

PID Controller Tuning

The Zeigler-Nichols methods is probably the easiest method to use for simple systems where you can allow your system to go unstable or oscillate a lot. An overview of the process is:

- 1) Set the K_i and K_d gains to zero.
- 2) Increase the proportional gain, which we will call **K_u** , until you see a stable oscillation at your output. It shouldn't be decaying or growing very much at all.
- 3) Capture data representing the time and position of the the motor.
- 4) Import this data into Excel or Matlab and measure the period of oscillation, which we will call **T_u** . Hint: generate your data with commas separating the values and a new line for each measurement and print in the Serial monitor, then copy into a comma-separated values (.CSV) text file, which can be imported directly into Excel or Matlab.
- 5) Use a Ziegler-Nichols table to determine the final **K_p** , **K_i** , and **K_d** as a function of K_u and T_u .

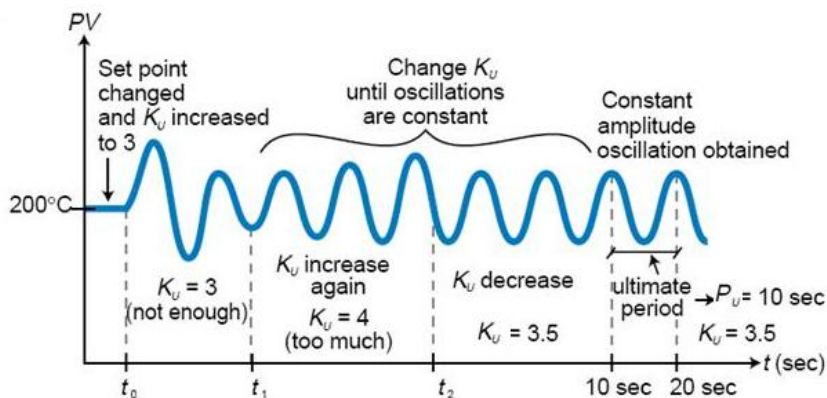


Image from: https://controls.engin.umich.edu/wiki/index.php/PIDTuningClassical#Ziegler-Nichols_Method

See https://en.wikipedia.org/wiki/Ziegler%E2%80%93Nichols_method and https://controls.engin.umich.edu/wiki/index.php/PIDTuningClassical#Ziegler-Nichols_Method for details and the tables.

Remember that this black-box approach takes into account any changes in the mass being rotated. ***So, make sure to have your sensor mount and sensors attached when doing the tuning (but don't have the wires plugged in yet in case it goes unstable).***