WiFi Programmable PID Temperature Controller User Guide

This is a Digital, Programmable, Proportional-Integrator-Derivative (PID), Web-Enabled Temperature Controller (WiFi Programmable PID Thermocontroller). It provides an excellent and simple way to control temperature variability to have it closely match a target value. Implementing PID control offers a way to account for error accumulating over time and allows the system to "self-correct". Once the temperature exceeds or drops below the target value input in the program (temperature value), the PID controller starts accumulating error. This accumulated error informs future decisions the controller makes to limit the overshoot in the future, meaning there is better control over the programmed temperature.

Our thermocontroller has a WiFi access point named "ThermoController". Once you connect to it you get access to the controller management through a web interface. You can connect using any device with a web browser, e.g. PC, tablet, smartphone etc. independent of whether the device is Windows, Linux or iOS.

You can change existing and create new temperature curves with the curve editor. Just drag the points on the graph to the correct position and drop it. You can also use the text fields below to enter specific values manually. The resulting slopes are calculated automatically for convenient datasheet comparison.

Features:

- easy to create new kiln programme or modify an existing one
- no limit on runtime – the kiln can fire for days
- view status from multiple devices at once - computer, tablet etc.
- NIST-linearized conversion for accurate K-type thermocouple readings
- monitor temperature inside of the kiln after the programme has ended

Technical specifications:

- Voltage input: 110V - 240V AC
- SSR input current: </= 100mA
- SSR input voltage: >/= 3V
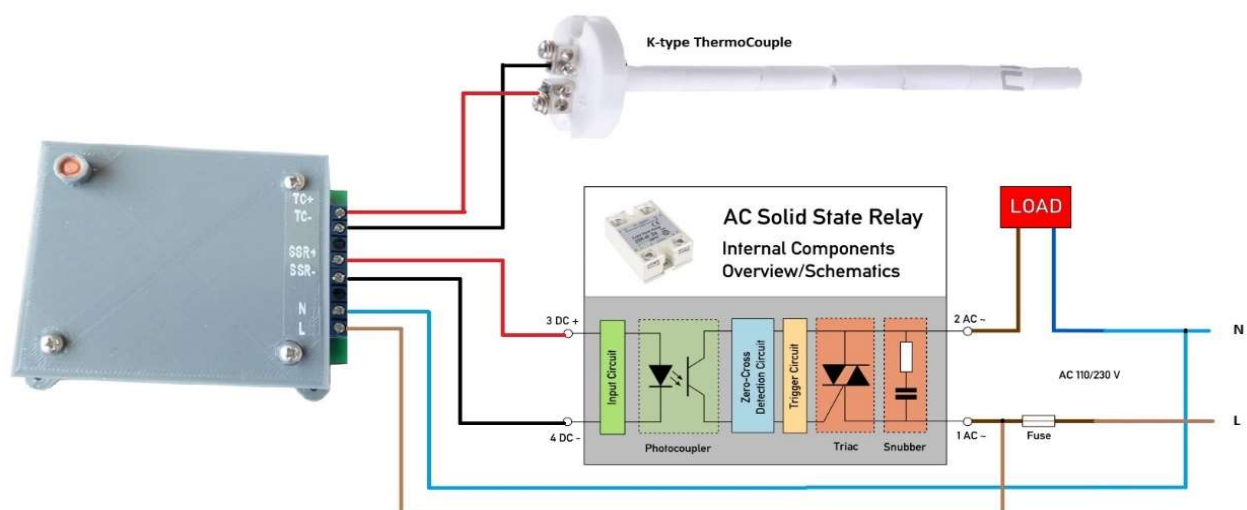- ThermoCouple Sensor: K-type only

Figure 1. Typical thermocontroller wiring diagram.

1. How to use the thermocontroller:

To be able to use the thermocontroller please make sure that your device can work through WiFi connection and has a web browser. You can use PC, laptop, tablet, or smartphone independent of the operating system (Windows, Linux, iOS, Android etc).

Once you have connected all the necessary items to the thermocontroller (**Fig. 1**), switch the thermocontroller power supply on. Then, on your device of choice that you will use to manage the thermocontroller open the WiFi connection manager, find the access point 'ThermoController' and connect to it. Please also input the word combination 'ThermoController' as a password.

Next, open your web browser, input 192.168.4.1:8888 in the address bar and click 'Go' or 'Enter'. You will then see a web interface opening, which will now allow you to manage the thermocontroller. Please refer to **Figure 2**.

Figure 2. Thermocontroller WEB Interface. (1) Current temperature; **(2)** Currently programmed temperature; **(3)** Remaining time until the program run ends; **(4)** Completion progress; **(5)** Pre-set programs list; **(6)** Edit selected program; **(7)** Add/save new pre-set program; **(8)** Start/Stop button.

Choose the programme you need from the dropdown menu (**Fig 2., label 5**), then click 'Start' (**Fig 2., label 8**). You will see a pop-up window coming up showing the title for the program you have chosen to run, the estimated run time, and an approximate electricity consumption and cost needed to complete the program (**Fig 3**). However, please take into account that the electricity consumption and cost is a very rough estimate and is only there to give you a very rough idea of the numbers. This estimate does not guarantee that you will use exactly that much electricity at that specific cost.

