

KCL - 05

**TEMPERATURE CONTROLLER
TRAINER**



Temperature control is an important application of control theory to industrial processes. This experiment has been designed to expose the students to such a practical control system, its various stages for control, and the tuning of a PID controller. The process consists of a small and fast responding oven which can be controlled in the temperature range from ambient to about 90°C. Temperature readings may be taken manually on a 3½ digit meter, mounted on the main unit, at regular intervals.

The oven is connected to the main unit through a four pin connector, two for the sensor output and the others for controller output to the heater. The main unit has provisions for configuring any type of controller such as P, PI, PD, PID or ON-OFF, and has potentiometer controls for PID coefficient settings. All supplies and metering system are built-in and no accessories are required.

Open loop response of the oven is obtained by applying a step command with feedback disconnected. Temperature readings are noted and the plot so obtained provides the characteristics of the oven, i.e., its time constant and time delay.

The simplest form of controller is a relay which switches the oven ON and OFF. Presence of hysteresis is essential for avoiding excessive relay switching, of course at the cost of accuracy. The performance is studied here for the two hysteresis settings of the built-in 'electronic relay'.

PID controllers may be set or tuned by many different methods. In this experiment the design method of Ziegler-Nichol is suggested for setting the coefficient potentiometers and the resulting response curve is studied. Other methods may also be used equally easily.

Features

- Temperature controller with facilities for P, I, D and relay control blocks.
- Operating temperature: Ambient to 90°C.
- Separate controls for P, I, D channel gains.
- Two settings for relay hysteresis.
- Fast 25W oven fitted with IC temperature sensor.
- Digital display of set and measured temperature on 3 ½ digit built-in DVM.
- Buttered output for recorder.
- IC regulation in controlled circuit power supplies.
- Interconnections
 - All interconnections are made using 2mm banana Patch cords.
- Test points are provided to analyze signals at various points.
- All ICS are mounted on IC Sockets.
- Bare board Tested Glass Epoxy SMOBC PCB is used.
- In-Built Power Supply with Power ON indication
- Attractive ABS Plastic enclosures
- Set of 2mm Patch cords for interconnections.
- User's Manual.

List of Experiments

- Identification of the oven parameters.
- Study of ON-OFF temperature control (with adjustable relay characteristics).
- Study of P, PI, PD and PID controls having adjustable coefficients.

Note : Specifications can be altered without notice in our constant efforts for improvement.