



**HAZMAT SAFETY
CONSULTING**



SAE G27 Generic Packaging

What is a "Generic Packaging"?

Why is it needed?

How is it approved?

Are these packages available?

Bob Richard

President, Hazmat Safety Consulting LLC

October 27, 2022

SAE G27 Generic Packaging

The SAE Aerospace Standard (AS6413) specifies a minimum performance package standard that supports the safe shipment of lithium batteries as cargo on aircraft.

The standard provides test methods to demonstrate and document the mitigation of the potential hazards from lithium cells or batteries when transported as cargo on aircraft. It addresses the need to control the hazards to the aircraft from a failure of an individual cell by containing the hazards within the package.

The standard includes baseline tests and testing alternatives which include generic packaging.

SAE G27 Generic Packaging

What is a generic packaging?

2.3.5 Generic Package is a package that has been qualified for cells or batteries according to the criteria and test method specified in AS6413, Appendix B.3.

It is a package designed to be used for a variety of configurations of cells or batteries without having to test every configuration.

The generic package can save testing costs and provide an alternative when a package tested for a specific cell, battery or tested packaging configuration is unavailable.

SAE G27 Generic Packaging

What is a generic packaging?

The test is conducted in accordance with the baseline test method but with cells at 100% SOC for rechargeable cells and with undischarged non-rechargeable cells.

To establish an acceptable safety factor the test is conducted with a greater number of cells than are required to qualify a test article according to the AS 6413 baseline test.

The test is conducted using cells with the highest energy that the test article is qualified for as a generic package.

If the test article is intended to be used to transport batteries, the tested cells must be representative of the component cells of the batteries but in a worse-case configuration.

SAE G27 Generic Packaging

How is it tested?

The tests are conducted at not less than 150% of the total energy content intended for the qualification of the test article.

A test article is qualified to contain only cells or batteries from the same manufacturer and of the same form factor (e.g., prismatic, pouch, or cylindrical) unless the test article is successfully tested to the baseline test with the cells having the highest energy density*.

*Energy density is the measure of how much energy a battery contains in proportion to its weight. This measurement is typically presented in Watt-hours per kilogram (Wh/kg). A watt-hour is a measure of electrical energy that is equivalent to the consumption of one watt for one hour.

SAE G27 Generic Packaging

How is it tested?

The tests are conducted using fully charged cells.

To ensure an appropriate safety factor, the cumulative energy content of the tested cells in the test article shall be at least 150% of the total energy content intended for the qualification of the test article.

The test article must be tested with bare cells, grouped together in the worst-case configuration for thermal propagation. The cells must not be electrically connected.

SAE G27 Generic Packaging

What is the pass/fail criteria?

No flames or fragments exiting the package

The gas/vapor collected within the chamber shall not ignite during the test.

The walls of the package shall have no perforations and the package must contain its contents.

The temperature measured on any external surface upon the removal of the initiation energy will not exhibit an increase in temperature greater than 150°C for more than 3 minutes during the remainder of the test.

The integrated average temperature for each sensor shall not exceed an increase of +100 °C measured on any external surface upon the removal of the initiation energy during the remainder of the test procedure.

SAE G27 Generic Packaging

Reporting, documentation and coordination between manufacturers and users is essential.

4.1.4.3, LP906 Amend the third sentence to read “For batteries and items of equipment containing batteries:”.

“(4) The specific instructions for use of the package shall be made available by the packaging manufacturers and subsequent distributors to the consignor.

They shall include at least the identification of the batteries and items of equipment that may be contained inside the packaging, the maximum number of batteries contained in the package and the maximum total of the batteries’ energy content, as well as the configuration inside the package, including the separations and protections used during the performance verification test.”

SAE G27 Generic Packaging

Reporting, documentation and coordination between manufacturers and users will be important.

Definition of the package as tested. This shall include:

- a) Cell or battery manufacturer's name;
- b) Packaging manufacturer's name;
- c) Description of cell or battery to include at a minimum:
 - i. Lithium ion or lithium metal cell or battery;
 - ii. Mass;
 - iii. Watt-hour rating, or lithium content;
 - iv. Cell/battery geometry;
 - v. Model number;
 - vi. Design format;
 - vii. Cell or battery manufacturer
 - viii. State of charge of the cells or batteries in the "as tested" condition
 - ix. **The established SOC method and determined capacity**
- d) Detailed bill of materials in the package (including packaging materials)
- e) Instructions for assembling package.
- f) The number of cell/battery per package according to the qualification test
- g) Photographs of the package as presented for transport
- h) Definition of test apparatus to include:
 - i) List of instrumentation equipment and validation of calibration
 - j) Calculation of Test Chamber Free Volume during test
 - k) Heat source or other equipment used to initiate thermal runaway
 - l) If a method other than direct application of a heat source was used to initiate thermal runaway, the method used must be documented and the comparison of the cell hazards resulting from the heat source methodology and the alternate methodology must be included in the documentation.

SAE G27 Generic Packaging

Are these packages available?

Yes, they are being used under special permits and approvals to transport prototypes (SP A88), damaged defective or recalled (not by air), cells or batteries at states of charge in excess of 30% SOC (SP A331) and aboard passenger aircraft when needed urgently and cargo air services is unavailable (SP A334).

They are also used voluntarily to meet a higher level of safety.

SAE G27 Generic Packaging

Packing Providers:

Americase

KULR

Obexion

CellBlock

Packaging and Crating Technologies

Zarges



Questions?

Bob Richard

President, Hazmat Safety Consulting

brichard@hazmatsafety.com

+1 (773) 540-0837