Now, you can confirm the chosen program by clicking 'Yes, start the Run', which will start the run. Alternatively, if you want to change something click 'No, take me back', which will take you back to the original web interface window.
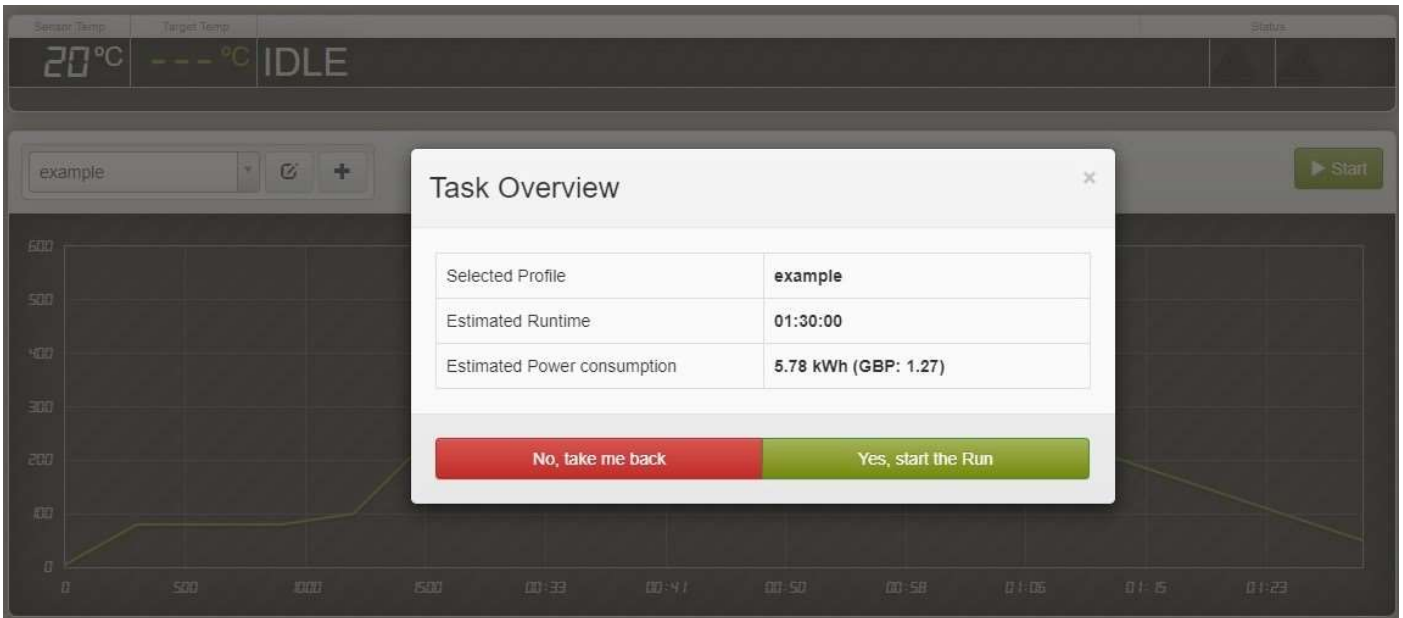
Figure 3. Pop-up window showing program name, run time, and estimated electricity consumption.

2. How to create a new program

In the main interface window click on the + button (**Fig. 2, label 7**) to start creating a new program. An editor window will open (**Fig. 4**), but it will be empty. You can now add or delete individual program steps by clicking '+' or '-'. If you do not require your program to be highly accurate you can drag the points corresponding to each program step you created onto the graph to your chosen location. You can do that by clicking and dragging with your mouse (PC, laptop) or taping and dragging with your finger (smartphone, tablet). Later, you will also be able to edit the points in the text input mode.

If you need to input very accurate point coordinates straight away, then you can go straight to the text input mode by clicking the button labelled **1** in **Figure 4**.

Figure 4. Editor Window. Y-axis – temperature, x-axis – time.

Once you clicked the button, you will see a window open as shown in **Figure 5**. Please take note: the time you input in the time fields corresponds to the time scale represented by the x-axis (**Fig. 4**), meaning the time commenced since the start of the program run. It does **NOT** correspond to the duration of the program step.

Here is a breakdown for the example program shown in **Figure 5**:

Step 1: Start at 0 minutes and 5ºC (usually here you input a temperature a bit lower than the temperature in the room where you are working).

Step 2: Raise the temperature to 80ºC within 5 minutes (type in 5 min and 80ºC).

Step 3: Hold the temperature at 80ºC for 10 minutes (type 80ºC, but to calculate the time add 10 minutes to the 5 minutes in step 2, so input 15 minutes).

