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**	
°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	-	-
100	4.095	± 2.2	± 0.75	5.268	± 2.2	± 0.75	6.317	± 1	± 0.50	4.277	± 1	± 0.75	2.773	±2.2	±0.75
200	8.137			10.777			13.419			9.286			5.911		
300	12.207			16.325			21.033			14.860			9.340		
400	16.395			21.846			28.943			20.869	-		12.972		
500	20.640			27.388			36.999			-			16.744		
600	24.902			33.096			45.058			-			20.609		
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 (½ and ¼ 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 confirming 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 $\mu\Omega$-cm	Temp Coeff of Resistance x10^{-6}/°C Value	Temp range	Thermal Linear Expansion Coeff. b/w 20-95°C 10^{-6}/K	Thermal Conductivity W/m K
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/TN	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

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