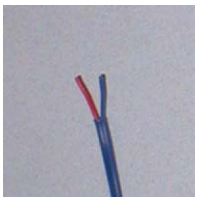
How to make a Thermocouple

The information provided here describes the proper method for making a reliable thermocouple. The importance of a reliable thermocouple cannot be overstated. Thermocouple problems are the number one reason for poor system performance. For SURE CURE equipment, use only Type T thermocouple wire.

1. Remove Insulation

All thermocouple wire consists of a pair of wires. These two wires are individually insulated. A second layer of insulation surrounds both wires.

Remove both layers of insulation from the two wires for 3/8–1/2 inch as shown in the photos. Shielded thermocouple wire also has a thin layer of aluminum shielding and a third wire that does not have its own layer of insulation. Strip away the aluminum shielding and trim the bare wire as far back as the outer insulation has been stripped.



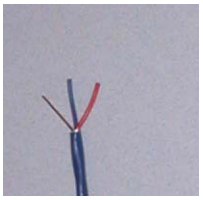
Unshielded wire with outer insulation stripped

Shielded wire with outer insulation stripped

2. Twist Wires

Hold the thermocouple wire securely near where the insulation has been stripped. With your other hand, twist the two bare sections of wire together for 3–4 turns. Twist the wires once more using needle-nose pliers. After twisting the wires, trim the two ends to prevent them from sticking out at an angle.

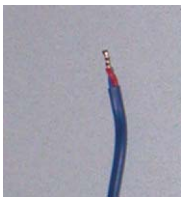
Unshielded wire with outer and inner insulation stripped



Shielded wire with outer insulation stripped and shielding removed

2a. Solder Wires

If your thermocouple is to be used repeatedly or if you desire a more reliable thermocouple, you should solder the wires together. Apply a small amount of solder to the twisted wires to ensure that they maintain good contact.



Twisted unshielded wire

Stripped shielded wire with ground wire trimmed

3. Insulate Exposed Wires

It is imperative that the exposed wires of the thermocouple be insulated. An uninsulated thermocouple can allow a power surge (e.g., lightning strike) to travel up the thermocouple and damage the electronic components of the SURE CURE control system.

Wrap 1–2 inches of electrical tape around the exposed metal of the thermocouple so that the metal is completely covered. (Too much electrical tape will insulate the thermocouple and cause the temperature readings to lag behind the actual temperatures.)

Another effective way to insulate the thermocouple is with heat-shrink tubing. Be sure that the tubing completely covers the bare, twisted ends of the wire. Apply heat to shrink the tubing into place. A tiny dab of caulk can be used to completely seal the tubing.

Soldered, twisted unshielded wire

Twisted shielded wire

Complete thermocouple using unshielded wire and shrink tube for electrical insulation

Complete thermocouple using shielded wire and electrical tape for electrical insulation

How to Connect Thermocouple Wires to Plugs

1. Remove Insulation

Remove the inner insulation from the two thermocouple wires for about 1/4 inch. Remove the outer layer of insulation an addition 3/8 inch.

For shielded thermocouple wire there will be a thin layer of aluminum shielding and a third wire that does not have its own layer of insulation. Strip away the aluminum shielding as far back as the outer insulation has been stripped. If you are connecting shielded wire to a 2-pole plug, trim the third wire back as far as the outer insulation has been stripped.

2. Bend Wires

Using needle-nose pliers, bend the tip of each wire clockwise so that it will go around the terminal screw on the thermocouple plug. (If you bend the wires counterclockwise, they will be less likely to make a secure connection since the screws turn clockwise to tighten.)

3. Terminate Wires

Place the bare, curved end of the copper (blue) wire around the matching screw on the plug. If needed, use a small screwdriver to bend the wire more tightly around the screw. Holding the wire securely, tighten the screw snugly onto the wire. Do not overtighten.

Repeat this process for the constantan (red) wire. If using shielded wire with a three-pole plug, repeat this process again to attach the bare wire to the terminal screw marked "G" on the plug.

Warning: Do not strip too much insulation from the wires. Too much bare wire will allow the wires to make contact at the plug. If the wires make contact at the plug, the computer will read the temperature at the plug instead of the temperature at the product.

4. Replace Plug Cover

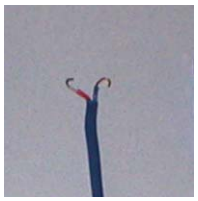
When replacing the cover on the thermocouple plug, we strongly recommend using a "cable clamp" to prevent damage to the thermocouple wire and to extend the life of the plug. To use a cable clamp, discard the two screws and nuts used to hold the cover onto the plug. (The nuts are recessed in the bottom of the plug.)

Place the threaded side of the cable clamp on the bottom of the plug so that the threaded holes line up with the holes that held the nuts. Position the cover on the plug and place the remaining side of the cable clamp on top of the cover so that the holes line up.

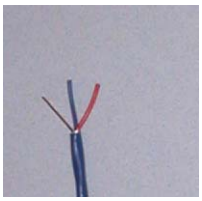
Use the two long screws provided with the cable clamp to secure the clamp and plug cover. The two small screws are used to secure the opposite end of the clamp around the wire.

Stripped unshielded wire.

Shielded wire with outer insulation stripped.

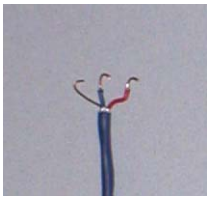


Unshielded wire, stripped and bent.

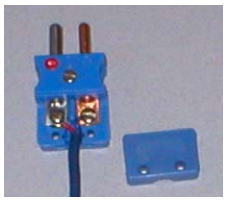


Stripped shielded wire, shielding removed

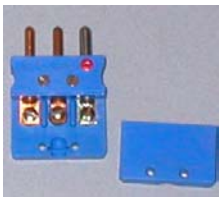
2-pole plug with cover off.



Shielded wire, stripped and bent.

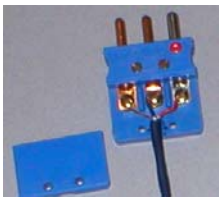


Unshielded wire attached to 2-pole plug.

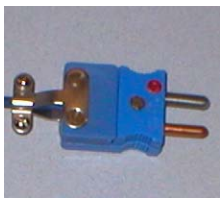


3-pole plug with cover off.

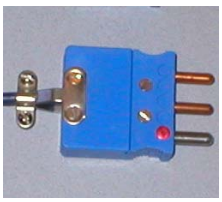
Cable clamp.



Shielded wire attached to 3-pole plug.



Completed 2-pole plug.



Completed 3-pole plug.