



SURFACE VEHICLE RECOMMENDED PRACTICE

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Full Adaptive Forward Lighting Systems

RATIONALE

This SAE Recommended Practice is based on United Nations (UN) Regulation No. 123, "Uniform Provisions Concerning the Approval of Adaptive Front-Lighting Systems (AFS) for Motor Vehicles." This document translated the UN R123 requirements into SAE J-document format, including the addition of environmental and self-certification requirements typically contained in SAE lighting documents, making them attuned with requirements in North America. When initially published, this document was in agreement with UN R123; however, UN R123 has since been updated and is expected to be further updated through the current UN regulatory simplification activities. SAE J2838 currently does not include any of these updates. Furthermore, it was determined that this document is not generally used in the industry based on publication sales. For these reasons, this document has been stabilized.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Road Illumination Devices Standards 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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For more information on this standard, visit
https://www.sae.org/standards/content/J2838_202003

Documents

Document Sharing Hub

1. SCOPE

This SAE standard provides test procedures, performance requirements, design guidelines and installation guidelines for full adaptive forward lighting systems (AFS).

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J599	Lighting Inspection Code
SAE J759	Lighting Identification Code
SAE J578	Color Specification
SAE J576	Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices

SAE J575	Test Methods and Equipment for Lighting Devices and Components For Use on Vehicles Less Than 2032 mm in Overall Width
SAE J1383	Performance Requirements for Motor Vehicle Headlamps
SAE J2442	Harmonized Provisions for Installation of Lamps and Retro-Reflecting Devices on Road Vehicles Except Motorcycles

2.2 Related Documents

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J565	Semiautomatic Headlamp Beam Switching Devices
SAE J581	Auxiliary High Beam Lamps
SAE J582	Auxiliary Low Beam Lamps
SAE J583	Front Fog Lamps
SAE J852	Front Cornering Lamps for Use on Motor Vehicles

2.2.2 Federal Publications

Available from the Superintendent of Documents, U. S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320 or at www.nhtsa.dot.gov.

Federal Motor Vehicle Safety Standard 49CFR 571.108

Federal Motor Vehicle Safety Standard 49CFR 564

Available from Transport Canada, Roads Safety and Motor Vehicle Regulation, Ottawa, Ontario K1A 0N5, Canada, www.tc.gc.ca:

Canada Motor Vehicle Safety Act and Regulations - Section 108 (CMVSS 108)

Technical Standard Document No. 108

2.2.3 UNECE Publications

Available from United Nations Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10, Switzerland, Tel: +41-0-22-917-12-34, <http://www.unece.org/trans/main/wp29/wp29regs.html>.

UNECE Standard No. 123	Uniform Provisions Concerning the Approval of Adaptive Front-Lighting Systems (AFS) for Motor Vehicles
TRANS-WP29-GRE-48-inf30e	AFS History and Scientific Backup
TRANS-WP29-GRE-48-inf28e	Adaptive Front Lighting System (AFS) Presentation to the 48th Session of GRE

3. DEFINITIONS

3.1 CLASS

Designation of a low beam. (C, V, E or W)

3.2 MODE

A beam from a forward lighting function complying with this standard.

3.3 BASIC MODE (Class C Mode)

Unmodified low beam pattern.

3.4 TOWN MODE (Class V Mode)

Modified low beam pattern which minimizes glare light to oncoming traffic and increases illumination of road delineators.

3.5 LIMITED ACCESS HIGHWAY MODE (Class E Mode)

Modified low beam pattern which increases seeing light down the road.

3.6 ADVERSE WEATHER MODE (Class W Mode)

Modified low beam pattern which increases illumination of road delineators, increases seeing light down the road, and decreases the illumination in front of the vehicle.

3.7 BENDING MODE

Modified beam pattern to increase illumination in curves, bends, or intersections. The beam pattern can be laterally moved in its entirety, a portion of the beam can be laterally moved, or the beam can be modified to obtain similar results.

3.8 SWIVELING BENDING MODE (Category 1 bending mode)

A bending mode characterized by a horizontal rotation of the Axis of Reference.

3.9 STATIC BENDING MODE (Category 2 bending mode)

A bending mode without a horizontal rotation of the axis of reference.

3.10 LIGHTING UNIT

A light emitting part of the system that may consist of optical, mechanical and/or electrical components designed to provide or contribute to a beam of one or more forward lighting function(s) provided by the system.

3.11 INSTALLATION UNIT

An indivisible housing (lamp body) that contains one or more lighting unit(s).

3.12 RIGHT SIDE/LEFT SIDE

The combined total of the lighting units intended to be installed on that side of the longitudinal median plane of the vehicle, relative to its forward motion.

3.13 SYSTEM CONTROL

The part(s) of the system receiving specified input signals from the vehicle, which it uses to automatically control the operation of the lighting unit(s).

3.14 NEUTRAL STATE

The position and output of the system when the specified vehicle signal(s) to produce the Basic Mode or high beam is provided.

