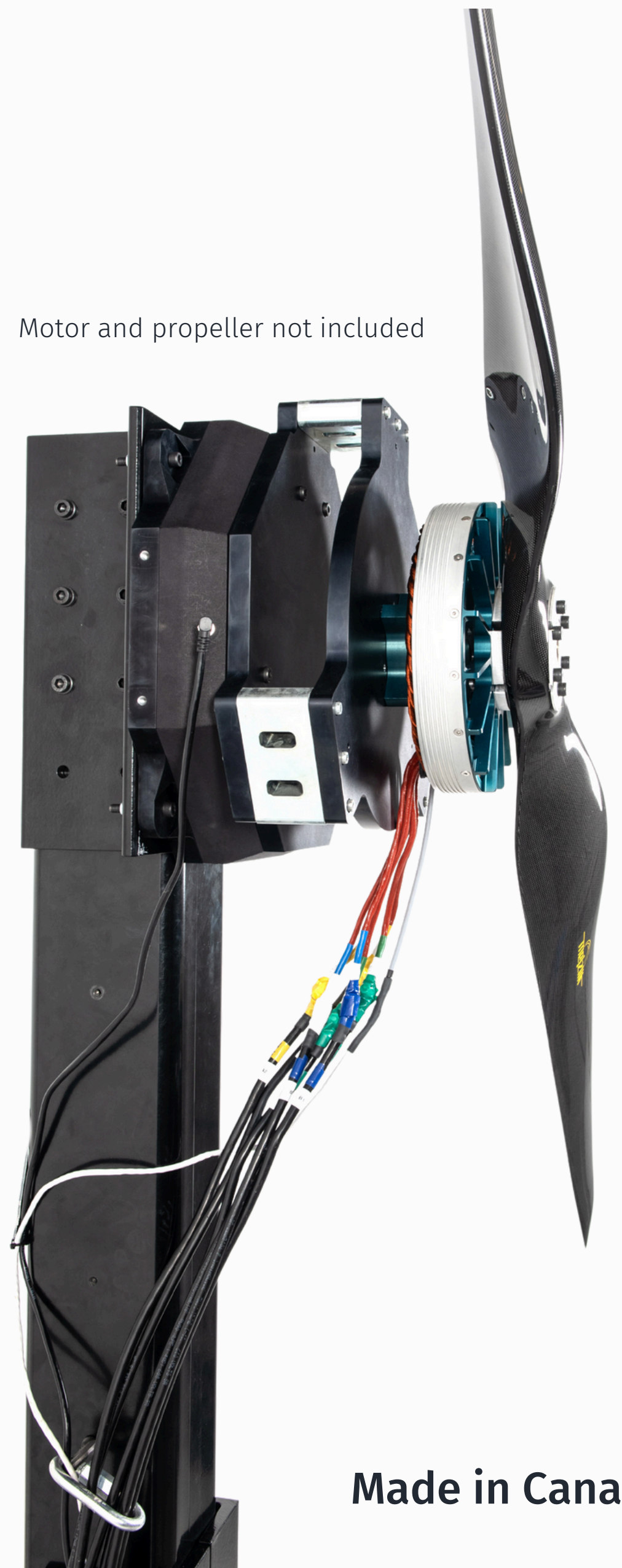# Flight Stand 500

Professional thrust stand for very large motors and propellers

Motor and propeller not included

Made in Canada

Introduction

The Flight Stand 500 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.

