

Specification for Testing Automotive Lamp Assemblies

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SPECIFICATION FOR TESTING AUTOMOTIVE LAMP ASSEMBLIES

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1. SCOPE*

The procedures contained in this specification cover the laboratory testing of Exterior Lamps for use in automotive road illumination. The following tests are intended to be run under the following conditions.

This document shall be applied to systems that meet the requirements for design, performance and validation established by government standards.

If other manufacture's components are intended to be approved for use in the lamp assembly, then those possible combinations of components shall be considered a new lamp assembly and shall also be tested.

2. SAFETY PRECAUTIONS

Halogen bulbs have pressurized gas inside and require special handling. They can burst or shatter if scratched or dropped.

- Wear appropriate eye protection, gloves, and shielding when performing any tests on bulbs covered by this specification.
- Use precaution in handling a bulb that has recently been energized. These bulbs operate at a very high temperature.
- Protect operating lamps from contact with liquid and moisture. Liquid contacting a hot bulb can cause it to shatter.
- Hold the bulb only by the base. Do not touch the glass portion of the bulb with bare hands.
- HID bulbs have pressurized gas inside, may contain mercury, and require special handling. They can burst or shatter if scratched or dropped.
- HID ballasts utilize high voltages to strike the arc. Use caution when handling.

2.1 High Voltage Identification/Labeling

The Lamp assembly shall meet the requirements of SAE J1673 - High Voltage Wiring Assembly Design. If a high voltage label is used, it shall meet the requirements of ISO 2575 Symbol M06 shown here.



ISO 2575 Symbol M06

This specification may involve hazardous materials, operations, and equipment. This specification does not purport to address all the safety concerns associated with its use. It is the responsibility of whoever uses this specification to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

3. REFERENCE STANDARDS

- AEC Q101 Stress Test Qualification For Discrete Semiconductors
- Chrysler, Ford, and General Motors Advanced Product Quality Planning and Control Plan Reference Manual
- Measurement Systems Analysis Reference Manual (AIAG)
- Potential Failure Mode and Effects Analysis Reference Manual (SAE J1739)
- Chrysler, Ford, and General Motors Production Part Approval Process Manual
- ANSI (C78.390)
- ASTM B117 (Standard Practice for Operating Salt Spray [Fog] Testing Apparatus)
- Chrysler, Ford, and General Motors Quality System Requirements—QS-9000 Manual
- IEC 60068-2-64 Vibration, broad band random and guidance
- ISO STANDARD 16750-3
- SAE J1330, Photometry Laboratory Accuracy Guidelines
- SAE J577, Vibration Test Machine and Operation Procedure
- SAE J578, Color Specification
- SAE J1383, Performance Requirements for Replaceable Bulb Motor Vehicle Headlamps
- SAE J2087, Daytime Running Lamps for Use on Motor Vehicles
- SAE/USCAR-15 "Specification for Testing Automotive Light Bulb Sockets".

Unless otherwise specified or required by law, suppliers shall use the most recent versions of any applicable reference documents or standards.

4. DIAGRAMS AND DEFINITIONS

4.1 Appendices

Diagrams are provided at the end of this specification to clarify the details of the test procedures. A Glossary of Terms is also included in the Appendix.

5. GENERAL REQUIREMENTS

5.1 Record Retention

Supplier must maintain a file for the storage of laboratory reports and calibration records, and establish a record retention policy concerning these records in accordance with QS-9000 and PPAP requirements. These records need not follow a standard format, but must present the required data in an orderly, professional manner. The file must be made available to any and all customer personnel upon request, including, but not limited to, representatives from the following areas: product engineering, purchasing, quality, and reliability.

5.1.1 Objectives of Record Retention

Following are the main objectives for retention of test documents or records:

1. Retain records that will evidence compliance so that the supplier can appropriately respond when or if product compliance is challenged. Files must exist for the storage of all laboratory records, data, and calibration records. The files must be available at any time for audit or inspection.
2. Retain records as needed to assist in evidencing the exercise of "due care" in matters relating to product compliance, government requirements, or product liability.
3. Comply with statutory requirements for the maintenance and retention of specific records.

5.1.2 Retention Methods

Methods of retention may include retention of original documents, the use of film, or the use of electronic storage equipment. Records shall be stored so that they are accessible in a reasonable amount of time. Storage areas should provide adequate protection from unauthorized access, moisture, and fire.

5.2 Sample Documentation and Retention

Engineering test samples must be numbered. Documentation must identify the type of test performed and describe special tests that are not a part of this specification. (Reference QS-9000 and PPAP requirements.)

5.2.1 Required Data Package

Supplier must submit the data package for the appropriate level of submission to the customer's responsible engineer and purchasing division for approval signatures.

5.2.2 Sample Retention

Samples tested to attain part approval must be retained by the manufacturer for a period of time specified in the PPAP Manual.

5.3 Power Sources

Supplier must use voltage regulated DC power sources for all tests to simulate an automotive battery and charging system.

