

# **Flight Stand 150** High-accuracy professional thrust stand

Motor and propeller not included





#### Introduction

The Flight Stand 150 thrust stand allows you to precisely characterize and evaluate the performance of your motors and propellers by measuring thrust, torque, RPM, current, voltage, temperature, propeller efficiency and motor efficiency.

#### Description

The Flight Stand 150 is our biggest thrust stand to date and the only off-the-shelf thrust stand of its size. It is designed to meet the needs of companies and institutions building very large drones, eVTOL aircraft, and electric airplanes.

It's impressive design and performance mirror that of our Flight Stand 15 / 50 Pro, but with a thrust measurement capacity up to 150 kgf and torque measurement up to 150 Nm.







# **Technical Specifications**

	Specification	Value	
Basic Information	Storage temp & humidity	23°C, 20% to 80% suggested	
	Operating temp & humidity	0°C to 40°C, 20% to 80% suggested	
	Dimensions	21" x 21" x 60"	
	Power adapter input power / output power	90 - 264 VAC, 1 A input adapts into 9 V, 2 A	
Measurement Information	Sampling rate	1,000 Hz	
	Thrust calibration	ASTM E74 standard (339 points, push & pull)	
	Torque calibration	Internal standard (204 points, CW & CCW)	
	Crosstalk calibration	Yes with 1044 points	
	Maximum angular speed	30 000 RPM	
Voltage and Current	Voltage range	0 V to 180 V	
	Voltage resolution	0.001 V	
	Voltage accuracy	1% from 5 V to 180 V	
	Current range	0 to 500 A	
	Current resolution	0.12 A	
	Current accuracy	1% from 25 A to 500 A	
Thrust	Range	±1500 N	
	Resolution	0.5 N	
	Accuracy	±1.0% of measured value, with lower limit of ±250 N (± 2.5 to ± 15 N)	
	Temperature effect	±1.5 N per 10 degree Celsius	
	Range	±150 Nm	
Torque	Resolution	0.01 Nm	
	Accuracy	±1.25% of measured value, with lower limit of 25 Nm (± 0.3125 to ± 1.875 Nm)	
	Temperature effect	±0.5 Nm per 10 degree Celsius	
RPM Sensor	Range	0 to 30 000 RPM	
	Operating environment	Indoor	
	Accuracy	±1 RPM	
	Operational distance	5 to 15 mm	
Temperature	PT100	-30 °C to 100 °C, ±2 °C	
General analog inputs	Range	2 inputs of ±10 V differential.	
	Resolution	0.001 V	
	Accuracy	±0.5% of measured value ±0.25 V	
	Supply pin	5 V ± 0.1 V 30 mA max	
External Inputs and Outputs	Connect CAN ESCs, pressure sensors, sound level sensors, and more	Included	



## Applications

Below is a non-exhaustive list of possible applications for the Flight Stand 150:

- **Real-time dynamic testing:** made possible by the 1,000 Hz sampling rate, which enables advanced analysis of harmonics, vibration, current fluctuations, torque ripple and more.
- **Flight replay:** upload your flight controller data to the software and recreate your throttle pattern while your propulsion system is hooked up to the thrust 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 8 powertrains simultaneously for a comprehensive understanding of your multirotor's performance. Data is recorded for each individual powertrain as well as the system as a whole.
- Propeller balancing: balance propellers to ISO standards in 3 easy steps.



**Tyto Robotics** B1 - 80 rue Adrien Robert • Gatineau, QC, Canada J8Y 3S2



### 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 Pro thrust stands are rigorously calibrated to ASTM standards to ensure maximum measurement accuracy. Thrust is calibrated with the 211-point ASTM E74 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 dual motor testing:** it is possible to perform dual motor 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, data management system with plots, tables, filtering and resampling capability, and the ability to connect CAN ESCs and external sensors.
- **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.





## **Hardware and Electronics**

The Flight Stand 150 comes fully equipped with software, hardware and electronics. Here's what's included with your Flight Stand:

#### Flight Stand 150:

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

#### Flight Stand 150 Dual Motor:

- 2x everything listed under Flight Stand 150 (except sync hub only 1 needed for 2 FMUs)
- Dual motor fixture kit: hardware for securing the two FMUs



**Tubular Structure** 



**Electrical Measurement Unit** 



Sync Hub



**Optical RPM Probe** 



Force Measurement Unit with Motor Mounting Plate



#### Software

Flight Stand 150 Datasheet Document ID: FSB150 V4.1 2024-12-20

The Flight Stand Software controls your thrust stand and records data. You can manually control tests with a throttle slider or automate tests using a table, data from a .CSV file, or the Python API. Supported protocols include:

<u>ESC:</u> Standard PWM: 50, 100, 200, 300, 400, 490 Hz Dshot: 150, 300, 600 Oneshot: 42, 125 Multishot \*CAN <u>Servos:</u> Standard PWM: 50, 100, 200, 300, 400, 490 Hz

With the Flight Stand Software you can:

- Control the thrust stand manually and view live data as it is recorded
- Automate tests with an easy-to-use interface that requires no programming
- Control the whole system from a Python API
- Connect external analog sensors with the Input Transformations tab
- Upload .CSV files from your flight controller to perform flight replay tests
- Save tests directly in the software and/or export them as .CSV files
- Re-sample data for smaller files and adjust sensor noise filtering
- Map and test up to 8 powertrains simultaneously (DEP testing)

\*Our I/O API also allows you to connect CAN ESCs.

		Powertrains				
Hardware	Add another posentrain *					
<ul> <li>UNDEFINED (0000000)</li> <li>UNDEFINED (00000005)</li> </ul>	Powertrain 1 Unmappe	d handware				
Setup	Visibility:	Timespan: 1 minute			*	
Powertrains	5m 14					
Manual Control						
	· · · · · ·					
	Sec. 10					
		4	ŝo	-		
	(pr. 10)					
	0.0					
		~				
Event log Clear Flight Stand App 2.53 available. Download. 1	year ago		in			
	100 M					



## **Technical Drawings**

#### Force Measurement Unit:



#### **Electrical Measurement Unit:**



**Tyto Robotics** B1 - 80 rue Adrien Robert • Gatineau, QC, Canada J8Y 3S2 **Stand Structure:** 



