



SURFACE VEHICLE STANDARD

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Heavy Duty Lamp Electrical Connector Standard

RATIONALE

5 year review.

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1. SCOPE

This SAE Standard encompasses connectors that form the electrical interface(s) between the heavy duty lighting device(s) and the truck and truck/trailer wiring harness system. This document provides design and performance requirements based upon the mechanical, electrical and environmental conditions and covers applications of connectors for direct current electrical systems of 24 V nominal or less in heavy-duty signaling and marking devices. This standard excludes forward lighting devices (i.e., fog lamps) but includes the following list of lamps:

- Stop Lamps
- Tail Lamps
- Turn Signal/Hazard Warning Lamps
- Side Marker Lamps
- Clearance Lamps
- Identification Lamps
- Back Up Lamps
- Side-Turn Signal Lamps
- Work Lamps
- License Lamps
- Chassis Component Status (ABS) Lamps
- Identification Lamps

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 J163	Low Tension Wiring and Cable Terminals and Splice Clips
SAE J726	Air Cleaner Test Code
SAE J1128	Low Voltage Primary Cable
SAE J1455	Recommended Environmental Practices for Electronic Equipment Design in Heavy-Duty Vehicle Applications

- SAE J1908 Electrical Grounding Practice
- SAE J2030 Heavy-Duty Electrical Connector Performance Standard
- SAE J2139 Tests for Signal and Marking Devices Used on Vehicles 2032 mm or More in Overall Width
- SAE J2174 Heavy-Duty Wiring Systems for Trailers 2032 mm or More in Width

2.1.2 MIL Specification

Available from U.S. Government, DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-2179, <http://assist.daps.mil> or <http://stinet.dtic.mil>.

- MIL-STD-1344A Method 3002.1 Low-Signal Level Contact Resistance

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

- ASTM G 154 Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
- ASTM G 155 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

2.2 Related Publications

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 J821 Electrical Wiring Systems for Construction, Agricultural, and Off-road Machines
- SAE J858 Electrical Terminals—Blade Type
- SAE J1067 Seven Conductor Cable—Truck and Bus
- SAE J1292 Automobile and Motor Coach Wiring
- SAE J1614 Wiring Distribution Systems for Construction, Agricultural, and Off-Road Work Machines
- SAE J2202 Heavy-Duty Wiring Systems for On-Highway Trucks
- SAE J2223-1 Connections for On-Board Road Vehicle Electrical Wiring Harnesses—Part 1: Single-Pole Connectors—Flat Blade Terminals—Dimensional Characteristics and Specific Requirements
- SAE J2223-2 Connections for On-Board Road Vehicle Electrical Wiring Harnesses—Part 2: Tests and General Performance Requirements
- SAE J2223-3 Connections for On-Board Road Vehicle Electrical Wiring Harnesses—Part 3: Multiple Connectors—Flat Blade Terminals—Dimensional Characteristics and Specific Requirements
- SAE/USCAR 2-5 Performance Specification for Automotive Electrical Connector Systems

2.2.2 ISO Publication

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 8090 Road vehicles—Connections for on-board electrical harnesses

2.2.3 TMC Publications

Available from the Technology and Maintenance Council, American Trucking Associations, 2200 Mill Road, Alexandria, VA 22314, Tel: (703) 838-1700, www.truckline.com.

TMC # RP-153(T)	Lamp-to-Connector Interface
TMC #RP-107	Seven Conductor Truck-Trailer and Converter Dolly Jumper Cable and Connector
TMC #RP 110A	Low Tension Cable for Heavy-Duty Truck-Trailer Wiring Systems
TMC #RP 112	Terminals for Heavy-Duty Truck-Trailer Primary Wiring Systems
TMC #RP 113	Electrical Systems Connectors
TMC #RP 120	Wiring System Identification
TMC #RP 121	Electrical Connector System for Auxiliary Starting and Off-Board Diagnostics
TMC #RP 129	Heavy-Duty Vehicle System Wiring Checks: 12-Volt Charging-12-Volt Cranking
TMC #RP 135	Multi-Pin Connector Repairs
TMC #RP 137	Antilock Electrical Supply from Tractors through the SAE J560 Seven-Pin Connector
TMC #RP 703A	Electrical and Gladhand Connector Placement
TMC #RP 704B	Heavy-Duty Lighting Systems for Trailers
TMC #RP 1201	Joint TMC/SAE Recommended Practice for Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications
TMC #RP 1203	Vehicle Electronics Glossary of Terms

3. DEFINITIONS

3.1 CONNECTOR

A coupling device which provides an electrical and/or mechanical junction between the heavy duty lighting device(s) and the vehicle harness system component. It can also provide for mechanical stability and geometric arrangement.

