

CL RESPONSE	RISE TIME	OVERSHOOT	SETTLING TIME	S-S ERROR
<b>Kp</b>	Decrease	Increase	Small Change	Decrease
<b>Ki</b>	Decrease	Increase	Increase	Eliminate
<b>Kd</b>	Small Change	Decrease	Decrease	Small Change

#### Followed method:

A similar experimental method to hauptmech's answer that I was taught in college:

1. Set all gains to 0.
2. Increase Kd until the system oscillates.
3. Reduce Kd by a factor of 2.
4. Set Kp to about 1% of Kd.
5. Increase Kp until oscillations start.
6. Decrease Kp by a factor of 2.
7. Set Ki to about 1% of Kp.
8. Increase Ki until oscillations start.
9. Decrease Ki by a factor of 2.

The Ziegler-Nichols method is more precise if you can get an accurate number for the oscillation period. It does generally cause oscillations using the "classic PID" numbers given, so it's not always optimal.

For general rules on the effect of each term on rise time, overshoot, settling time, steady-state error, and stability, see Table 1 of "PID Control System Analysis and Design", by Li, Ang, and Chong in IEEE Control Systems Magazine.

Results:

P	I	D
0	0	6
0	0	8
0	0	10
0	0	12
0	0	$12/4=3$
0	0	$12/2=6$
0,06	0	6
0,1	0	6
0,5	0	6
1	0	6
3	0	6
6	0	6
$6/2=3$	0	6
3	0,03	6
3	0,06	6
3	0,1	6
3	0,5	6
3	1	6