



ENVIRONMENTAL CHAMBERS FOR BATTERY TESTING



testforce



BATTERY TESTING SOLUTIONS



We are a leading provider of environmental test chambers with over 80 years of industry experience in designing and manufacturing temperature-humidity controlled products. We supply a variety of test chambers for testing batteries of any size with extensive experience in chambers designed for testing NIMH, lead acid and lithium ion batteries from small battery cells to large battery packs.

Battery testing chambers are supplied to a variety of industries including, automotive, computer, telecommunications, defense, and alternative energy markets. With the goal of reducing automobile emissions and the push toward electric hybrid vehicles, the need for lithium ion battery testing is even more critical. Our proven experience provides the most cost-effective solutions.

Each test chamber is built according to specific test requirements and may be interfaced with battery cyclers, control & monitoring data acquisitions systems and other test equipment for a complete integrated test solution.



© GM Corporation

CSZ reach-in and walk-in chambers featured at GM Battery Test Laboratory.



© GM Corporation

Products

- High/Low Temperature Cycling Chambers
- Humidity Chambers
- Thermal Shock Chambers
- AGREE Temperature/Vibration Chambers
- Altitude Chambers
- Explosion Proof Chambers

Temperature Ranges

Temperatures range from -70°C to +190°C (-94°F to + 375°F) with an optional humidity range as low as 10% to 95%. Sizes are available from small benchtop units to large walk-in rooms.

Single Stage: -34°C to +190°C (-30°F to +375°F)

Tundra®: -45°C to +190°C (-49°F to +375°F)

Tundra® II: -50°C to +190°C (-58°F to +375°F)

Cascade: -70°C to +190°C (-94°F to +375°F)

Exclusive Tundra® Refrigeration System



The utilities involved with battery testing facilities and electric consumption add to the operating cost of each piece of equipment, a consideration to the bottom line and an important aspect in selecting test equipment. The compressors on an environmental chamber are often a large portion of the electrical load. Our patented Tundra system utilizes a single compressor to get to -45°C (-49°F), and the Tundra II system which also uses a single compressor and provides the ability to test as low as -50°C (-58°F).

By using only one compressor for cold temperature testing at these low temperatures, significant savings can be realized in both operating and maintenance costs.

We offer extensive experience in chambers designed for battery testing from small battery cells to large battery packs.

