 ± 0.75	28.943		20.869		12.972					
	500	20.640		27.388		36.999	± 1 ± 0.50	-		16.744					
	600	24.902	± 2.2 ± 0.75	33.096		45.058		-		20.609			± 2.2 ± 0.75		
	700	29.128		39.130		53.110		-		24.525					
	800	33.277		45.498		61.022		-		28.456					
	900	37.325		-		68.783		-		32.370					
	1000	41.269		-		-		-		36.248					
	1100	45.108		-		-		-		40.076					
	1200	48.828		-		-		-		43.835					
	1300	52.398		-		-		-		47.502					

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Standard & Special grades

The EMF tolerance of standard grade of alloys is according to the table presented on the previous page. JLC's special grades offer closer tolerances ($\frac{1}{2}$ and $\frac{1}{4}$ of standard grades) for applications where higher accuracy is needed.

Calibration

JLC thermocouple grades are calibrated over the temperature range according to international specifications. All our grades are individually calibrated versus **NBS Pt 67**. Each coil/spool is tested for EMF and value of deviation from the standard EMF at different temperatures is shown on the labels attached to each coil/spool. All JLC thermocouple materials are made conforming to EMF/temperature requirements for thermocouples as per **NBS monograph 125**. Alternatively, calibration is also performed as per **ASTM E220** comparison technique.

Nominal Physical, Electrical & Mechanical Properties (at room temperature for annealed wire)						
Alloy	Density g/cm ³	Electrical Resistivity at 20°C μΩ-cm	Temp Coeff of Resistance x10 ⁻⁶ /°C		Thermal Linear Expansion Coeff. b/w 20-95°C 10 ⁻⁶ /K	Thermal Conductivity W/m K
			Value	Temp range		
KP/ EP	8.72	70.6	300	20-100°C	17.0	19.2
KN	8.60	29.2	1900	20-100°C	17.0	29.7
EN/JN/TP	8.90	49.0	60	20-100°C	14.0	21.4
Fe	7.86	13-14	5000	20-100°C	11.7	66.2
NP	8.53	100.0	90	20-100°C	17.0	13.0
NN	8.58	36.5	680	20-100°C	17.0	27.0

Note: JP is Iron and needs to be supplied in calibrated form, always along with JN. TP is regular electrolytic Copper.

Final Inspection & Testing

Each spool/coil of JLC thermocouple, extension and compensating alloy is calibrated according to specifications given above. JLC thermocouple alloys are fully tested for homogeneity of chemical composition, physical, and thermoelectric properties. This includes the testing of electrical resistivity (loop resistance), which is an important property of thermocouple alloys.

Size Range

JLC thermocouple materials are available in different sizes (mm/AWG/SWG) or resistance based upon customer's requirement.

Form	Dia (mm)	AWG
Wire	0.142-8.255	0-35

Strips and ribbons are also available in various sizes upon request