The force measurement system was designed with no moving parts to offer you frictionless, highly-accurate thrust and torque readings with minimal error:
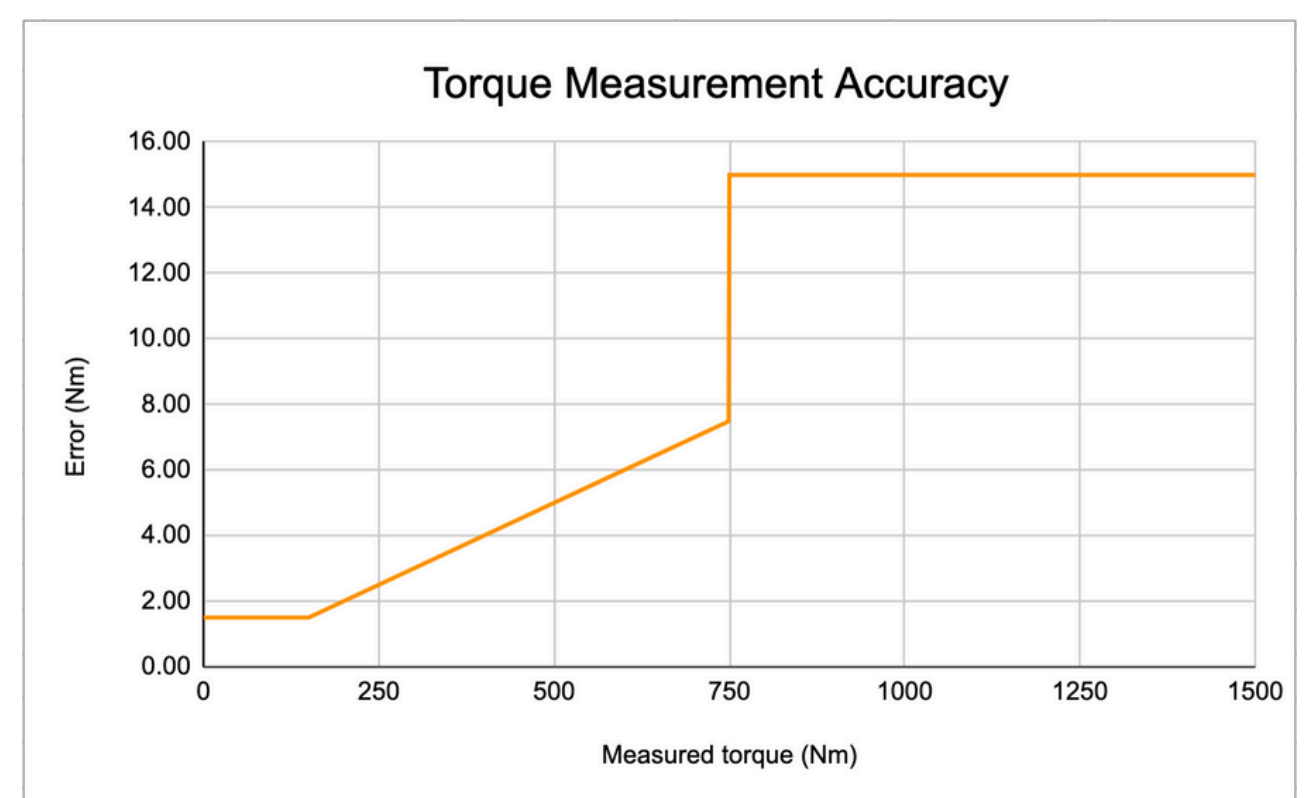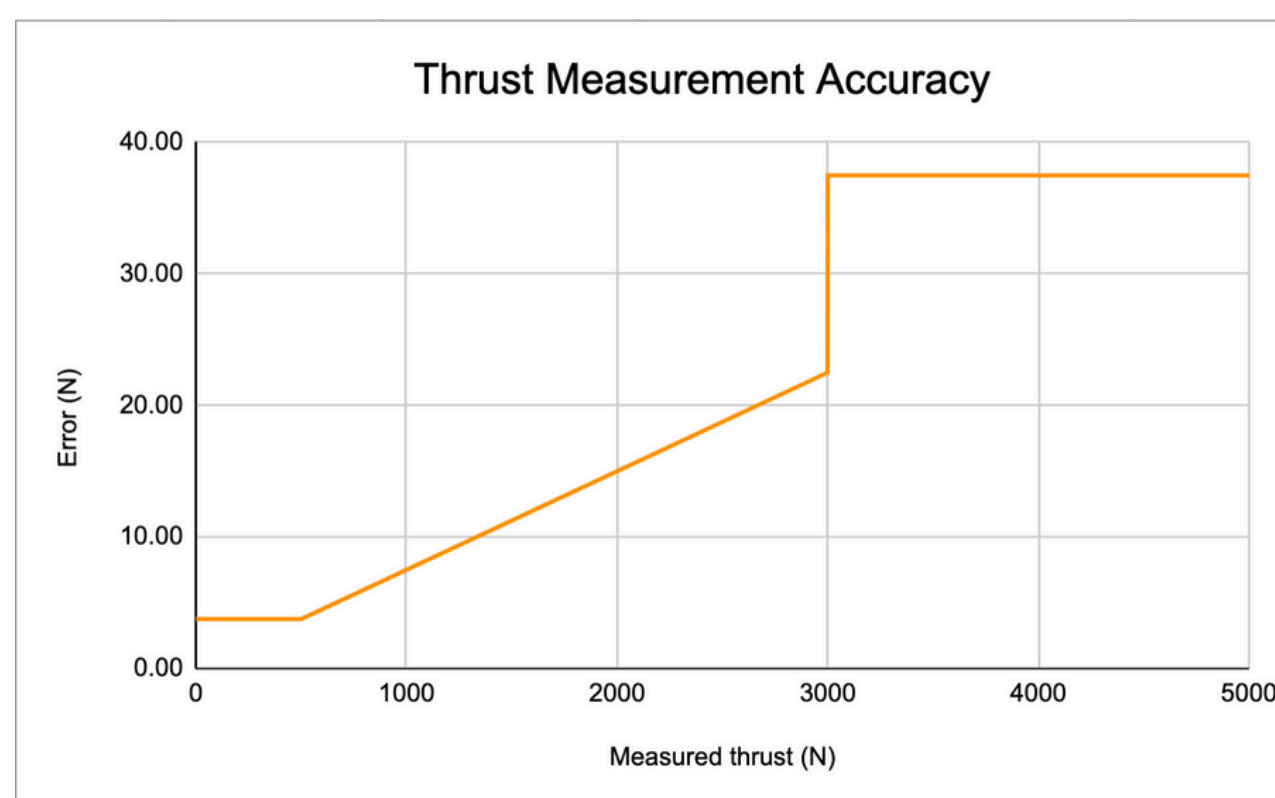
Important Features