5.3.1 Output Current

The power source must be capable of supplying a continuous output current as required by the design loads, including inrush current. Where required to simulate automotive inrush current conditions, an automotive battery or batteries with sufficient cold cranking amps may be connected in parallel with the power supply.

5.3.2 Output Voltage

The power source must be capable of supplying an output voltage that must not deviate more than 1.0 volt from the nominal setting over the entire load range (including surges). The power source must recover 63% of its maximum excursion within 5.0 milliseconds. Ripple voltage must not exceed 300 mV peak to peak. Power supplies used for photometric measurements must conform to SAE J1330.

5.4 Equipment Tolerances

Supplier must use test setups and equipment capable of measuring test parameters (expressed in nominals) within the limits found in Equipment Tolerance Table.

Equipment Tolerance Table

Test Chamber Temperature	nominal $\pm 3^{\circ}\text{C}$
Time	nominal $\pm 0.5\%$
Forces	nominal $\pm 0.01 \text{ N}$
Distances	nominal $\pm 0.01 \text{ mm}$
Mass	nominal $\pm 5\%$
Voltages	nominal $\pm 0.01 \text{ V}$ for photometrics
	nominal $\pm 0.1 \text{ V}$ for all other tests
MSCD	nominal $\pm 2.0\%$

NOTE: This table is not to be used for performance dependent variable (refer to section Measurement Accuracy)

5.5 Measurement Accuracy

Meters and gages used to assess the performance dependent variable, as defined by the basic function of the test sample, must have a smallest unit of measure one order of magnitude less than the least significant digit specified. For example, even though a 0.6 mm and 0.60 mm wire might be the same diameter, calipers capable of 0.01 mm resolution may be used to measure the first wire, but a micrometer with 0.001 mm resolution is needed for the second wire.

5.6 Test Repeatability and Calibration

5.6.1 Equipment Repeatability

All measurement equipment used for product evaluation must be repeatable to within 10% of the part tolerance according to Chrysler, Ford, and General Motors Measurement Systems Analysis Reference Manual.

5.6.2 Equipment Calibration

Equipment re-calibration/re-certification timing is to be calculated based on the capability of any individual instrument to retain its "Manufacture Stated Accuracy" between recall periods. However, this time shall not exceed one year.

5.6.3 Laboratory Masters (Photometry Only)

Lamps which are traceable to known standards are laboratory masters. Each supplier must use laboratory masters for comparison measurements, calibration of test equipment, and for evaluating long-term drift in test equipment.

5.7 Test Default Conditions

When specific test conditions are not given, the following basic conditions apply:

1. Test the lamp in its normal operating orientation.
2. Perform tests or measurements at the following ambient conditions:

Room Temperature.....23°C +/- 5°C

5.8 Test Failure Procedure

Should a test failure occur, the customer (Quality, Purchasing, and Design/Release Engineer) shall be notified immediately. When contact cannot be immediately made, stop the test until the requesting party can be contacted.

5.9 Control Plans

Supplier must maintain a control plan, consistent with the AIAG, that contains appropriate controls to ensure that all of the significant/critical characteristics are covered by the tests in sections Physical Performance, and Durability.

5.10 Reliability Programs and Methods

5.10.1 Reliability Growth and Ongoing Quality Improvements

Suppliers must establish and implement a plan to improve demonstrated product quality and reliability. They must establish procedures for analyzing and correcting end-of-line defects and predominant failure modes identified by the field return program. True reliability growth occurs when design changes to the lamp assembly or manufacturing process are made to eliminate the failure modes.

5.10.1.1 Notification of Process Changes

Suppliers must notify the customer of manufacturing process, material, or design changes to determine if resubmission for PPAP approval is required.

5.10.2 Quality/Reliability Improvement Tools

Suppliers must use appropriate methods to improve the quality and reliability of their products in accordance with QS-9000. Examples of such methods are Field Return Programs, Design Failure Mode Effects Analysis (DFMEA), Process Failure Mode Effects Analysis (PFMEA), and Fault Tree Analysis (FTA) or Fishbone Diagrams. Further information on these methods is available from the Automotive Industry Action Group (AIAG).

5.11 Hazardous Material Restriction

Any regulated substance that is identified by any federal, state, provincial, or local government unit or automotive manufacturer, shall not be used in the manufacturing process of any lamp assembly. Any lamp manufacturer that is currently supplying hazardous material in a component will submit a timeline to General Motors, Ford, and Chrysler for the removal of said product.

6. ENVIRONMENTAL TESTS

6.1 Internal Heat

This test simulates the internal heat generated in a lamp operating in a warm ambient environment. The testing is divided into signal lamps and headlamps/front fog lamps. The individual lamp functions are cycled ON/OFF to simulate driving conditions.

