Thermocouple Wire

Thermocouple features

- Type E (chromel-constantan) has the highest sensitivity among the standard thermocouple types typically used at low temperatures. The best choice for temperatures down to 40 K.
- Type K (chromel-alumel) Recommended for continuous use in inert atmospheres. Has a sensitivity of 4.1 mV/K at 20 K (about ½ of Type E).

Thermocouple wire is used in a variety of cryogenic applications, but special techniques must be employed to approach temperature accuracies of 1% of temperature, even without consideration for the effects of high magnetic fields or high radiation fluxes. The problems are further complicated by exposure to variable gradient conditions at cryogenic temperatures.

Many Lake Shore temperature controllers offer inputs that accommodate most common types of cryogenic thermocouple wire in use.

Note:

Heat conduction down the thermocouple wire is the same as with lead wire going to any other sensing device. Refer to Appendix C: Conduction (Lead Attachment) for more detailed information.

See Appendix G for thermocouple curve data.

Typical magnetic field-dependent temperature errors[1] ΔT/T (%) at B (magnetic induction)

	Type E thermocouple[2]		
	2.5 T	8 T	14 T
10 K	1	3	7
20 K	<1	2	4
45 K	<1	<1	2

[2] *Useful when T ≥ 10 K. Refer to comments for chromel-AuFe (0.07%)*

Range of use

	Minimum limit	Maximum limit[3]
Type E	3.15 K	953 K
Type K	3.15 K	1543 K

[3] *Upper limit dependent on wire size; to achieve higher than 473 K, insulation must be removed*

Part number Explanation

TC = Thermocouple
Y = Wire type, E or K
ZZ = Wire diameter excluding insulation
XX = Wire length in meters

	Wire gauge	
	30 AWG	36 AWG
Type E	TC-E-30-XX	TC-E-36-XX
Type K	TC-K-30-XX	TC-K-36-XX

Ordering information

Thermocouple wire	36 AWG = 0.005 in (0.127 mm) diameter wire, excluding insulation 30 AWG = 0.010 in (0.254 mm) diameter wire, excluding insulation All thermocouple wire is Teflon® insulated—76.2 µm wall
Part number	**Description**
TC-Y-ZZ-03	Thermocouple wire — 3 m
TC-Y-ZZ-06	Thermocouple wire — 6 m
TC-Y-ZZ-10	Thermocouple wire — 10 m
TC-Y-ZZ-20	Thermocouple wire — 20 m
TC-Y-ZZ-50	Thermocouple wire — 50 m