These are some of the key features of the Flight Stand 500:

- **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.

- **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 thrust stands are calibrated to ASTM standards to ensure maximum measurement accuracy. Thrust and torque are both calibrated with ASTM procedures.

- **CAN ESC Compatibility:** the stand can be controlled with CAN ESCs via the In/Out API.

Technical Specifications

Note: these are preliminary values based on initial tests and may be subject to change.

	Specification	Value
Basic Information	Storage temp & humidity	23°C, 20% - 80% suggested
	Operating temp & humidity	0°C to 40°C, 20% - 80%
	Operating environment	Indoor
	Dimensions	0.93 m x 0.68 m x 2.59 m
	Net weight	325 kg
	Input power / Output power	90 - 264 VAC, 1 A input adapts into 9 V, 2 A
Measurement Information	Sampling rate	1,000 Hz
	Wireless testing	Yes
	Thrust calibration	ASTM E74 standard (up to ±3,000 N)
	Torque calibration	ASTM E2428 standard (up to ±750 Nm)
Voltage and Current	Voltage range	0 - 1,000 V
	Voltage resolution	0.001 V
	Voltage accuracy	1% between 6 V to 1,000 V
	Current range	200, 300, or 500 A
	Hall sensor linearity	1% from 25 - 500 A
	Current accuracy	±1% of measured value (between lower limit and full range)
Thrust	Range	±5,000 N
	Resolution	5 N
	Accuracy	0 - 500 N: constant error of ±3.75 N; 500 - 3000 N: ±0.75 % of measured value (±3.75 N to ±22.5 N); >3000 N: constant error of ±37.5 N
	Temperature effect	9 N per 10 degrees Celsius
Torque	Range	±1,500 Nm
	Resolution	1.4 Nm
	Accuracy	0 - 150 Nm: constant error of ±1.5 Nm; 150 - 750 Nm: ±1.0 % of measured value (±1.5 Nm to ±7.5 Nm); >750 Nm: constant error of ±15 Nm
	Temperature effect	2.6 Nm per 10 degrees Celsius
RPM Sensor	Range	400 to 30,000 RPM
	Resolution	1 RPM
	Accuracy	±1 RPM
External Inputs and Outputs	Connect CAN ESCs, sensors, wind tunnels, and more	Possible using In/Out API and Transformations feature in Flight Stand software

Applications

Below is a non-exhaustive list of possible applications for the Flight Stand 500:

- **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.

- **Propeller balancing:** balance propellers to ISO standards in 3 easy steps.

What's Included

The Flight Stand 500 comes fully equipped with software, hardware and electronics. Here's what's included with your Flight Stand 500:

- **Force Measurement Unit (FMU):** measures thrust and torque
- **Data Acquisition Unit (DAQ) (2):** core unit connecting FMU and sensor measurements
- **Force Amplification Box:** amplifies thrust and torque measurements from the load cells
- **Tubular structure:** supports the FMU and propulsion system, protects wiring
- **Motor mounting plate:** mounts the motor on the thrust stand
- **Thermocouples (2):** records the temperature at the desired location
- **Fiber optic RPM sensor:** provides a precise measurement of the motor's rotation speed
- **Flight Stand Software**