The male connector half is the portion of the connector that incorporates the blade terminals.

3.2 TERMINAL

An electrically conductive device attached to a conductor to facilitate connection to an electrical component.

3.3 SEALED

A system that creates a non-leaking union between mechanical elements when subjected to the water immersion, fluid immersion and pressure washing requirements as defined in the tests within this document.

3.4 SIGNAL LEVEL CIRCUIT

A circuit in which open circuit voltages and currents are low, generally produces $< 5^{\circ}\text{C}$ temperature rise over ambient and at the levels where the current is not able to break through the film of oxides, sulfides, or other films or contaminants which may build up on the contact surfaces.

3.5 POWER CIRCUIT

A system using two or more cables where current flows from the source to one or more electronic/electrical devices and back again to the source. The electrical energy is supplied at high levels of current at typical system voltage and generally produces greater than 10°C temperature rise over ambient.

3.6 INDEPENDENT CONNECTOR

Is a connector in which both halves are attached to wire leads or wire harnesses.

3.7 INTEGRAL CONNECTOR

Is a connector in which one-half is built into the lamp housing.

3.8 SECONDARY LOCK

Is an auxiliary or additional piece that fits over the body of a connector half in order to retain seals and/or terminals.

4. SAMPLES FOR TESTS

4.1 Sample Preparation

Samples shall be made on the manufacturer's recommended connector tooling and checked for conformance to manufacturer's standards for connectors.

4.2 Assembly

All cavities shall be wired with minimum approved wire insulation size in lengths sufficient to accommodate testing. Wire insulation diameter shall be checked and be within the connector's manufacturing specification. Crimp characteristics (i.e., height, width, etc.) shall be checked. To prevent capillary action on sealed connectors, all loose wire ends and test points (i.e., millivolt test connection) shall be sealed with alcohol-base RTV silicone or equivalent. The wire gage is to be verified for correctness.

5. TEST SEQUENCE

Test samples shall be subjected to the tests in the order shown in Table 1.

TABLE 1 - TEST SEQUENCES

Test Description	Test Para.	Test Group A Samples 6 Sequence	Test Group B Samples 6 Sequence	Test Group C Samples 6 Sequence	Test Group D Samples 6 Sequence	Test Group E Samples 6 Sequence	Test Group F Samples 6 Sequence	Acceptance Requirements Paragraph
Examination of Product	6.1	1	1	1	1	1	1	7.1
Insulation Resistance	6.2	2,7,9,11,13,16	2,7,9,11,13,				2,6	7.2
Specified Rated Resistance	6.3				2,8	4,14,16		7.3
Steam Cleaning/ Pressure Washing	6.22	15	12					7.22
Maintenance Aging	6.5				4			7.5
Temperature Life	6.6		4	5		5	3	7.6 & 7.21
Mating Forces	6.14.2			14	7			7.14.2
Unmating Forces	6.14.3			13	6			7.14.3
Durability	6.8		3	3	3	2		7.8 & 7.1
Corrosion	6.9	12	8					7.9
Thermal Shock	6.12	6		9		7		7.12 & 7.1
Fluid Immersion	6.11	14	10					7.11
Shock	6.13.1	4		12				7.13.1
Drop Test	6.13.2	5						7.13.2
Vibration	6.13.3	3	5	11		9		7.13.3
Terminal Retention	6.7				10			7.7
Water Submersion	6.10.1	10	6					7.10.1
Water Submersion	6.10.2						5	7.10.2
Connector Retention	6.14.1			16	9			7.14.1
Mismatching	6.14.4							7.14.4
Side Load Force	6.14.5						4	7.14.5
Current Test	6.15					15		7.15/6.3/7.3
Temperature/ Humidity	6.18	8		7		11		7.18 (7.21)
Low-Voltage Resistance	6.16			2,4,6,8, 10,15		3,6,8,10,12		7.16
Current Cycling	6.19					13		7.19/6.3/7.3
Dust Test	6.20				5			7.20
Crimp Strength	6.4					18		7.4
Visual Examination	6.21	15	14	17	11	17	7	7.21