3.15 SIGNAL

Any electrical input or output to or from the system intended to transmit information to the system control.

3.16 SUPPLY AND OPERATING DEVICE

One or more components of a system providing power to part or all of the system.

3.17 SYSTEM REFERENCE AXIS

The line emitting from the Center of Reference that is parallel with the longitudinal axis of the vehicle.

3.18 LENS

The light transmitting outer surface of an installation unit.

3.19 COATING

Any material applied to the light-transmitting outer surface of system.

3.20 AIMING

Positioning of the beam or parts thereof using an aiming screen.

3.21 ADJUSTMENT

The means provided for vertical and/or horizontal aiming of the beam.

3.22 SUBSTITUTE FUNCTION

Any lighting function which is used to replace a forward lighting function as a result of failure to provide a temporary level of performance.

3.23 COMPLETE SYSTEM

The entire set of right side and left side lighting units, including any control devices, power supply devices, and operating device(s) and any surrounding body components including lamps that could influence the system's thermal dissipation.

3.24 CUTOFF

A visual/optical aiming cue in the low beam that marks a separation between areas of higher and lower luminance.

3.25 FLASH TO PASS

The temporary manual activation of one or more lighting units for signaling vehicles ahead that the driver is intending to pass.

4. LIGHTING IDENTIFICATION CODE

A system with adaptive lighting functionality may be identified by the lighting functions in accordance with SAE J759.

5. TESTS

5.1 The following SAE J575 tests are applicable with modifications as indicated.

5.1.1 Photometry

5.1.1.1 Photometric measurements shall be performed for each function contained within the system.

5.1.1.2 Lighting units shall not be re-aimed during photometry testing beyond any beam changes resulting from the automated adaptation described in the following sections.

5.1.1.3 Low beam

The system shall be set to the neutral state emitting the Basic Mode (class C) low beam prior to subsequent test procedures.

5.1.1.3.1 Lighting units shall be tested in their designed state when a signal (per section 3.15) corresponding to the Class V mode, Class W mode, Class E mode, or Class T mode is provided as applies.

5.1.1.3.2 If applicable, lighting units shall be tested in their designed state when an additional signal (per section 3.15) is provided, or when additional combinations of signals are provided as specified by the design of the system.

5.1.1.4 High Beam

If the system incorporates an aiming mechanism that allows it to be aimed independently of the low beam, the lighting unit(s) shall be aimed such that the area of maximum illumination is centered on the point (HV) of intersection of the lines H-H and V-V.

5.1.2 Vibration

5.1.3 Impact

5.1.4 Abrasion Test of Plastic Headlamp Lens Material

5.1.5 Warpage Test on Device with Plastic Components

5.1.6 Thermal Cycle Tests

5.1.7 Internal Heat Test

5.1.8 Solar Irradiation

5.1.9 Water Intrusion (Moisture) Test

5.1.10 Humidity Test

The system or parts thereof shall be seasoned and photometered to Table 3 through Table 8 as applicable before and after the humidity test as specified in SAE J575.

5.1.11 Dust Exposure Test

5.1.12 Corrosion Test

5.1.13 Corrosion Resistance Test for Reflectors of Replaceable Lens Lamps

5.1.13.1 The lighting unit shall be seasoned and photometered to Table 3 through Table 8 as applicable before and after the corrosion test.

5.1.14 Chemical Resistance Test

5.1.15 Chemical Resistance Test for Reflectors of Replaceable Lens Lamps

The system or part(s) thereof shall be seasoned and photometered to Table 3 through Table 8 as applicable before and after the chemical resistance test.

5.2 The following SAE J1383 tests are applicable with modifications as indicated.

5.2.1 Color

5.2.2 Plastic Materials

5.2.3 Aiming Adjustment

5.2.3.1 When conducting the aiming adjustment test, an accurate measurement technique shall be used. This may consist of:

- Attaching a device, such as a spot projector, to the headlamp, or
- Replacing the replaceable bulb with a mirror along with a separate light source, or
- Other equally accurate means.

5.2.3.2 When conducting the test, the headlamp shall be mounted initially in the design position with the unit at nominal aim (0,0).

5.2.3.3 The vertical aiming device shall be turned to the upper and lower extremes of its range as defined in 6.2.3 and the vertical angle between the mechanical and H-V axes shall be measured in each position. Any change in horizontal angle throughout the vertical aim range shall also be recorded.

5.2.3.4 The horizontal aiming screw shall be turned to the left and right extremes of its range as defined in 6.2.3, and the horizontal angle between the mechanical and H-V axes shall be measured in each of these positions. Any change in vertical angle throughout the horizontal aim range shall also be recorded.

5.2.4 Aim Range

The photometry shall be tested per 5.1.1 with the lens at any position relative to the reflector within the range limits of ± 2 degrees or the maximum range of the lamp if less than 2 degrees.

5.2.5 Inward Force

5.2.6 Torque Deflection

5.2.7 Thermal Cycle Test

5.2.8 Internal Heat Test