



SURFACE VEHICLE RECOMMENDED PRACTICE

J902™

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Passenger Vehicle Windshield Demisting and Defrosting Systems

RATIONALE

Five years have passed, and updates to windshield zones are expected to be updated.

1. SCOPE

This SAE Recommend Practice establishes for passenger cars, light trucks, and multipurpose vehicles with GVW of 4500 kg (10000 pounds) or less, as defined by the EPA, and M1 category vehicles, as defined by the European Commission:

- 1.1 Minimum performance standards for defrosting and demisting systems.
- 1.2 Test procedures that can be conducted on uniform test equipment by commercially available laboratory facilities.
- 1.3 This procedure may be used to develop or to validate a defrosting and defogging system.

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 +1 724-776-4970 (outside USA), www.sae.org.

SAE J826	Devices for Use in Defining and Measuring Vehicle Seating Accommodation
SAE J903	Passenger Car Windshield Wiper Systems
SAE J941	Motor Vehicle Drivers' Eye Locations
SAE J1100	Motor Vehicle Dimensions

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SAE WEB ADDRESS:

Full document details: SAE J902_202506

For more information on this standard, visit
https://www.sae.org/standards/content/J902_202506/

Documents

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2.1.2 NHTSA Publications

Available from National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590, Tel: 1-888-327-4236, <https://www.nhtsa.gov/>.

Laboratory Test Procedure for FMVSS 103 - Windshield Defrosting and Defogging Systems, <http://www.nhtsa.gov/DOT/NHTSA/Vehicle%20Safety/Test%20Procedures/Associated%20Files/TP-103-13.pdf>.

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 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 3468 Road Vehicles - Windscreen Defrosting Systems for Passenger Cars - Test Methods

ISO 3470 Passenger Cars - Windscreen Demisting Systems - Test Method

ISO 5897 Passenger Cars - Rear-Window Demisting System - Test Method

ISO 5898 Passenger Cars - Rear-Window Defrosting Systems - Test Method

2.2.2 United Nations Publications

Available from United Nations Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10, Switzerland, Tel: +41-0-22-917-12-34, www.unece.org.

EEC Council Directive 672/2010 on windshield defrost and defog

3. DEFINITIONS

3.1 DEFROSTING

Means elimination of frost or ice covering the inside or outside glazed surfaces by the operation of the windshield defroster system with inclusion of windshield wiper and electrical, friction/mechanical, and washing systems.

3.2 WINDSHIELD DEFROSTER SYSTEM

Defines the system consisting of all the apparatus used for cleaning the exterior surface of windshield glazing, together with the necessary devices and controls to start and stop operation.

3.3 DEFROSTED AREA

Defines the area of the glazed surfaces having a dry surface and the area covered with melted or partially melted (wet) frost, which can be removed from the outside face by the windshield wiper system. It excludes the area of the windshield covered with dry frost (white). The vision area is defined and qualified by the following:

3.3.1 The driver's seat in the rearmost position (refer to SAE J903, Figure 6).

3.3.2 The 95th percentile tangential cutoff two-dimensional ellipse in accordance with SAE J941 shall be used.

3.3.3 SAE J903 defines the method to create the vision area requirement.

3.4 WINDSHIELD WIPER SYSTEM

Means the system consisting of all the apparatus used for cleaning the exterior surface of windshield glazing, together with the necessary devices and controls to start and stop operation.

3.5 WINDSHIELD WASHING SYSTEM

Means device for storing washer solution and applying it to the windscreen outer glazed surface, together with the necessary controls.

3.6 DEMISTING

Means the elimination of condensate from the interior glazed surface of the windshield by the operation of the demisting system.

3.7 WINDSHIELD DEMISTING SYSTEM

Means device, or combination of devices, intended to remove the condensate from the interior glazed surface of the windshield and thus restore visibility, together with the necessary accessories and controls.

4. PERFORMANCE REQUIREMENTS

4.1 Defrosting

4.1.1 When tested in accordance with the following procedure, the defrosting system shall be capable of defrosting a minimum area as specified in Table A1 of Appendix A.

4.2 Demisting

4.2.1 When tested in accordance with the following procedure, the defrosting system shall be capable of demisting a minimum area as specified in Table A2 of Appendix A.

4.3 Drive Unit Type

4.3.1 An internal combustion engine vehicle type is referred to as an IC.

4.3.2 A hybrid (internal combustion engine with electric propulsion mode) vehicle type is referred to as an HD unless running in pure electric propulsion mode throughout the test (see 4.3.3).

4.3.3 An electric vehicle type is referred to as an EV; a hybrid vehicle running in pure electric propulsion mode throughout the test is also called an EV.

5. TEST METHOD

5.1 Test Equipment

5.1.1 Cold chamber large enough to contain the complete vehicle and capable of producing and maintaining a test temperature of:

5.1.1.1 Defrosting: $-18\text{ }^{\circ}\text{C} + 3\text{ }^{\circ}\text{C}/-10\text{ }^{\circ}\text{C}$ or between $-15\text{ }^{\circ}\text{C}$ and $-28\text{ }^{\circ}\text{C}$ throughout the duration of the test.