Tubular Structure
Force Measurement Unit
Motor Mounting Plate
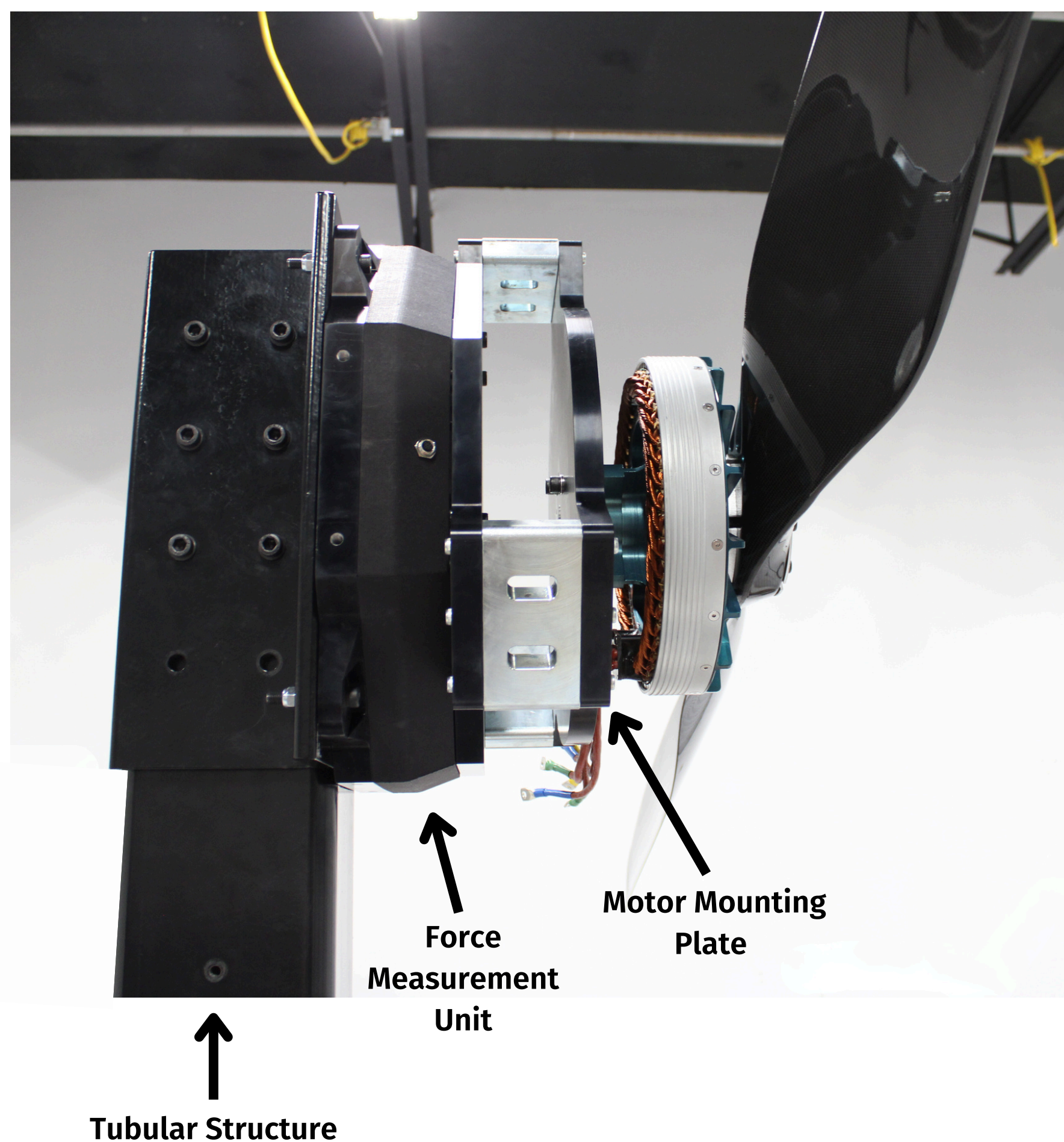

Data Acquisition Unit

Thermocouple

Fiber Optic RPM Sensor

Software Experience

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.

Key Features:

- **Input Transformations:** users can connect and control third party sensors with the Flight Stand software. Examples include acoustic and vibration sensors, additional motors, flight controllers, wind tunnels, and more.

- **CAN ESCs Supported:** there is a wide variety of CAN protocols available, which is why we've made it possible to control any CAN ESC as an external input.

- **Python Control API:** users who prefer to program tests in an external text editor can fully control their tests using the Python API. We've created several examples and test templates to help users setup the API and get started.

- **CSV Data Upload:** one way to automate tests is by uploading throttle values from a .CSV file. This includes throttle data from a recent flight with your UAV.

- **Detailed Software Tutorials:** we offer detailed, easy to follow articles and videos that explain how to use the Flight Stand software helping you make use of all features.

