

FFT GYRO

The FFT GYRO is a device in which you can attach different types of multi-rotors to perform the First Flight Tests in a safe and efficient way. The device allows the user to get a better understanding of the dynamics of the aircrafts, and it can also be useful to teach students the use and control of this type of vehicles.

DEVELOP AND IMPLEMENT YOUR OWN NEW FLIGHT CONTROL ALGORITHMS FASTER



The FFT GYRO* system is an economical safe test bed that helps to understand, develop and implement control laws for flight dynamics of vertical take-off and landing vehicles without putting at risk the equipment. It

can be connected to MATLAB / Simulink to accelerate the test and implementation of the algorithms. Thanks to the safe structure, the system can be installed in a classroom or a lab, where students can get a closer look and get a deep understanding of the vehicles dynamics and control.

HOW IT WORKS

The system is a platform that has a structure like a 3 DOF Gyroscope (see Fig 2). A multi-rotor can be attached to a plate, which can hold different types and sizes and align the geometric center to the center of rotation of the FFT GYRO, letting the vehicle move about it's real geometric center, and not eccentrically like in other platforms. This plate is mounted inside an inner gimbal which in turn is mounted inside an outer gimbal. The structure is designed to allow free rotation about the main axes of a rigid body (see Fig 1), so the airship can rotate freely. The gimbals are equipped with slip rings, so there is no limitation in the rotation of the parts and the connections. The system has three encoders and DC motors (optional). To measure the true roll, pitch and yaw angles of the drone, high-resolution magnetic absolute multi-turn encoders are used. And the DC motors can simulate external forces as disturbances, to perform validations of the robustness for the control laws. The gimbals are made of high-quality carbon fiber, to reduce the inertia that might be added to the system and maintain the properties of a rigid structure. The external structure is made of aluminum, to reduce the weight and ensure the long durability of the overall system.

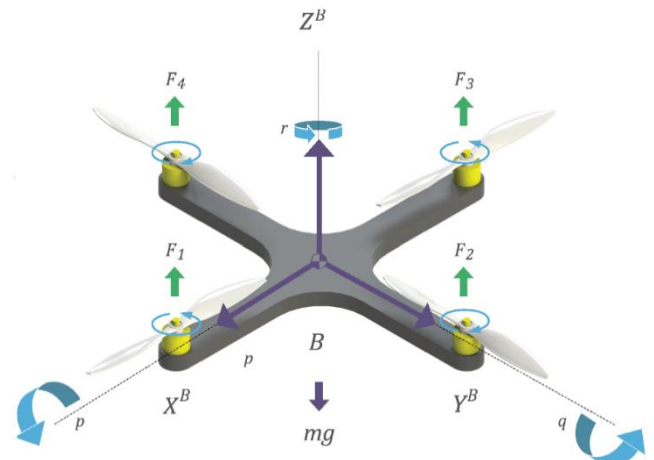


Fig 1. Principal dynamics of a multi-rotor

The FFT GYRO allows researchers to perform experiments and tests with more reliable and efficient results, which significantly reduce the uncertainty of aircraft sensors on board and even allowing to improve and automate calibration techniques for these sensors.

FFT GYRO WORKSTATION COMPONENTS

- FFT Gyro plant
- FFT Gyro acquisition board
- FFT Gyro interface software for MATLAB / Simulink
- User Manual and Quick Start Installation Guide (digital)



Fig 2. System specifications on reverse page.

SYSTEM SPECIFICATIONS

FFT GYRO

Light and strong carbon fiber material, reducing the extra weight to de vehicle.



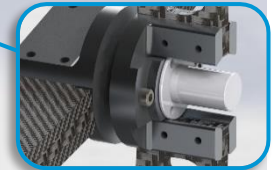
High-resolution magnetic encoders, to measure roll, pitch and yaw angles.



Adjustable height for different types of multi-rotors



Slip-rings provide absolute free rotation in the 3 DOF



Led status indicators and USB port to connect with MATLAB and Simulink.



FEATURES

- Compatible with different types of multi-rotors, and sizes, from 100mm to 500mm length from rotor to rotor.
- Three degrees of freedom about the main axes, roll pitch and yaw angles.
- Slip rings of 12 channels, that allows free rotation about any of the Euler angles.
- High-resolution magnetic absolute encoders, with multiple turns. (12 bits)
- Mechanically balanced design, reducing any disturbance in the rotation dynamics.
- High-quality carbon fiber gimbals, strong for reducing deflection issues and light to minimize extra weight and inertia added to the vehicle dynamics.
- Sensing and control operation from MATLAB / Simulink.
- The motors can be driven by current or voltage, so torque, rotation speed or angular position control could be implemented.
- Fully documented systems models and parameters.
- Robust and heavy-duty machined components.
- External aluminum frame, that can be customizable.

DEVICE SPECIFICATIONS

	Series 290	Series 450
Dimensions – H x W x L	96cm x 63cm x 63cm	100cm x 85cm x 85cm
Device mass	28 Kg	49 Kg
Encoder resolution	0.0879° (12-bits)	0.0879° (12-bits)
Motor power	15.3 Kg · cm	15.3 Kg · cm
Plate (roll) mass	435 gr	745 gr
Inner Gimbal (pitch) mass	650 gr	827 gr
Outer Gimbal (yaw) mass	500 gr	524 gr
Roll, pitch and yaw range	360° (multi-turn)	360° (multi-turn)
Multi-rotor compatible sizes	100mm to 300mm rotor to rotor distance.	300mm to 500mm rotor to rotor distance.
Power specs	12 V, 5 A, 120W	12 V, 5 A, 120W
Communication protocols	USB2.0, serial port, 100 Hz.	USB2.0, serial port, 100 Hz.