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## Series 1580/1585 Education Kit Datasheet

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## Introduction

The Series 1580/1585 Education Kit is perfect for teaching students about motor and propeller theory. The kit includes all the testing and safety equipment needed to complete two experiments, as well as the two lab coursewares with instructions and practice questions.

## Description

### Kit components

- Series 1580 or 1585 Test Stand
- Optical RPM probe
- No-solder board
- 5 propellers
- 2 motors
- Motor controller (ESC)
- Safety enclosure
- 1.5h courseware about propeller theory
- 1.5h courseware about motor theory

### Topics covered

- Mechanical and electrical power
- Electric motor theory
- Propeller theory
- Efficiency

## Objectives

The labs present students with a practical problem: they are tasked with selecting the motor and propeller that will maximize the flight time of a small drone used to deliver packages. The labs walk the students through the selection process:

### Introduction (0.5h)

- Present and understand the problem to be solved
- Components of a drone (motor, propeller, motor controller, battery, airframe, payload)
- Simple static theory (thrust and weight)
- Establish design requirements and assumption

### Propeller Lab (1.5h)

- Understand propeller thrust and how to calculate the thrust required for a quadcopter
- Understand the concept of torque (rotation force) and rotation speed
- Understand and calculate mechanical power and propeller

### Motor Lab (1.5h)

- Understand the concept of current, voltage and electrical power
- Understand the concept of motor efficiency and how to calculate it
- Understand the concept of overall efficiency and how to calculate the flight time

## Technical Specifications

**Table 1:** Technical specifications for the Series 1580 and Series 1585 Test Stands

Specification	Series 1580 Range	Series 1585 Range	Tolerance	Unit
Thrust	-5 – 5	-5 – 5	0.5%	kgf
Torque	-1.5 – 1.5	-1.5 – 1.5	0.5%	Nm
Voltage	0 – 35	0 – 50	0.5%	V
Current	0 – 40	0 – 55	1%	A
Burst current	0 – 50	0 – 60	--	A
Angular speed	0 – 190,000	0 – 190,000	1	eRPM
Coil resistance	0.003 – 240	0.003 – 240	0.5%	Ohm
Digital scale	n/a	0 – 3	0.5%	kgf

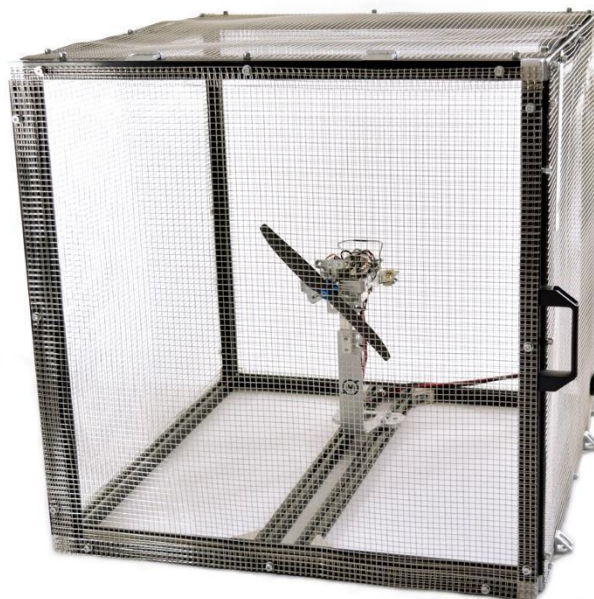
## Hardware

- Series 1580/1585 test stand:** Our test stands are designed for measuring motor and propeller performance for characterization and optimization of drone propulsion systems. The Series 1580 and 1585 allow you to record thrust, torque, voltage, current, rotation speed and vibration to derive system efficiency. Below are the technical specifications for the two stands:
- Optical RPM probe:** The optical probe allows you to accurately measure motor rotation speed. Comes with all of the hardware required for installation.
- No-solder board:** A simple board that can be fixed directly on the test stand, allowing the installation of various types of ESCs and motors without any soldering.
- 5 propellers:** Propellers come in five sizes: (7.0" x 4.0"), (8.0" x 4.0"), (8.0" x 6.0"), (8.0" x 8.0"), and (9.0" x 4.0").

- **2 motors:** Motors provided are rated at 1500Kv and 2300Kv, respectively
- **Motor controller (ESC):** An electronic speed controller used to deliver power to the motor. It supports multiple ESC protocols and is controlled with the RCbenchmark software
- **Safety enclosure (figure 1):** The thrust stand can be installed and isolated inside the enclosure to minimize damage in case a propeller breaks during a test. It can also help to avoid operators from getting too close to the spinning propellers. This enclosure has been tested and proven safe for carbon and plastic propellers no larger than 16".

## Safety

Fast spinning propellers and motors can potentially cause harm to the user. Safety goggles must always be worn when operating the equipment and the test stand should be used inside the safety enclosure provided. The software has automatic cutoffs based on the specifications of the device. Prior to starting the lab, the instructor should show the students how to install the motors and propellers on the test stand and how to change and control them safely.



**Figure 1:** Safety enclosure with the Series 1585 Test Stand inside

## Software

Our open-source propulsion testing software is included with all test stands and allows you to control your propulsion system and record data easily.

The test stand can be controlled manually or automatically with Windows, Linux, Mac and Chrome OS. The interface displays sensor information in textual and graphical form, which can be recorded as single data points or continuous data. We provide pre-written test scripts, which you can then edit or you can write your own custom scripts.

Once the data is recorded, you can easily export it to a .CSV file, readable with most spreadsheet softwares. You can set-up your own working units, safety cut-offs and live plots to meet your needs. Your results will provide you with important information about propeller and motor efficiency as well as consumed power.

- Real time graphs
- Manual motor control
- Manual servo control (three channels)
- Calibration wizard
- Safety cutoffs based on any measured data
- CSV export
- Automated test
  - Ramps
  - Steps
  - Measure Kv
  - Measure number of poles
  - And more...
- User scripts with documentation