- **Wireless control:** remotely control the Flight Stand software from any computer on the same network to maintain a safe distance from the thrust stand.
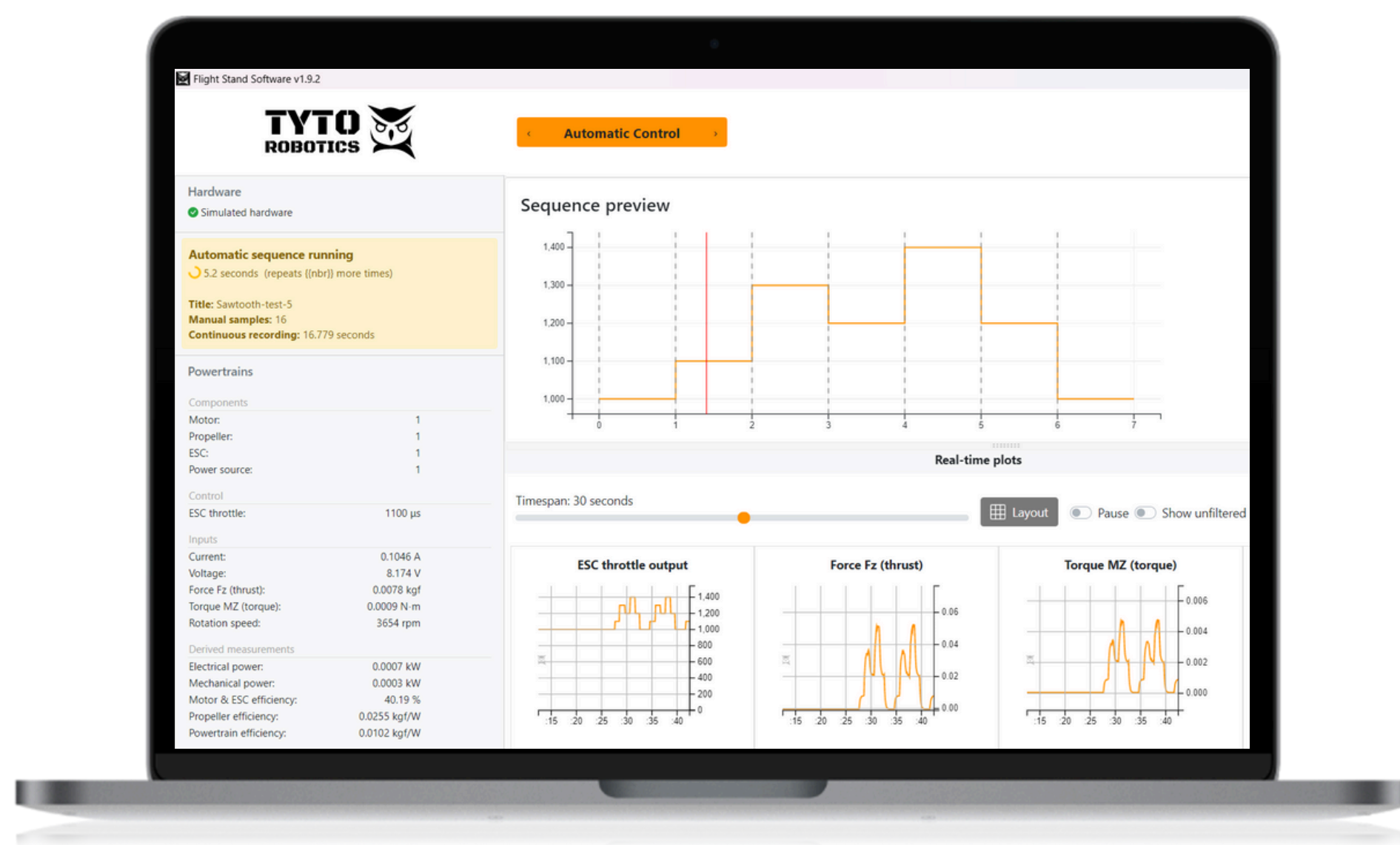
Example Test Schematic

