

Upgrade the Kiln with PID Controller.

Upgrading the kiln with PID controller normally requires three items, PID controller, switching device and thermocouple. Some kiln may already have the switching device and thermocouple that can be used.

1. Switching device

The first thing you need to decide is what type of switching device you want to use.

Is the kiln use electric heater or gas heater? For gas heater, please see section B.

A) Kiln with electric heater. The commonly used switching devices for kiln are contactor, SSR and mercury switch.

The contactor (also known as electromechanical relay) is economical, safe and simple to use. But it has limited life time and is noisy when switching. To extend its life, it has to be switched at slower rate than the other two types of switch. That will reduce the control precision (temperature stability) for some system.

The SSR (or solid state relay) has infinite life time when used properly. It can be switched at high frequency for a tighter temperature control. There are several disadvantages for it also. Because it is made of semiconductor, it has limited internal resistance that will cause it to heat up when passing current. A heat sink is needed for SSR. When current is more than 40 Amp, the heat sink has to be cooled by forced air (fan blower). SSR is also sensitive to the voltage spike in the power line. It can be damaged by voltage surge due to lightening or inductive load switching. When it fails, it normally ends up shorted, which will cause the kiln to keep heating. Another issue is that SSR normally is used to switch only one of the power lines. When 240VAC is used, the heater will stay at high voltage even if the SSR is off. Therefore, a mechanical switch (or a contactor) should be installed in the power main entrance to cut off the power completely when not in use.

Mercury switch does not have the disadvantage of either SSR or contactor. It does not produce heat and has very long lifetime. However, it is expensive and may not be allowed to use in some state. Normally, a SSR is required to drive the mercury switch. Here is a link from Joppa Glass that shows how it is wired.

http://joppaglass.com/elements/kiln_control/WIRING_PLANS/240%20VAC%20Wiring%20Plan.pdf

Selecting which type of switching device to use can be confusing. It depends on the application requirements, budget, and tradition. Here are our observations. For kiln used on ceramic or powder coating oven that normally involves very high power heater, contactor is the most common switching device used. For glass kiln, we saw all three types of switching device were used. For heat treatment oven where the precision is very important, SSR is more common than other type of switching device. For example, most high precision kilns made by Blue M use SSR.

To select the switching device, it is also important to know the electric current that heater will draw. Some kilns do not have a label for the current. You need to find the current by the information on wattage and voltage. The relation is

$$\text{Current} = \text{Wattage}/\text{Voltage}.$$

e.g. a 5600 watts, 240V heater will draw 23.3 Amp. You should select a switching device that has 25 A or more capacity. A 30A contactor or a 25A SSR can be used.

B) Kiln with gas heater. This type of heating is controlled by a solenoid valve. You should use the controller with relay control output.

2. Controller.

For glass and heat treatment kiln, a controller with ramp/soak function must be used to control the temperature rising and dropping rate. We have 4 models with ramp/soak function. The function of them is the same. The only difference is the size and output configuration. For the 1/16 DIN size (48x48 mm or 1.89x1.89"), we have SYL-2342P for contactor control and SYL-2352P for the SSR and Mercury switch control. For the 1/4 DIN size (96x96 mm or 3.8x3.8"), we have SYL-4342 for contactor control and SYL-4352P for the SSR and Mercury switch control. Here are the links.

http://www.auberins.com/index.php?main_page=product_info&cPath=1&products_id=4

http://www.auberins.com/index.php?main_page=product_info&cPath=1&products_id=5

http://www.auberins.com/index.php?main_page=product_info&cPath=1&products_id=102

If you don't need to control the heating up speed (ramp rate) and only need control at one temperature set point, you should use our standard PID controller that is much simpler to use.

http://www.auberins.com/index.php?main_page=index&cPath=1

3. Thermocouple.

A) If you need to go above 2000 °F (1100°C), you need a K type thermocouple with ceramic body.

http://www.auberins.com/index.php?main_page=product_info&cPath=3&products_id=39

If the kiln uses gas heater, you also need to add a ceramic sheath. Here is the link.

http://www.auberins.com/index.php?main_page=product_info&cPath=3&products_id=40

B) If you work above 750 °F (400 °C) but below 2000 °F (1100 °C), you can use this probe.

http://www.auberins.com/index.php?main_page=product_info&cPath=3&products_id=22

C) If work under 750 °F (400 °C), you can use any of the thermocouple listed at [auberins.com](http://www.auberins.com)