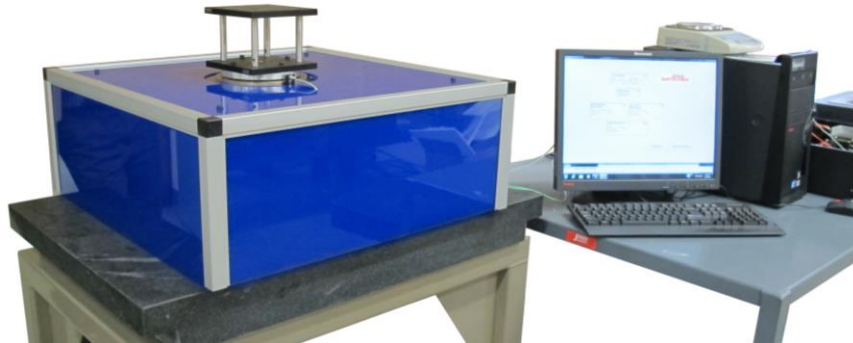


FBD Series

Force Balance Dynamometer



Instrument Selection

FBD instruments can be delivered with or without a spin motor. The version without a motor is used by test engineers to balance payloads that spin about their own bearings, eliminating the time consuming process of precisely aligning the payload spin axis with the rotation axis of a spin balance machine.

General Description

The Force Balance Dynamometer (FBD) is a new series of spin balance instruments, which measure both static unbalance (due to CG offset) and dynamic unbalance (due to product of inertia). System software collects unbalance data, reports unbalance information, calculates correction mass solutions, and measures the expected residual unbalance of the payload after balancing.

This new instrument has the ability to spin balance a payload in a vacuum environment and thereby provide a solution to eliminate errors due to aerodynamic forces. It is low profile, permanently calibrated, has unmatched sensitivity, and can be used over a wide temperature range.

Measurement sensitivity of the FBD system is equivalent to the Space Electronics traditional POI series, which features the best accuracy in the world for low spin speed applications.

Design Features

The FBD instrument is designed for use in vacuum chambers and temperature chambers.

It is designed specifically to be low profile, measuring less than one foot in height, so that the whole instrument can be placed in a chamber. This overcomes limitations of hook height or test chamber space.

This is a major design enhancement over previous designs that use oil or compressed air. With those previous designs the interface between the instrument and the chamber was problematic.

The payload can be balanced without separating its rotating and non-rotating portions, which allows balancing or balance verification at any point in the integration and test flow without violating the integrity of a fully tested structure. Typical applications include spacecraft and inertia wheels.

Space Electronics currently offers two capacity ranges of the FBD instrument: a tabletop, 90 kg capacity instrument that can be used to balance payloads as small as 1 kg cubesats, and a 1,000 kg capacity version used to balance full-size spacecraft.

Plans for future development include a smaller version to balance lightweight payloads such as inertia wheels, as well as a large capacity version to balance payloads weighing as much as 10,000 kg.

General Technical Specifications

| | FBD200 | FBD2200 |
|----------------------------|---|--|
| Maximum Payload Mass | 90 kg | 1,000 kg |
| Range of Spin Speeds | 50 – 200 RPM | 30 – 150 RPM |
| Minimum Achievable Readout | 0.2 kg-cm ² at 50 rpm 0.03 kg-cm ² at 100 rpm 0.009 kg-cm ² at 200 rpm | 5.86 kg-cm ² at 30 rpm 1.47 kg-cm ² at 50 rpm 0.44 kg-cm ² at 100 rpm |
| Unbalance Reduction Ratio | 85% | 85% |