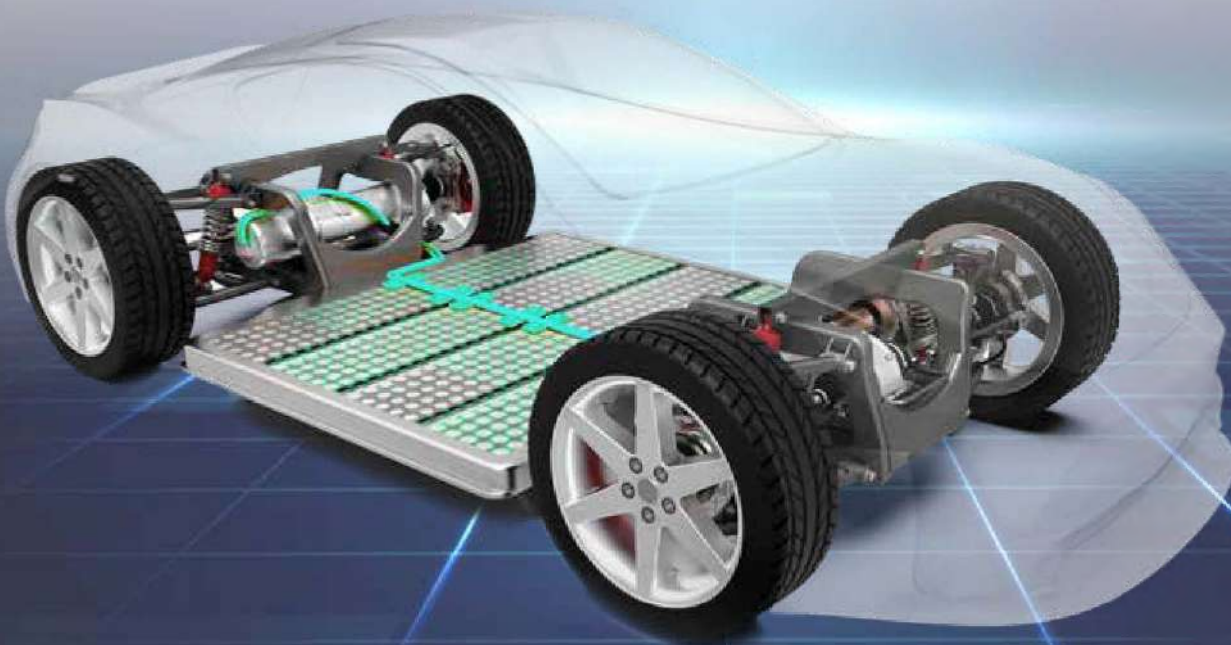


AGREE Temperature, Humidity Chamber interfaced with Vibration Shaker Table

EUCAR Hazard Levels

Hazard Severity Level	Description	Classification Criteria and Effect
0	No Effect	No effect. No loss of functionality
1	Passive Protection Activated	No defect; no leakage; no venting, fire, or flame; no rupture; no explosion; no exothermic reaction or thermal runaway. Cell reversibly damaged. Repair of protection device needed.
2	Defect/Damage	No leakage; no venting, fire, or flame; no rupture; no explosion; no exothermic reaction or thermal runaway. Cell irreversibly damaged. Repair needed.
3	Minor Leakage	No venting, fire, or flame*; no rupture; no explosion. Weight loss <50% of electrolyte weight (electrolyte = solvent + salt).
4	Major Leakage/Venting	No fire or flame; no rupture; no explosion. Weight loss \geq 50% of electrolyte weight (electrolyte = solvent + salt).
5	Fire or Flame	No rupture; no explosion (i.e., no flying parts).
6	Rupture	No explosion, but flying parts of the active mass.
7	Explosion	Explosion (i.e., disintegration of the cell).

* The presence of flame requires the presence of an ignition source in combination with fuel and oxidizer in concentrations that will support combustion. A fire or flame will not be observed if any of these elements are absent. For this reason, we recommend that a spark source be used during tests that are likely to result in venting of cell(s). We believe that "credible abuse environments" would likely include a spark source. Thus, if a spark source were added to the test configuration and the gas or liquid expelled from the cell was flammable, the test article would likely progress from level 3 or level 4 to level 5.



Safety Features and Options

We provide safety features for reliability and abuse testing of batteries. Each environmental chamber is designed with safety in mind. Safety features may be incorporated into CSZ test chambers and tailored to the various hazard levels (0 - 6) to help mitigate potential risks.



Safety Features and Options

Electronic Safety Door Interlock

Prevents entry either during tests or after an event.



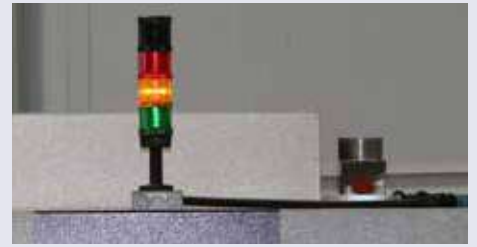
Temperature Limited Sheath Heaters

Sheath heater temperature is set below ignition temp of gases.



Light Stack & Audible Alarm

Shows chamber status or other specific alarm functions



Lighting Options

Exterior mounted light eliminates potential for spark.



LED Light with external electrical connection.



Secondary Door Restraint

Catches door in the event of pressure event.



Fire Suppression Systems

Uses N2 or CO2 used to "manage" the thermal runaway of a battery fire; not actually suppress a fire.

Lithium-ion fires are self-sustaining. CO2 will be used to cool the environment and inert the volume. Fire detection tubing detects flame and (heat), bursts, and allows the cylinder's valve to open and release the CO2 suppression agent.



Dry Air Purge or Fresh Air Blower

This option cycles for a duration of time to completely exchange "contaminated" air with dry air. Needs a compressed air or fresh air intake and can be manual or automatic.



Gas Monitors (O2, HC, CO)

Monitors the presence of specified gases. Can be interlocked to controller to shut down chambers.



Heated Explosive Relief Vent

Protects chamber from a sudden release of high pressure gas.





© GM Corporation

Other Battery Safety Options

- **Explosion Resistant Light** - Fully enclosed explosion rated light to prevent ignition source.
- **Product Limit with Alarm** - An added level of safety to prevent overheating.
- **Nitrogen Purge** - Aids in flushing gases from inside the chamber prior to opening the door.
- **Intrinsically Safe Barriers** - Prevents the potential of high voltage pulses.
- **Reinforced Floor** - Reinforced Chamber floor supports weight of heavy battery modules or packs.

Battery Testing Risks

- Chemical reactions
- Thermal charges & thermal runaways
- Reactions to overcharge
- Reactions to fast charge
- Reactions to damage
- Rupture
- Fire & flame from ignition of flammable gas/liquid
- Explosion

Failure Modes

- Cracks in membrane separating anode and cathode
- Overheating
- Over charging
- Under charging





Battery Test Specifications for Environmental Testing

Below are common battery testing standards that require various types of environmental testing such as temperature cycling, humidity, altitude and vibration.