5.1.1.2 Demisting: $-3\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ throughout the duration of the test.

5.1.2 The chassis dynamometer load used to simulate road load shall be calculated as follows:

Using the product of the overall width (W117) and overall height (H101), as defined by SAE J1100, to approximate the vehicle cross-sectional area, determine the vehicle air resistance horsepower using Equation 1:

$$W = \frac{F^{**} \times \text{km/h}}{3.6} \quad (\text{Eq. 1})$$

where:

F = air resistance force, [N] = 0.00275 A

then for:

$F^{**} = C_d Q A$

where:

C_d = coefficient of drag (use 0.35 as a typical value)

Q = dynamic pressure = $1/2 \rho V^2 = 78.5 \text{ N/m}^2$ at 40 km/h

where:

ρ = mass density, kg/m³

V = velocity, m/s

A = vehicle cross-sectional area, cm²

$F = 0.35 \times 78.5 \times A/10000 = 0.00275 A$

NOTE: The calculated air resistance horsepower is the maximum load that is to be applied to the chassis dynamometer. The absence of the rolling friction of the non-driving wheels of the test vehicle compensates for the fact that the driving wheels on the dynamometer rolls result in greater rolling friction than that existing on a level road.

5.1.3 Defrost and defog performance capture equipment. Use either:

5.1.3.1 Two observers inside the vehicle with tracing method and vellum trace equipment or photographic trace capture method.

5.1.3.2 Fixed camera (not handheld) mounted outside the vehicle (tripod or ceiling mount) pointed perpendicular to the glass surface with computer method to process photographic data.

5.1.3.3 Defog only; observer or two observers outside the vehicle with tracing method and vellum trace equipment or photographic trace capture method.

5.1.4 Defrosting Only

5.1.4.1 Spray gun capable of applying liquid spray to the outer surface of the windshield and having the following characteristics:

5.1.4.1.1 Nozzle diameter: 1.7 mm

5.1.4.1.2 Operating pressure: 350 kPa $\pm$ 20 kPa

5.1.4.1.3 Liquid flow rate: 395 mL/min

5.1.4.1.4 Projection cone diameter at 200 mm from nozzle: 300 mm

5.1.5 Demisting Only

5.1.5.1 Steam generator as described in Appendix B and having the following characteristics:

5.1.5.1.1 Water capacity: 2.25 L

5.1.5.1.2 Heat loss at boiling point at $-3\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$: $\leq 75\text{ W}$

5.1.5.1.3 Air flow rate at 50 Pa static pressure: 0.07 to 0.10 m³/min

5.1.5.1.4 Device to regulate the steam output by controlling the input power to the heating element.

5.2 Test Procedure

5.2.1 Defrosting

5.2.1.1 The test shall be carried out in a cold chamber as described in 5.1.1 at or below the temperature specified in 5.1.1: $-18\text{ }^{\circ}\text{C} + 3\text{ }^{\circ}\text{C}/-10\text{ }^{\circ}\text{C}$.

5.2.1.2 For validation and reporting, all vehicle systems used in the test shall utilize standard production tooling. The vehicle shall be instrumented to ensure satisfactory test run and data recording. Follow Appendix C requirements for instrumentation. At a minimum, the following instrumentation should be present on the vehicle:

5.2.1.2.1 IC and HD only: Engine coolant temperature at temperature sensor location (thermal sensor or mechanical thermostat).

5.2.1.2.2 IC and HD only: Temperature of the engine oil.

5.2.1.2.3 EV only: Temperature of the drive unit oil or drive unit lower case if oil/coolant are not used in the drive unit.

5.2.1.2.4 Coolant media heating defrosting system only: Coolant temperature in and out of defroster heater unit.

5.2.1.2.5 Air out of the defroster outlet.

5.2.1.2.6 Passenger inboard seat rail temperature.

5.2.1.3 Before the test, the outer and inner glazed surfaces of the windshield shall be thoroughly degreased using methylated spirit or another appropriate degreasing agent. When dry, apply a solution of ammonia in water with a volume fraction of 3 to 10%, allow to dry, and finally wipe with a dry, clean cotton cloth or paper towel.

5.2.1.4 The starting battery (12 V or 48 V) and high-voltage battery (where equipped) should be fully charged prior to soaking (see 5.2.1.5). The 12-V battery may remain on charge during the soak. The passenger cabin shall not be preconditioned. The high-voltage battery should not be conditioned or charged during the soak.

5.2.1.5 After the chamber stabilizes at the 5.2.1.1-specified test temperature, the vehicle turned off shall be soaked at this temperature for not less than 10 hours. The soak period might be shortened if the seat rail temperature is measured and is within $\pm 3\text{ }^{\circ}\text{C}$ of the test temperature for at least 1 hour.