CARIMO TECHNOLOGIES

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DC Motor Kit — Control Education Platform

TECHNICAL DATASHEET



A compact, portable **tabletop DC-motor control kit** — a real "plant on a bench" for hands-on control education. A permanent-magnet DC motor with a quadrature encoder connects to a Windows PC over USB; hot-swap magnetic load disks inject real disturbances. The same kit runs any **CARIMO controller — PI/PID, Model Predictive Control (MPC)* or Fuzzy Logic Control*** — for speed control on every edition; the Python edition adds position control. Plant identification and CSV logging throughout.

Hardware specifications

Motor	Permanent-magnet brushed DC (PMDC)
Encoder	Quadrature; **±8 RPM accuracy**
Max speed	~3200 RPM (at full supply)
Controller	32-bit ARM Cortex-M4F MCU — 84 MHz; on-chip PWM
Motor driver	Integrated H-bridge, current-regulated, up to 3.5 A peak; over-current & over-temperature protection
Power reg.	Regulated on-board supply

Load	Hot-swap magnetic load disks of varying magnet count; no-load & loaded
Power	12 V DC adapter; 230 V AC mains input
Connectivity	Connects to a Windows PC over USB 2.0
Enclosure	Durable ABS, tabletop, portable
Control modes	Open-loop & closed-loop speed; **speed + position** in the Python edition
Monitoring	Live RPM & PWM; timestamped CSV logging

Control software options

Software package	Method	Needs MATLAB?	Expts	Status
PI / PID — Python	Classical	**No** — standalone Windows app	7	INCLUDED
PI / PID — Simulink	Classical	**Yes** · Simulink	7	ADD-ON
MPC — Python	Predictive	**No** — desktop app	5	NEW ADD-ON
MPC Position — Python	Predictive	**No** — Python scripts	12	NEW ADD-ON
MPC — Simulink	Predictive	**Yes** · Simulink + MPC Toolbox	13	ADD-ON
Fuzzy Logic Control — Python	Rule-based	**No** — desktop app	5	NEW ADD-ON
Fuzzy Logic Control — Simulink	Rule-based	**Yes** · Simulink + Fuzzy Logic Toolbox	13	ADD-ON

** Optional add-ons, licensed separately directly from CARIMO · contact@carimo.tech*

What's included

- ✓ DC Motor Kit (PMDC motor + quadrature encoder)
- ✓ 12 V DC power adapter + USB cable
- ✓ 1-year hardware warranty
- ✓ Hot-swap magnetic load disks
- ✓ User manual
- ✓ Built-in Python PI/PID software (speed + position, no MATLAB)

Software. The kit ships with **built-in Python PI/PID software** (speed + position; copy-protected; no MATLAB, no source code) — the lab works out of the box. **MPC** and **Fuzzy Logic Control** are offered as **Python editions** (desktop apps, no MATLAB required; MPC also for position control) and as **Simulink editions** — all optional add-ons, licensed separately. The Simulink editions require the customer's own MATLAB®/Simulink® (plus the MPC or Fuzzy Logic Toolbox where applicable, from MathWorks) and ship fully-editable Simulink source models. Runs on Windows 10/11 with a USB 2.0 port. *MATLAB App editions of MPC and Fuzzy Logic Control are in development and will be available soon.*

Developed at **IIT Bombay** · "Remote-Triggered Labs" (MHRD / NMEICT) · **Prof. (Retd.) Nataraj Paluri** · DPIIT & MSME recognised
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