



Energy Storage & Battery Technology Testing Services

Exponent's energy storage and battery technology testing services encompass a wide variety of battery chemistries used across numerous battery-powered products as well as battery backup (e.g., UPS) and hybrid systems, including:

- Cell phones and accessories
- Audio and visual products
- Battery-powered toys and educational products
- Notebook computers
- GPS systems
- Military systems
- Digital cameras
- Battery backup systems
- Hybrid, plug-in hybrid, and electric vehicles
- Telecommunication systems
- Energy storage systems, control systems, and UPSs for solar, hydro, and wind power systems

Typical battery performance tests include:

- Normal operation characterization
- Temperature cycle testing
- Temperature variation analysis and testing
- Service life testing
- Stress testing performed to evaluate response to a variety of stresses, including:

Electrical

- Electrical overstress/overcharge
- Electrostatic discharge (ESD)
- Electrical over-discharge
- Electrical life cycle testing

Environmental

- Heating, including hot box and flame attack
- Altitude simulation
- High/low humidity

Mechanical

- Steady force application
- Random and controlled vibration
- Mechanical shock, including random and controlled impacts or drops
- Crush and puncture, including nail penetration
- Customized user abuse scenarios
- Vehicle accident scenarios
- Underwriter Laboratory (UL) projectile testing

Our energy storage and battery technology experts also use state-of-the-art techniques, including:

- Traditional electrochemical materials characterization and evaluation
- Reference electrode testing on commercial cells
- Electrochemical impedance spectroscopy (EIS)
- Charge/discharge cycling
- Accelerating rate calorimetry (ARC)
- Fractional thermal runaway calorimetry (FTRC)
- Coin cell testing
- Gaseous release and composition analysis

Exponent's comprehensive regulatory and performance testing for energy storage products includes specialty equipment, such as:

- Fully automated MACCOR battery testers with a combined total of >500 Channels
- Mobile high-power electric load and supply for testing large cells and packs
- Environmental chambers
- Mechanical abuse test fixtures (e.g., nail penetration, crush, shock, vibration, etc.)
- Safety testing as outlined in UL 1642 and IEC 62133
- Failure analysis, including gas gauge characterization

Exponent also offers focused expertise in simulating heat transfers within a battery-powered product and analyzing its performance in various environmental conditions, including stresses related to foreseeable user abuse conditions. This includes determining hot spots and temperature rise and distribution inside battery packs, power supplies, chargers, and host devices. Examples of environmental stress tests Exponent performs include:

- Random and controlled impact tests
- Temperature tests
- Random and controlled drop tests
- Pressure tests
- Humidity tests
- Random and controlled vibration tests
- Altitude tests
- Electrical overstress tests
- EMI tests
- Mechanical shock tests
- ESD tests
- Human factor aided abuse testing
- Vehicle accident testing

Exponent is accredited to ISO 17025 by A2LA and is a CTIA Authorized Test Lab (CATL) for cellular phone batteries (A2LA Certificate 2561.02).

888.656.EXPO | www.exponent.com | info@exponent.com

Alexandria | Atlanta | Austin | Bowie | Chicago | Denver | Detroit | Houston | Irvine | Los Angeles | Maynard | Menlo Park | Miami | Natick | New York | Oakland | Pasadena | Philadelphia | Phoenix | Sacramento | Seattle | Warrenton | Washington D.C. | United Kingdom | Switzerland | China | Singapore