

Technical Note 3

Innovative Solutions for Battery Testing



Introduction

As part of our commitment to providing test services and equipment for the renewable energy sector, CVMS Climatic has developed a series of environmental test chambers for battery testing. This includes the small batteries used in portable electronic devices, the large battery packs designed for electric vehicles and everything in between.

The European Council for Automotive R&D (EUCAR) have published a classification of the hazard levels associated with the use of batteries in electrically powered vehicles and we follow this guidance when designing our test chambers.

EUCAR Hazard Level Table - CVMS CLIMATIC

Hazard 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	Leakage Δ mass < 50%	No venting, fire, or flame; no rupture; no explosion. Weight loss < 50% of electrolyte weight (electrolyte = solvent + salt).
4	Venting Δ mass $\geq$ 50%	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).

Batteries are subjected to environmental testing to ensure safety in operation as well as testing their performance under extreme conditions to improve service life and reliability. We can provide test chambers ranging from compact benchtop sizes to walk-in or drive-in facilities. We can simulate all the conditions encountered by batteries during the manufacturing process,



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storage, transportation, and use. CVMS Climatic's battery test chambers control temperature and humidity with great accuracy and repeatability and if required, we can combine this with a vibration system that will provide the customer with a comprehensive test package.

As well as the usual features you would expect from a good quality test chamber, we have incorporated the safety equipment and devices needed for dedicated battery testing or the testing of equipment containing batteries. Depending on the proposed test regime this can include any of the following:

- Robust design with reinforced door, locks, and chains.
- Emergency stop switch.
- Door interlock to prevent the door being opened during operation.
- Pressure relief vents to direct rapid gas expansion safely.
- Gas detection and monitoring [H₂, CO, HC] appropriate to the test.
- Alarm with external signal and automatic purge system.
- Over-temperature protection.
- Reinforced floor and racks for heavy test loads.
- Window and lamp protection cover.
- Status indicator lamps.
- Smoke detector.
- CO₂ fire suppression.
- GN₂ purge to maintain O₂ at safe levels.

Relevant test standards:

- UL2580 Batteries used in electric vehicles.
- UL1642 Standards for lithium batteries
- IEC62660-1 Secondary lithium-ion cells for propulsion of electric vehicles
- IEC62660-2 Reliability and abuse testing for lithium-ion cells in electric vehicles
- SAE J2464 EV and HEV rechargeable energy storage system safety and abuse testing
- UN/DOT 38.3 Lithium batteries during shipping

Outer explosion proof window cover



CO₂ fire suppression



All our chambers are bespoke designs, tailored to the customer's specific requirements.

Our products include:

- Compact or benchtop chamber for small devices (hazard level 0 – 4)
- Walk-in / Drive-in climatic test rooms (hazard level 0 – 6)
- Air treatment unit (ATU) with remote enclosure (hazard level 0 – 6)
- Floor-standing climatic chambers (hazard level 0 – 6)
- Combined Climate and vibration systems (hazard level 0 – 6)
- Special purpose containment chamber (hazard level 7)

For further information contact:



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