



# SURFACE VEHICLE RECOMMENDED PRACTICE

J2288™

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## Life Cycle Testing of Electric Vehicle Battery Modules

### RATIONALE

The life cycle test methods for electric vehicle battery modules provided in SAE J2288 are mature and have been used for comparative testing since 1996. The methods are not likely to change in the foreseeable future. In addition, various other standards documents refer to SAE J2288. Therefore, SAE J2288 has been stabilized. Since SAE J1798/2 (Performance Rating of Lithium Ion Electric Vehicle Battery Modules) is being developed, SAE J1798/2 will incorporate corresponding life cycle test methods to maintain consistency with SAE J2288.

### STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Battery Standards Testing Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. **Scope**—This SAE Recommended Practice defines a standardized test method to determine the expected service life, in cycles, of electric vehicle battery modules. It is based on a set of nominal or baseline operating conditions in order to characterize the expected degradation in electrical performance as a function of life and to identify relevant failure mechanisms where possible. Accelerated aging is not included in the scope of this procedure, although the time compression resulting from continuous testing may unintentionally accelerate battery degradation unless test conditions are carefully controlled. The process used to define a test matrix of accelerated aging conditions based on failure mechanisms, and to establish statistical confidence levels for the results, is considered beyond the scope of this document.

Because the intent is to use standard testing conditions whenever possible, results from the evaluation of different technologies should be comparable. End-of-life is determined based on module capacity and power ratings. This may result in a measured cycle life different than that which would be determined based on actual capacity; however, this approach permits a battery manufacturer to make necessary tradeoffs between power and energy in establishing ratings for a battery module. This approach is considered appropriate for a mature design or production battery. It should be noted that the procedure defined in this document is functionally identical to the USABC Baseline Life Cycle Test Procedure.

#### 1.1 **Field of Application**—Electric Vehicles

#### 1.2 **Product Classification**—Electrochemical Storage Devices

- 1.3 **Form**—An Electric Vehicle propulsion battery will consist of a battery configuration of several (typically 12 V) modules interconnected in one or more series strings. This document provides test methods to determine the life expectancy of such modules, including but not limited to modules built in accordance with SAE J1797. Use of this document is intended for single independently packaged modules operating at ambient conditions (i.e., standard room temperature). Testing of a fully configured propulsion battery system, especially when designed to operate at elevated or reduced temperatures, usually results in reduced expected service life and requires testing methods beyond the scope of those included in this document.