

Flight Stand 15

High-precision professional test stand



Introduction

The Flight Stand 15 test stand allows you to precisely characterize and evaluate the performance of your motors and propellers by measuring thrust, torque, RPM, current, voltage, temperature, airspeed*, propeller efficiency and motor efficiency.

This test stand is the result of five years of experience developing propulsion testing systems and refining our equipment based on feedback from thousands of clients.

Description

Several versions of the Flight Stand 15 (FS15) are available:

- **FS15 Standard:** has our essential performance characteristics for static tests over our standard range of values
- **FS15 Pro:** has enhanced performance characteristics for designers who wish to perform dynamic tests over a wider range of values with the highest possible accuracy. Supports higher sampling rate and two extra general purpose analog inputs.
- **FS15 Coaxial (available in Standard or Pro):** Two powertrains tested simultaneously in one of three configurations: back-to-back, face-to-face, or offset (below).



- **Multi-powertrain version:** designed for distributed electric propulsion (DEP) testing - record the performance of up to 4 powertrains simultaneously*

* Optional feature planned to be released at the end of 2022

Technical Specifications

	Specification	Standard	Pro
Basic Information	Storage Temp & Humidity	23°C, 20% to 80% suggested	23°C, 20% to 80% suggested
	Operating Temp & Humidity	0°C to 40°C, 20% to 80% suggested	0°C to 40°C, 20% to 80% suggested
	Dimensions	28" x 12" x 6"	28" x 12" x 6"
	Input power / Output power	90 - 264 VAC, 1 A input adapts into 9 V, 2 A	90 - 264 VAC, 1 A input adapts into 9 V, 2 A
Measurement Information	Sampling rate	50 Hz	1,000 Hz
	Thrust calibration	Internal standard (26 points, push & pull)	ASTM E74 standard (211 points, push & pull)
	Torque calibration	Internal standard (30 points, CW & CCW)	ASTM E2428 (213 points, CW & CCW)
	Crosstalk calibration	Yes with 48 points	Yes with 1056 points
Recommended	Thrust	-15 to -5, or 5 to 15 kgf	-15 to -3, or 3 to 15 kgf
	Angular speed	400 to 30 000 RPM	400 to 30 000 RPM
Test Range	Resonant frequencies	Mode 1: 25.91 Hz Mode 2: 26.29 Hz Mode 3: 128.91 Hz [for a motor + propeller mass of 0.8 kg]	Mode 1: 25.91 Hz Mode 2: 26.29 Hz Mode 3: 128.91 Hz [for a motor + propeller mass of 0.8 kg]
	Propeller diameter	16" to 40"	12" to 40"
Voltage and Current	Voltage range	0 V to 180 V max	0 V to 180 V max
	Voltage resolution	0.001 V	0.001 V
	Voltage accuracy	1% measured value from 5 V to 180 V	1% measured value from 5 V to 180 V
	Current range	0 to 150 A	0 to 150 A
	Current resolution	0.001 A	0.001 A
	Current accuracy	1% from 5 A to 150 A	1% from 5 A to 150 A
Thrust	Range	±150 N	±150 N
	Resolution	0.05 N	0.002 N
	Accuracy	± 1.5 N	±0.5% of measured value, with lower limit of ±20 N (± 0.1 to ± 0.75 N)
	Temperature effect	±1.5 N per 10 degree Celsius	±0.4 N per 10 degree Celsius
Torque	Range	±8 Nm	±8 Nm
	Resolution	0.005 Nm	0.001 Nm
	Accuracy	± 0.1 Nm	±0.75% of measured value, with lower limit of 1.2 Nm (± 0.01 to ± 0.06 Nm)
	Temperature effect	±0.5 Nm per 10 degree Celsius	±0.15 Nm per 10 degree Celsius
RPM Sensor	Range	0 to 30 000 RPM	0 to 30 000 RPM
	Operating environment	Indoor	Indoor
	Accuracy	±1 RPM	±1 RPM
Temperature	PT100	-30 °C to 100 °C, ±2 °C	-30 °C to 100 °C, ±2 °C
General analog inputs	Range	N/A	2 inputs of ±10 V differential.
	Resolution	N/A	0.001 V
	Accuracy	N/A	±0.5% of measured value ±0.1 V
	Supply pin	N/A	5 V ± 0.1 V 30 mA max

