PROPORTIONAL-INTEGRAL-DERIVATIVE (SIMULINK) · CARIMO DCMK KIT

PI & PID SPEED CONTROL

The foundation of industrial control. Identify the motor from a single step test, then tune the gains by formula, on a real motor.

7
HARDWARE EXPERIMENTS



Characteristic PI step response on the DCMK plant: a fast rise, a small controlled overshoot, and zero steady-state error as the speed settles exactly on target.

IN ONE BREATH

PID answers one question, how far is the motor from its target, with three teamed responses: push on the error now (P), erase the leftover gap (I), and anticipate sudden change (D). On this kit it runs as a clean, analytically-tuned PI loop: identify the motor from a single step test, then derive the gains by formula. No trial and error.

0
steady-state error

1 test
identifies the motor, gains by formula

Editable
Simulink source, every block

Three teamed responses, one clean loop

P
Proportional
Push harder the bigger the error is right now.

I
Integral
Build up over time to erase the leftover gap.

D
Derivative
React to how fast the error is changing.

2
2-DOF
Setpoint weighting kills overshoot, keeps fast recovery.

Seven hardware experiments

1. Open-loop step
2. PI setpoint tracking
3. Disk disturbance rejection
4. Setpoint weighting (2-DOF)
5. Anti-windup
6. Sinusoidal tracking
7. PI vs PID, derivative-N sweep

Why PI, not full PID? On this motor, derivative action amplifies encoder noise at near-zero gain. Experiment 7 lets students prove it for themselves, then choose the cleaner PI loop.

Why students win

Foundation skill
The bedrock every engineer masters before advanced control.

Real hardware
Seven experiments on a live spinning motor.

Plant to gains
Identify the motor from one step test, tune by formula.

Career-ready
PID runs the vast majority of industrial control loops.

Open source
Fully editable Simulink, inspect, modify, extend.

What you need

Software
MATLAB® R2021a or later · Simulink®
Also: a no-MATLAB Python edition ships built into the kit.

System
Windows 10 or 11 · one free USB port.
Perpetual lab licence with a year of updates.

Hardware
CARIMO DC Motor Kit (V1.0 / V2.0) with magnetic load disk · **sold separately**

One motor, three paradigms: PID, Fuzzy and MPC.

Part of the CARIMO DCMK control family, built on a 15-year teaching heritage at IIT Bombay

Request a demo or quote | www.carimotech.com | contact@carimo.tech | +91 90823 97027