6.1.1 Test and Measurement Apparatus

1. Portland Cement – ASTM C 150-84
2. Heat Chamber – Static Air (no air flow), capable of maintaining $50^{\circ}\text{C} \pm 5^{\circ}\text{C}$
3. Power Supply
4. Controller to switch lamp functions ON/OFF

6.1.2 Procedure

1. For lamp assemblies, containing headlamps and/or front fog lamps, uniformly coat entire lens area (including signal functions) with ASTM C 150-84 Portland Cement per SAE J575 – INTERNAL HEAT TEST.
2. Mount the lamp assembly in the heat chamber in design position. If chamber air flow cannot be turned off, mount the lamp assembly in an enclosure. If an enclosure is used, the ambient test temperature shall be measured in the enclosure.
3. Connect lamp using appropriate mating connectors with all power, ground and signal lines as required by vehicle electrical architecture so all lamp functions can be exercised per test schedule.
4. Allow chamber to reach 50°C and stabilize for 1 hour. For interior mounted lamps (e.g. CHMSL) test chamber temperature shall be 95°C
5. Cycle lamp functions ON/OFF per attached Table, applying 14.0 ± 0.1 Vdc as measured at the lamp connection.
6. After the 4 hour cycle, allow the lamp to cool to room temperature.
7. Clean lens and visually inspect.
8. Power each function after lamp returns to ambient to verify functionality.

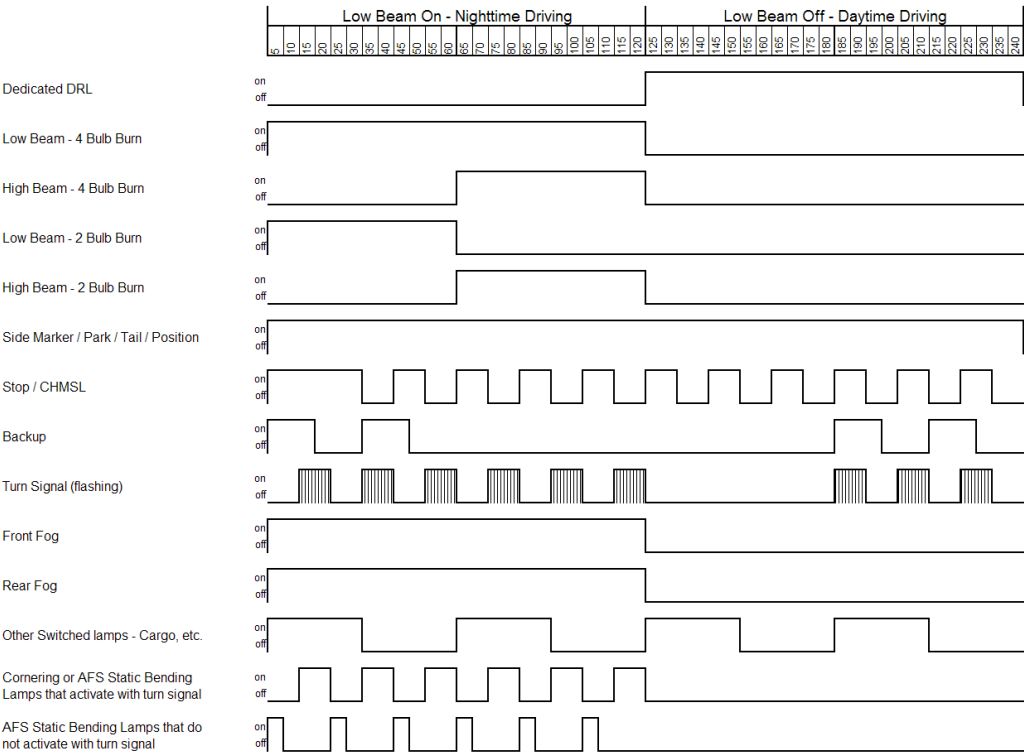


Table - Lamp Function Cycling

6.1.3 Acceptance Criteria*

- All lamps shall be visibly free of warps, cracks, crazing, blistering, de-lamination, out-gassing, haze or any other defect seen without magnification.
- All light sources shall illuminate when cycled “ON” during and at the end of the test.

6.2 Vibration with Temperature Cycling

Stress Test to ISO Standard 16750-3 while temperature cycling.

6.2.1 Test and Measurement Apparatus

1. Test fixture with In-vehicle attachment scheme
2. Temperature chamber with vibration capability
3. Power Supply

6.2.2 Procedure

1. Mount lamp assembly in the temperature chamber on test fixture utilizing lamp attachment features.
2. Using mating connector, connect wiring to lamp.
3. Simultaneously subject lamp assembly to the vibration profile from ISO Standard 16750-3 (sprung mass), temperature profile and voltage cycling with the max acceleration of 1.81Grms (fore, aft and lateral) and 2.84Grms (vertical)
4. Power the lamp 14.0 Vdc as shown in the charts; Ambient Temperature Transition Rates, Lamp Function Cycling.
5. Run vibration & temperature profile for 8 h for each X, Y, Z co-ordinate axis of the lamp assembly. (Option: If the vibration equipment is capable, all 3 axis may be run simultaneously.)