Test Specification	Description
ANSI C18.3M, Part 2	Portable Lithium Primary Cells and Batteries - Safety Standard
ECE R100 Rev2	Uniform provisions concerning the approval of vehicles with regard to specific requirements for the electric power train
IEC 60086-4	Primary Batteries, Part 4: Safety of Lithium Batteries
IEC 61960	Secondary Lithium Cells and Batteries for portable applications
IEC 62133	Secondary Cells and Batteries Containing Alkaline or Other Non-acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from them, for Use in Portable Applications
IEC 62281	Safety of primary and secondary lithium cells and batteries during transport (similar to UN/DOT 38.3)
IEC 62660-2	Secondary lithium-ion cells for the propulsion of electric road vehicles - part 2: reliability and abuse testing
IEEE 1625	Rechargeable Batteries for Multi-Cell Mobile Computing Devices
IEEE 1725	Rechargeable Batteries for Cellular Telephones
RTCA DO-311	Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems
SAE J 2289	Electric Drive Battery Pack System Functional Guidelines
SAE J 2464	Electric and Hybrid Electric Vehicle Rechargeable Energy Storage System (RESS) Safety and Abuse Testing
SAE J 2929	Electric and Hybrid Vehicle Propulsion Battery System Safety Standard - Lithium Based Rechargeable Cells
UL 1642	Used for testing lithium cells. Battery level tests are covered by UL 2054
UL 2054	Household and Commercial Batteries - Component cell level testing covered by UL 1642
UL 2580	Batteries for use in Electric Vehicles
UN/DOT 38.3	UN Lithium Battery Testing Requirements, Covers transportation safety testing for all lithium metal and lithium ion cells and batteries
UNECE Regulation R100	Safety requirements specific to the electric power train of road vehicles including rechargeable battery systems
USCAR	Battery safety and performance from the EV Battery Test Procedures Manual, Battery Technology Life Verification Test Manual

EZT-570S Controller

The Next Generation Controller with Smartphone Technology

Communications & Connectivity

- Monitor and/or Control the chamber remotely for anytime, anywhere access from any device using LAN VNC
- Alarm notification sends email and/or text messages
- Email built-in to send data, alarm, audit trail files directly from controller
- Ethernet TCP/IP, EIA-232, EIA-485 communications

Profiling

- Profiling includes up to 99 steps and 1000 cycles
- Program ramp steps entering time or °C/min
- Easily review profile using trend chart or review list of steps before running profile
- Profile status view displays current step, estimated start/stop date and time and more
- Profiles may be transferred to different chambers via USB or optional EZ-View software
- Automated delay profile start

Data Logging

- Configurable log interval, data file length, filename, operator entered batch & lot information as well as an unlimited number of operator notes saved to the data file
- Access data files directly from controller or PC
- Easily download profiles, alarm files, audit trail files and data files using USB or email from controller in a compatible .csv file format for ease of use. Also import profiles to other chambers saving valuable profile entry time
- Files may also be automatically backed up daily for hassle-free file management using FTP. FTP/FileWeb/DataWeb (LAN/WAN)

User Convenience & Flexibility

- Controller may be configured in any of one of 28 languages - one setting updates icons, menus and help screen
- Selectable power failure/recovery options
- Full system security allows up to 30 different users with four different levels of security
- Audit trail files track changes in settings by each user
- Import/export configuration settings to other controllers saving time
- Configurable alarms and maintenance alerts



Save valuable time with the ease of use of the EZT-570S featuring fewer steps to accomplish your daily testing needs while incorporating simplified operation and programming to test faster.





Cincinnati Sub-Zero is a product brand of Weiss Technik North America, Inc. Weiss Technik North America is a member of the Weiss Technik group of companies, a division of the Schunk Group with its headquarters in Heuchelheim, Germany. Weiss Technik is the world's largest manufacturer of environmental simulation systems and employs more than 2,400 people in 22 group companies in 15 countries.



Testing Services

Our A2LA Accredited Test Laboratory provides environmental simulation testing utilizing the latest test technology to meet your testing needs from product qualification testing, overflow testing and /or third party product validation. Capabilities include Temperature, Humidity, and/or Vibration, Thermal Shock, Burn-in, Altitude, Vibration, HALT/HASS, Shock, Salt Spray, Cyclic Corrosion test and Drop Testing. Serving you from two locations in **Cincinnati, OH** and **Sterling Heights, MI**.



CSZ
Cincinnati Sub-Zero
The Testing Standard.

testforce

+1 (888) 880-6804
sales@testforce.com