

Technical Note No. 102-C

Soldering Thermocouple Wires

When soldering iron and nickel alloys, the correct flux is needed. Standard rosin flux is not effective. Thermocouple materials are listed here for reference.

TC	Insulation color	Alloy	Composition	Will standard rosin flux work?
J+	White	Iron	Iron	No
J-	Red	Constantan	55% Cu – 45% Ni	Yes
K+	Yellow	Chromel	90% Ni – 10% Cr	No
K-	Red	Alumel	95% NI – 2% Mn – 2% Al	No
T+	Blue	Copper		Yes
T-	Red	Constantan	55% Cu – 45% Ni	Yes
E+	Violet	Chromel	90% Ni – 10% Cr	No
E-	Red	Constantan	55% Cu – 45% Ni	Yes

Identification notes: Iron and Alumel are magnetic. Constantan is silver colored.

Notes:

- Use *Rectorseal Aqua Flux* for soldering Iron, Chromel and Alumel. Michigan Scientific Corporation stocks this flux.
- Rosin flux and *Rectorseal Aqua Flux* are not corrosive. *Kester 2331ZX Water Soluble Organic Flux* can be used in place of the *Rectorseal Aqua Flux*, but it is more corrosive so it is recommended clean it off with water shortly after soldering. Fluxes containing zinc chloride are corrosive. If zinc chloride fluxes are used, the solder joints need to be neutralized by brushing with ammonia and then water. Do not leave *Kester 2331ZX* uncleaned overnight
- Use 24 AWG or smaller thermocouple wire.

Instructions:

1. Cut the insulation off the end of the wire and remove any existing oxide. Do not use thermal wire strippers, because they can create an oxide layer on the wire. Type K is especially difficult to tin unless the oxide is mechanically removed first. For stranded wire, grit blasting is the only effective removal technique. It is recommended to use new wire.
2. Stir the flux.
3. Dip the end of wire in the *Aqua Flux*.
4. With a solder iron, “tin” (plate) the wire with solder. Steps 3 and 4 may need to be repeated multiple times to achieve good plating. Michigan Scientific uses *Kester Sn96.5 Ag03 Cu0.5* solder with 3.3% #48 rosin core. The rosin core does not interfere. The solder iron should be 500°F to 600°F when using this method.
5. After the wire is tinned, it can be wrapped around a solder terminal and soldered with *Aqua Flux* or rosin flux.
6. Clean off any excess *Aqua Flux* by brushing with water. Alternatively, clean off rosin flux with rosin flux remover (50% alcohol, 50% toluene).
7. Check for electrical insulation; the resistance between the leads and the slip ring housing should be several hundred MΩ and the thermocouples should also be insulated from each other. The resistance should be greater 2,000 MΩ.

Rectorseal's Product data and MSDS sheets are available for download at www.rectorseal.com.

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