The flow chart illustrates a test setup with the Flight Stand 500 connected to 2 DAQ units and sensors, linked to a computer running the Flight Stand Software.
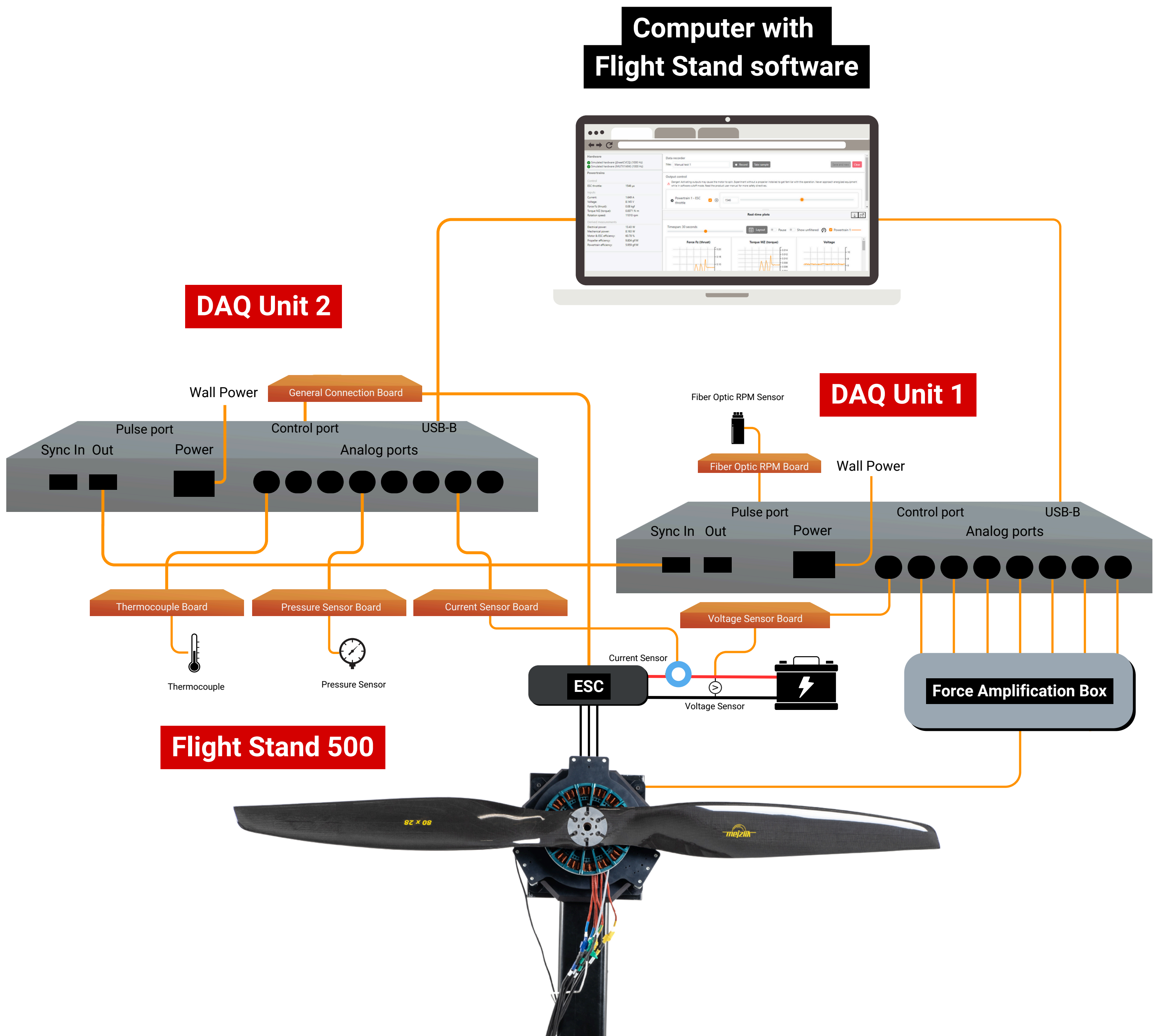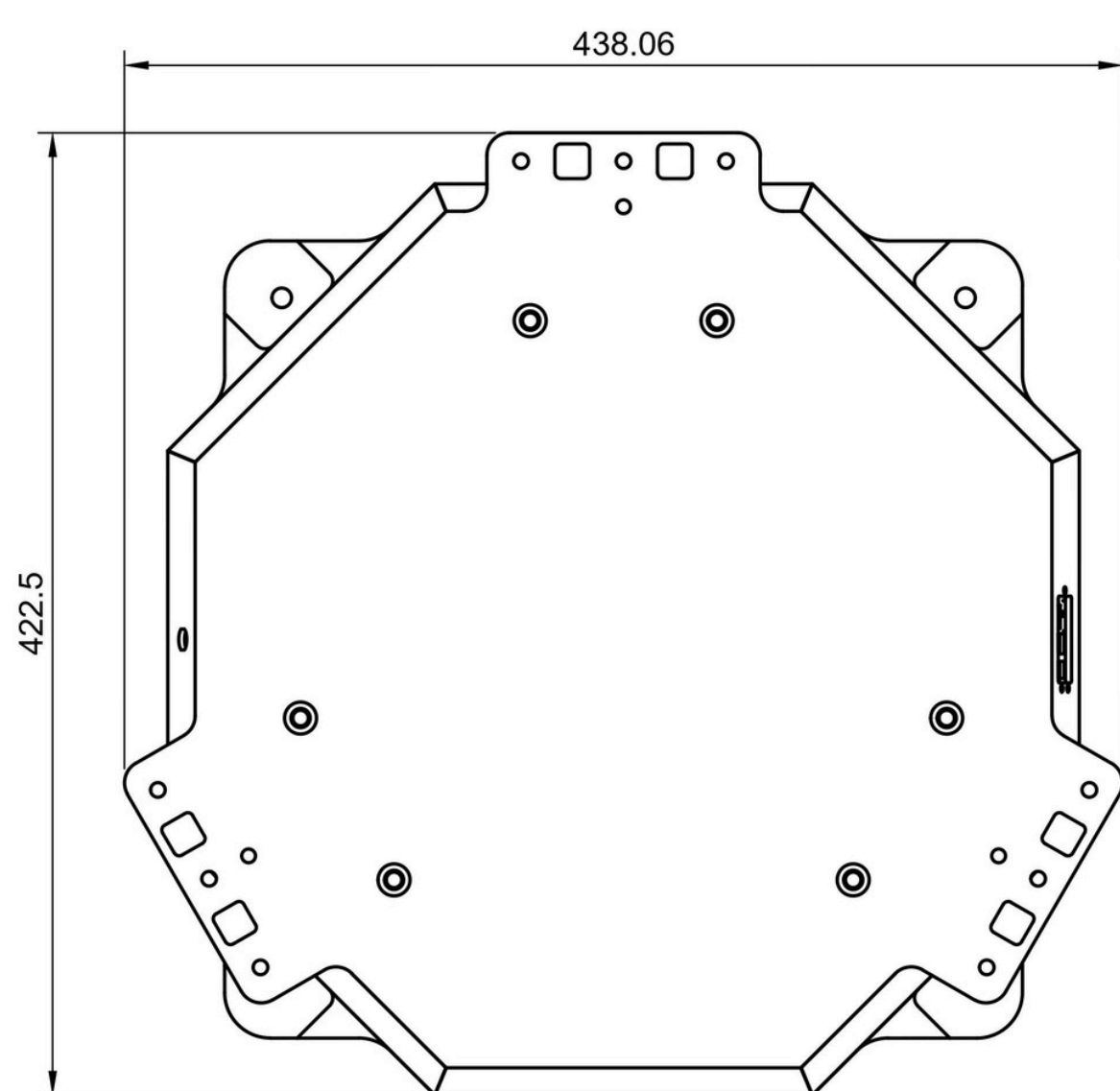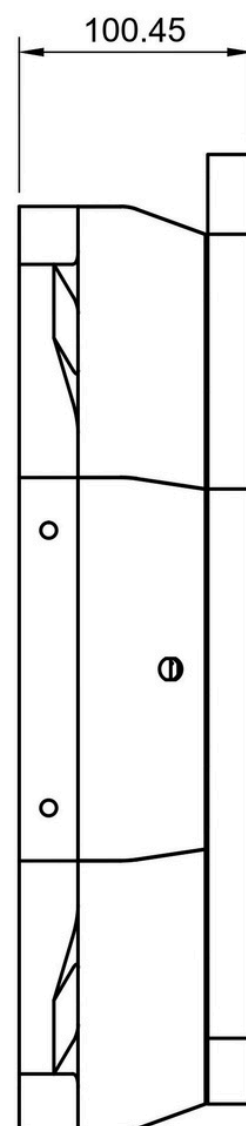
Technical Drawings

