

CB Measurement

Why Measure?

Understanding mass properties, such as center of gravity, makes it possible to design and build stable objects and to predict their performance in a medium such as air or water. The performance of a submersible marine vehicle depends on its center of buoyancy. The center of buoyancy of an object is defined as the point that would be the center of gravity of the displaced fluid, not the submersed object itself. Until now determining the center of buoyancy was primarily done using calculations or indirect measurement.

Concept of Operation

Raptor Scientific's CB Measurement Instrument suspends the test article from three load cells to first determine Center of Gravity in air. Measured CG in air is accurate to ± 0.1 inch. The marine vehicle is then submerged and the load cell output is recorded. Differences between the load cell forces in air and in water indicate the Center of Buoyancy.



Center of Buoyancy Measurement Instrument

System Design

The Center of Buoyancy measurement instrument is designed to support the marine vehicle from above by overhead crane. This allows measurement of any object within the crane's capacity. Also, since the load cells are above the vehicle being tested, they remain above the water surface.

Design Advantages

- Weight, center of gravity and center of buoyancy are measured using the same machine and setup.
- Portable - All that is needed is a crane and a dunk tank or other body of water.
- Ease of handling and loading.
- Small waves do not affect instrument stability. This instrument is suitable to use in a non-benign environment.

Additional Benefits

- More cost-effective than sea tests.
- Significantly reduced analysis time vs. trial and error methods.
- Quantitative NIST traceable results.
- Better towing trim, resulting in less drag.
- Highly scalable.

General Specifications

CG Measurement Accuracy	± 0.1 in (0.0 \pm 0.25 cm)
CB Measurement Accuracy	± 0.1 in (0.0 \pm 0.25 cm)
Payload Weight Capacity	1000 lb (453 kg)
Test Article Width	Up to 70 in (Up to 177 cm)
Test Article Diameter	Up to 20 in (Up to 50 cm)

* Alternate dimensions and capacities are available. We also offer adjustable options.