Soldering Thermocouple

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.

Use Rectorseal Aqua Flux for soldering Iron, Chromel and Alumel. Michigan Scientific Corporation stocks this flux in 2oz containers. Use 24 AWG or smaller thermocouple wire. Cut the insulation off the end of the wire and scrape away any existing oxide. Don't 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 way that works really well. We have also given up using wire that is several years old, it can have thick oxide which makes it impossible to solder. Use new wire.

Stir the flux. Dip the end of wire in the Aqua Flux. With a solder iron "tin" (plate) the wire with 60/40 solder. You may need to dip the wire in the flux and "tin" the wire 3 or 4 times to achieve good plating. (We use Kester 60/40 solder with or without #44 or #66 rosin core. The rosin core doesn't seem to interfere. The solder iron should be 500 to 600 F.) After the wire is tinned, it can be wrapped around a solder terminal and soldered with Aqua Flux or rosin flux.

Clean off Aqua Flux by brushing with water. Clean off rosin flux with rosin flux remover (50% alcohol, 50% toluene). Check for electrical insulation; the resistance between the leads and the slip ring housing should be several hundred Megaohms and the thermocouples should also be insulated from each other. We expect the resistance to be above 2000 Megaohms.

Rosin flux and Rectorseal Aqua Flux are not very corrosive. Kester 2331ZX water soluble organic flux can be used in place of the Rectorseal Aqua Flux, but seems more corrosive so we clean it off with water shortly after soldering.

Fluxes containing zinc chloride are quite corrosive. If zinc chloride fluxes are used, the solder joints need to be neutralized by brushing with ammonia and then water.

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

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