Step 4: Raise the temperature to 100ºC within 5 minutes (type in 100ºC, for the time calculation add 5 minutes to the previously calculated 15 minutes, thus type in 20 minutes).
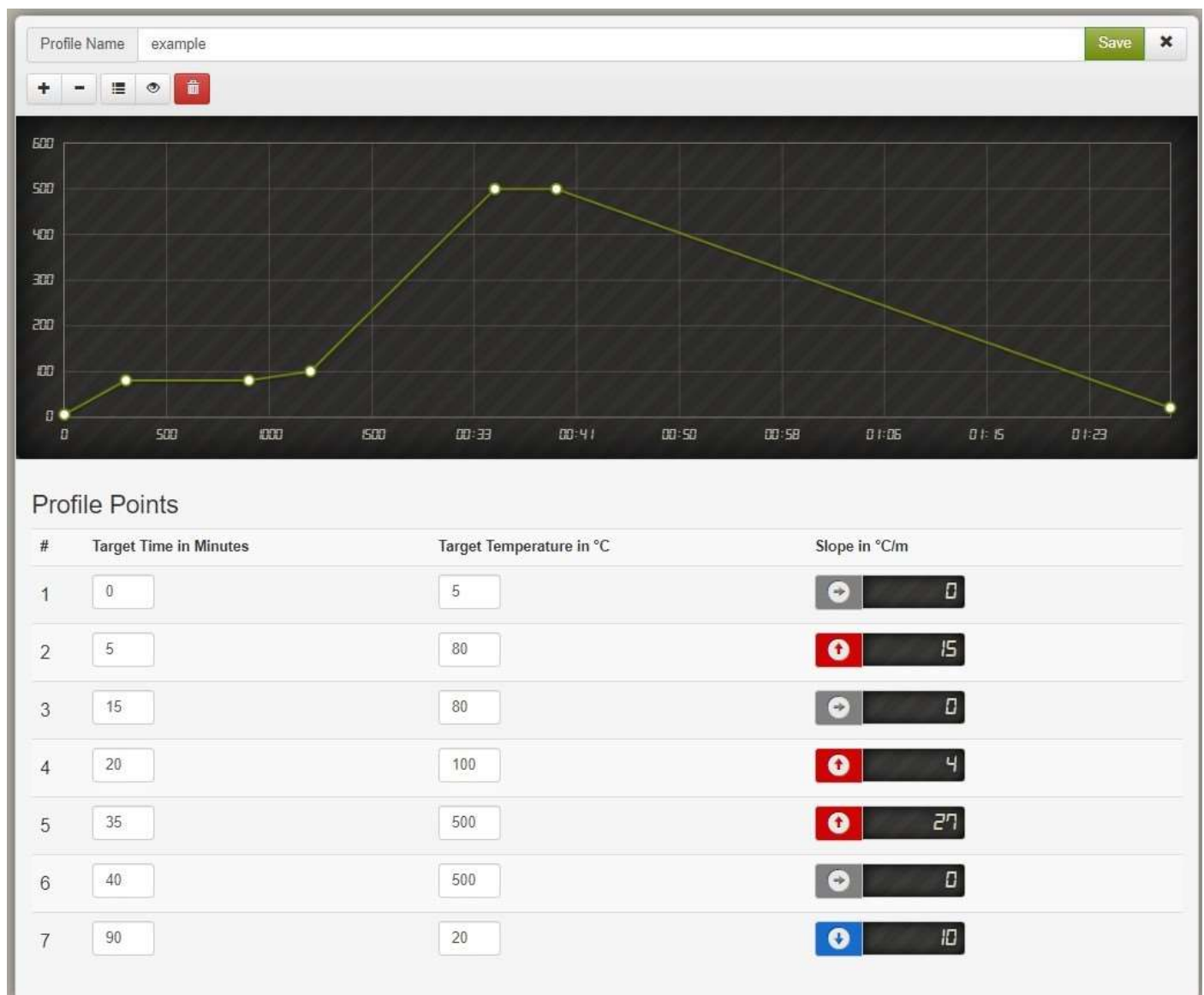
And so on.

Figure 5. Text editor window showing an example of a program steps input. Here you can input accurate time and temperature values for each program step.

Once you have filled in all the values in your program you can save it by typing in a program title of your choice in the 'Profile Name' field and then clicking/tapping on 'Save' button.

Please take note:

A: When the controller is switched on, for the first 3-5 minutes the temperature values displayed will be slightly lower or higher than the actual temperature. This is normal, and after around 5-10 minutes the system will start taking into account the ambient temperature in the room and inside the controller. It will then stabilise and start displaying accurate temperature. You can start working despite of this temperature difference because the controller starts showing accurate temperature readings when the temperature is in the range of 100°C - 1260°C.

B: Please do not put the thermocontroller in any place prone to heating up to temperatures above 50°C. If you place the thermocontroller in a box, you need to ensure that the temperature within that box does not exceed 40-50°C. If the temperature does get quite high in the box, you would need to arrange for a good ventilation.

C: To connect thermocouple to thermocontroller please use a special extension K-type wire or a multicore copper wire with a wire section of 0.5mm². It is preferable to have a twisted pair.

D: If you are planning to use a few of our controllers at home then you should let us know before or immediately after placing the order. We will then set up your controllers to have different IP addresses so that there is no IP conflict when you start using them.