Applications

Below is a non-exhaustive list of possible applications for the Flight Stand 15:

- **Real-time dynamic testing:** made possible by the FS15 Pro's 1,000 Hz sampling rate. Perform frequency and step input parameter identification.
- **Flight replay:** upload your flight controller data to the software and recreate your throttle input while your propulsion system is hooked up to the test stand*.
- **Efficiency and power characterization:** measure the efficiency of your motor, propeller and overall system and compare electrical power input with mechanical power output.
- **Endurance and reliability testing:** study the endurance of your system's components using automated tests designed by you. Our user-friendly testing interface allows you to easily design and run step tests, ramp tests, flight replay tests, or any protocol you can come up with.
- **Distributed electric propulsion (DEP) testing:** test up to 4 powertrains simultaneously* for a comprehensive understanding of your multicopter's performance. Data is recorded for each individual powertrain as well as the system as a whole.



Advantages

Here's why the Flight Stand is the best propulsion testing tool on the market:

- **Frictionless measurement:** our tools have a solid-state system for measuring thrust and torque, meaning there are no moving parts between the motor and load cells. This design significantly improves the accuracy of measurements and eliminates the need for bearings and hinges, which cause friction and are prone to misalignment.
- **ASTM Calibration:** our test stands are rigorously calibrated to ASTM standards to ensure maximum measurement precision. Thrust is calibrated with the 211-point ASTM E74 procedure and torque is calibrated with the 213-point ASTM E2428 procedure.
- **Ultra compact design:** the compact shape of the Flight Stand ensures that there is minimal airflow disturbance from the tool's hardware and wiring. This promotes more realistic measurements and testing conditions that more closely mimic flight.
- **Realistic coaxial testing:** it is possible to perform coaxial tests in 3+ configurations with the Flight Stand, each representing a different aircraft design. In the back-to-back testing configuration, the motors are separated by a distance as little as 91 mm, similar to the distance you'd have in a multicopter.
- **Superior software experience:** our software allows you to perform manual or automated tests with no programming required. We also offer a Python API and data management system with index, plots, tables, filtering and resampling capability.
- **Exceptional customer support:** our team is ready to respond to any questions you may have in a friendly and timely manner.

Award Winning

In 2022, the Flight Stand won the Regional Innovation Award from the Order of Engineers of Quebec, thanks to its ground-breaking design and capabilities.



Test with confidence with the Flight Stand 15.

Hardware and Electronics

The Flight Stand 15 comes fully equipped with software, hardware and electronics. Here's what's included with your Flight Stand:

Flight Stand 15:

- Force Measurement Unit (15 kgf / 8 Nm) (1x): measures thrust and torque
- Electric Measurement Unit (180 V - 150 A) (1x): measures current and voltage
- Tubular structure (1x): supports the FMU and propulsion system, protects wiring
- Sync Hub (1x): connects the test stand to the software
- Temperature probes (2x): records the temperature at the desired location
- Optical RPM probe (1x): provides a precise measurement of the motor's rotation speed
- Flight Stand Software

Flight Stand 15 Coaxial:

- 2x everything listed under Flight Stand 15 (except sync hub - only 1 needed for 2 FMUs)
- Coaxial fixture kit: ground rails and hardware for securing Flight Stands



Tubular Structure (Pro)



Electrical Measurement Unit (Pro)



Optical RPM Probe



Sync Hub



**Force Measurement Unit with
Motor Mounting Plate**

Software

The Flight Stand Software is used to control your test stand and record your data. It allows you to precisely program your test scripts manually or automatically. If you prefer to manually control your tests, you can enter values in a front-end table. If you prefer to code your tests, you can configure the script directly in the user interface or use the Python API to fully control the software.

With the Flight Stand Software you can:

- Control the test stand manually and view data live as it is recorded
- Automate tests with an easy-to-use interface that requires no programming
- Control the whole system from Python API* (Summer 2022)
- Upload .CSV files from your flight controller to perform flight replay tests*
- Save tests directly in the software or export them as .CSV files
- Re-sample data before export for smaller files

The software supports multi-powertrain testing for up to four powertrains and you can name each powertrain for easy analysis*. The stand connects automatically to the software and allows the user to adjust sensor noise filtering options.



