

The Kiln Corner— The Thermocouple

by Arnold Howard

Though I work for Paragon Industries, L.P., the information in this column applies to all brands of glass kilns. Feel free to send questions for this column no matter what brand of kiln you own.

What is a thermocouple?

The thermocouple reads the kiln's temperature. It is the small rod that extends into the firing chamber.

If a thermocouple is pushed part of the way into the kiln wall, will the thermocouple read hotter or cooler than the correct temperature?

During firing, the temperature within the kiln wall is lower than the temperature in the firing chamber. So if the thermocouple is pushed into the firebrick wall, the thermocouple will register a lower temperature than the firing chamber. This will cause the controller to keep the elements turned on longer to compensate for the low reading, resulting in an overfire.

If the thermocouple extends into the firing chamber by 1/8" instead of the recommended 3/4" to 1", the overfire will be only a few degrees. If you are firing slowly and the heat has soaked into the firebricks, there might not be an overfire at all. But if the thermocouple tip has been pushed well past the firebrick surface, the overfire could be as high as several hundred degrees Fahrenheit.

Another factor is distance to the elements. If the thermocouple hole is near an element, the kiln might not overfire at all when the thermocouple tip is flush with the firebrick surface.

It is very important to not disturb the thermocouple, either by bumping it with a shelf or twisting it. Twisting the thermocouple can cause the two thermocouple wires to touch each other at some point inside the kiln wall. This could short out the thermocouple tip and cause the thermocouple to read the temperature from inside the firebrick wall where the crossed thermocouple wires are touching. This would overfire the kiln.

I am getting a thermocouple error message. How does one test a thermocouple?

Here is a simple thermocouple test that works with most brands of controllers and will help you determine if a thermocouple error message is due to the thermocouple or the controller:

1. Unplug or disconnect the kiln. Remove the controller board from the switch box. On Paragon kilns, remove the four corner screws from the controller faceplate. Lift the faceplate out of the control panel.
2. Look at the back of the controller circuit board. You should see two thermocouple wires connected to the board. Disconnect those two wires. (Controllers have either screw connectors, lever connectors, or push-button connectors.)
3. Insert a thin piece of wire such as a bent paper clip in the thermocouple connectors on the back of the controller.



Check your controller instruction manual for the correct distance that the thermocouple should extend into the firing chamber of your kiln.



A loose thermocouple screw can cause erratic temperature readings in the controller display window.

4. Place the controller faceplate onto the kiln's switchbox with a couple of screws. Connect the power to the kiln. If the board reads room temperature, the thermocouple is causing the error message. But if the error message remains in the display window, you may need to have the controller checked.

I replaced the thermocouple, and now the kiln no longer fires accurately.

There are several diagnostics questions to consider:

1. Did you replace the thermocouple with the same type as the old one? Glass kilns use the Type-K thermocouple. Types K, R, and S are not interchangeable.
2. Are all the thermocouple wire connections tight? (A thermocouple screw can be tight, but the thermocouple wire under the screw can be broken and barely making contact with the screw.)
3. Are the wires connected to the correct color-coded terminals? (If one end of the thermocouple wires is reversed, the controller will not operate. It is possible to fire the controller if the thermocouple wires are reversed at both controller and thermocouple ends, but the temperature will be off.)
4. Is the thermocouple touching the stainless steel kiln jacket?
5. Is the thermocouple pushed far enough into the firing chamber?

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Arnold Howard writes instruction manuals and advertisements for Paragon Industries, L.P. His hobbies are glass fusing and karate. He also enjoys studying history and watching classic movies. You can reach Arnold at ahoward@paragonweb.com with questions for future columns. Visit www.paragonweb.com to sign up for his kiln newsletter.