



Cell Calendar Life for Rechargeable Energy Storage Systems

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This standard specifies the test procedure for evaluating the performance for Hybrid Electric Vehicle (HEV), Plug-in Hybrid Electric Vehicle (PHEV), Extended Range Electric Vehicle (EREV) and Electric Vehicle (EV) batteries that are used in a vehicle environment.

1.1.1 Calendar Life. This test shall be used to evaluate the ability to meet vehicle rechargeable energy storage systems (RESS) performance metrics. The calendar life test is designed to permit the evaluation of cell or battery degradation as a result of the passage of time with minimal usage. It is not a pure shelf life test, because the devices under test are maintained at or near a target state of charge (SOC) during the test. They must also be periodically subjected to reference discharges to determine the changes (if any) in their performance characteristics.

1.2 Foreword. This document provides the standard technical requirements for HEV, PHEV, EREV and EV batteries. A program-specific technical specification that is used in conjunction with this document may include additional program-specific requirements that are not referenced in this document and may supercede any requirements included in this document. In the case of any conflicts between this document and the program-specific technical specification, the program-specific technical specification takes precedence.

1.3 Applicability. This standard applies to all RESS for passenger or commercial vehicles and trucks. General Motors shall approve all changes to the format and/or content of this test standard.

Hybrid controllers, battery disconnect units (BDU), and other internal electrical/electronic components are required to meet GMW3172.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3172

2.3 Additional References.

CG2762 Default Test Parameters

United States Advanced Battery Consortium (USABC): **FreedomCAR Battery Test Manual for Power-Assist Hybrid Electric Vehicles**

USABC: **FreedomCAR Battery Test Manual for Plug-In Hybrid Electric Vehicles**

3 Resources

3.1 Facilities. The test facilities and equipment shall be in good working order and shall have valid calibrations. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

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3.2 Equipment. Appropriate equipment is required to complete the test procedure defined in Section 4 to acquire and store all necessary data. Data must be recorded using appropriate software for the battery cycler in use. Data sources will include data measured by the battery cycler and any external process indicators, i.e., flow meters. There may be additional data sources.

3.2.1 Equipment Parameters. Unless stated otherwise, the information in Table 1 defines the minimum test equipment parameters and tolerances to be used for all testing.

Table 1: Equipment Parameters and Tolerances

Parameter	Range	Accuracy
Direct Current (DC) Voltage: Cell Level – Generate and Measure	0 V to 20 V	± 0.1% of Full Scale
DC Current: Cell Level – Generate and Measure	± 0 A to ± 500 A	± 1% of Full Scale

3.3 Test Vehicle/Test Piece. All Cell Level RESS.

3.4 Test Time. See CG2762.

3.5 Test Required Information. All limits imposed by the battery manufacturer shall be observed over the course of testing. Power, current, voltage and temperature restrictions provided in written documentation by the manufacturer take precedence over any instructions given in this document.

3.6 Personnel/Skills. All personnel performing tests must have up to date training records in a high voltage training program.

3.7 Personal Protection Equipment (PPE). PPE, such as high voltage gloves, face shields, fire extinguishers, etc., shall be in good working order and available in the immediate area used in the execution of the testing.

4 Procedure

4.1 Preparation.

4.1.1 Soft-packaged prismatic cells and metal can prismatic cells must be tested under a minimum external pressure. See CG2762 for more information.

4.1.2 Additional customer requests or requirements must be provided in writing prior to start of test.

4.1.3 All devices under test (DUT) should be subjected to an initial inspection, as defined by the requestor.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless stated otherwise, the information in Table 2 defines the minimum test environment parameters and tolerances to be used for all testing.

Table 2: Environmental Parameters and Tolerances

Parameter	Range	Tolerance
Temperature Sensor – Measure	-40 °C to 85 °C	± 3 °C
Chamber Temperature – Generate and Measure	-40 °C to 85 °C	± 3 °C
Chamber Humidity – Generate and Measure	0% to 95% relative humidity (RH)	± 5% RH
Lab Environment Temperature – Measure	25 °C	± 10 °C
Lab Environment Humidity – Measure	10% to 85% RH	± 5% RH

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