*Note: These are non-contractual dimensions; subject to slight changes.

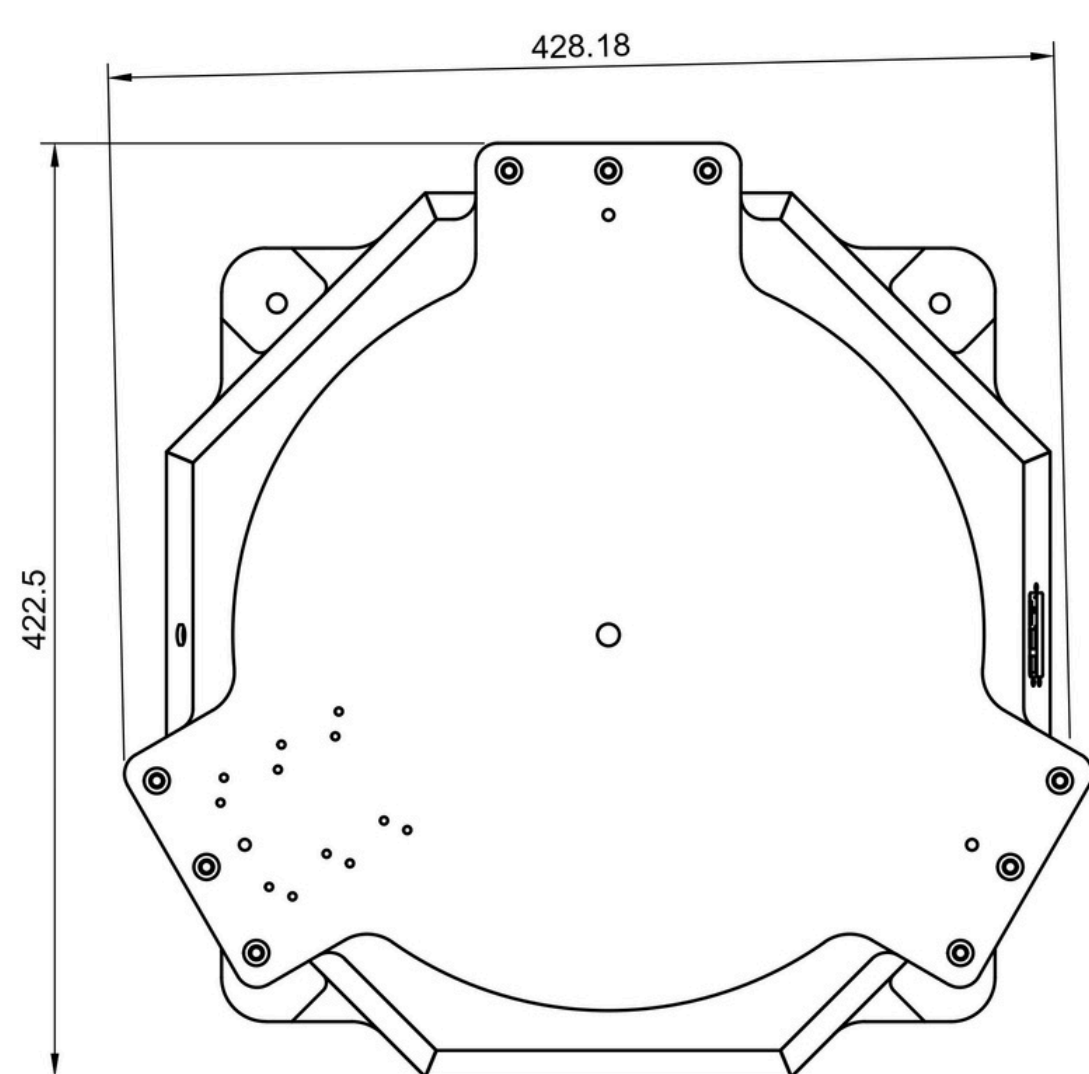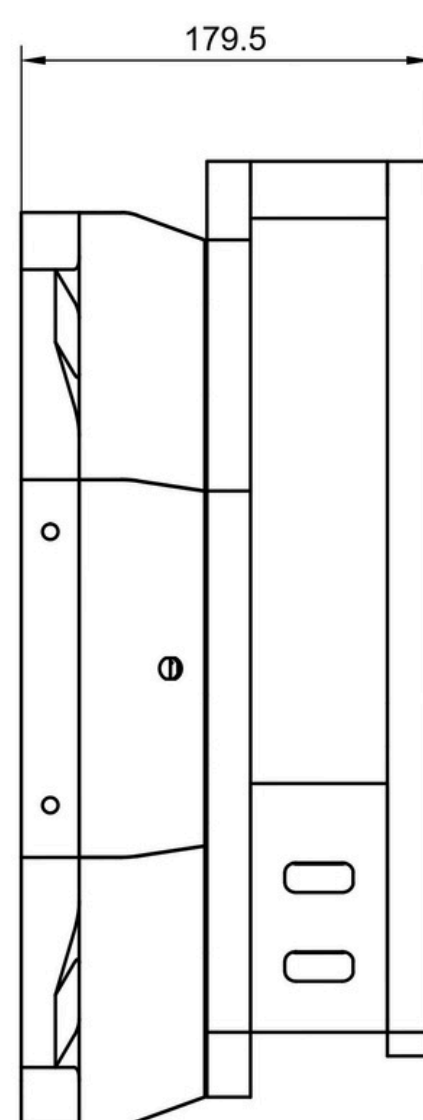## Force Measurement Unit

Without Motor Mounting Plate:

438.06

422.5

100.45

Front View

Side View

With Motor Mounting Plate:

428.18

422.5

179.5

Front View

Side View

Stand Structure Front View

2665

2440

680