

This series of tests ensures the buoy's durability, functionality, and efficiency in real-world marine conditions. Key assessments include airtightness, watertight integrity, and neutral buoyancy to prevent leaks and sinking. Electronics testing verifies power transfer and sensor accuracy, while environmental monitoring tracks internal conditions. Additional tests optimize stability, charge efficiency, and structural resilience against wave impacts. Together, these evaluations enhance the buoy's reliability for sustained energy generation.

**Tests:**

**Internal Air Pressure Test** – Evaluates the buoy's airtightness and resistance to pressure changes using a digital pressure sensor and analog manometer. This prevents water leakage and electronics corrosion. The test runs at 1.5 atmospheres (22 psi) with 15-minute monitoring over two hours. Leaks at joints and seals are a risk, mitigated by applying sealant.

**Hydrophobic Test** – Ensures watertight integrity using a bubble test under the same conditions as the internal pressure test. Risks and solutions mirror those of the pressure test.

**Electronics Test** – Validates power transfer from the generator to the battery at the motor's operating speed while assessing sensor accuracy and the safety shut-off. Risks include seawater corrosion and component overload, mitigated with dielectric grease and thicker wiring.

**Environmental Monitoring** – Records internal buoy conditions for comparative analysis. Sensors on electronic boards will track internal power production & internal buoy environment.

**Neutral Buoyancy Test** – Ensures near-neutral buoyancy to prevent sinking or excessive floating. If negatively buoyant, the buoy's volume will be increased to improve buoyancy.

**Final Counterweight Adjustment** – Optimizes stability and hydrodynamic efficiency by fine-tuning the counterweight after the neutral buoyancy test, ensuring optimal rotation for electricity generation.

**Charge Time Analysis** – Measures the time needed to fully charge a device under varying wave conditions, based on data from preselected sites, to determine the most efficient charging environment.

**Theoretical Drop/Stress Test** – Simulates a large wave lifting and dropping the buoy to assess structural integrity, buoyancy retention, and component resilience upon impact.

Test Name	Range (Min - Max)	Risks	Mitigations
Internal Air Pressure	1.5 atm, 2 hrs	Leaks	Sealant
Hydrophobic	No leaks	Leaks	Same as pressure test
Electronics	Within limits	Corrosion, overload	Grease, thick wiring
Environmental Monitoring	Stable readings	None	N/A
Neutral Buoyancy	Near-neutral	Sinking	Increase volume
Counterweight Adjustment	Optimized rotation	Imbalance	Adjust weight
Charge Time	Varied charge times	Inefficiency	Analyze data
Drop/Stress	No damage	Failure	Reinforce structure