



Defroster System Maximum Performance Validation for Passenger Vehicles

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. Validation of the performance capability of a vehicle windshield and side window defrosting system using reproducible measurements in a climatic wind tunnel.

1.2 Applicability. For all passenger vehicle defroster systems.

1.3 Remarks. Relative humidity of the climatic wind tunnel is a significant factor in determining the defrosting performance of the vehicle per this procedure. It is imperative that the recommendation for relative humidity outlined in this procedure be followed for consistent deicing performance.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

SAE J902

2.2 GM Standards/Specifications.

GMW15845

2.3 Additional References.

- Vehicle Technical Specifications (VTS)

3 Resources

3.1 Facilities. Climatic wind tunnel including a chassis dynamometer capable of controlling a dyno speed of 50 km/h minimum, wind speed of 50 km/h minimum, and an ambient temperature of -30 °C minimum with relative humidity (RH) control between 10% and 95% RH.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Temperature measuring and recording equipment for at least 14 measurements per 4.3.2.1 and GMW15845.

3.2.2 Measuring and recording equipment for voltage and current for compartment blower(s), battery(s) (voltage only) per 4.3.2.2.

3.2.3 Measuring and recording equipment for the engine speed per 4.3.2.3.

3.2.4 Engine Oil/Coolant. As released for the engine at the test temperature.

3.2.5 Device for operation and adjustment of accelerator pedal.

3.2.6 Spray gun for applying water to windshield (Binks Model 62 spray gun, with fluid nozzle 66 and air nozzle 66SD, 66SF, or equivalent equipment as specified in SAE J902).

3.2.7 Device for measuring quantity of water required to fill into the spray gun.

3.2.8 Timing device with stopwatch functions.

3.2.9 Means of recording cleared glass area for all tests (felt tip marker, etc.)

3.2.10 Methyl alcohol or equivalent degreasing agent.

3.2.11 Window cleaning agent (3% to 5% ammonia or equivalent).

3.2.12 Camera.

3.2.13 Optional: Auxiliary power source to power the vehicle blower motor and prevent frost build-up on the brushes and commutator of blower motor during pre-soak.

3.3 Test Vehicle/Test Piece. Passenger vehicles equipped with a defroster system.

3.4 Test Time. See 4.3.1.

3.5 Test Required Information. Area of windshield and one front side window is used to calculate amount of water to fill into the Spray Gun. The vision areas of the windscreen are described in Appendix B.

3.6 Personnel/Skills. One climatic tunnel operator, one driver and one observer.

4 Procedure

4.1 Preparation. The vehicle shall be prepared for the climatic tunnel using equipment and procedures according to 3.2 and 4.3.2.

4.1.1 Fuel. Use winter grade fuel for all engine applications.

4.1.2 Cleaning of the Windows. The inner surfaces of the vehicle glass shall be completely degreased with methyl alcohol or an equivalent degreasing agent. After drying, an ammonia solution of 3% to 5% shall be applied. The surface treated in this manner shall be allowed to dry and then wiped with a dry cotton cloth.

4.1.3 Settings. The vehicle front ventilation system controls shall be set to Full Hot, Defrost, Outside Air (OSA) and high blower(s) speed.

The center face outlets shall remain closed and the outboard face vents shall be aimed as much as possible at the center of the mirror patch on the front side windows. This setup is performed regardless of the vehicle having dedicated Side Window Defogger (SWD) outlets.

4.1.4 Functional Operation of the System. Verify the functional operation of all switches, controls, blower motor and fan.

4.2 Conditions.

4.2.1 Environmental Conditions. Pre-soak temperature can be modified to accelerate test.

Standard condition:

- Test temperature: $-4^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- Test humidity: $90\% \pm 5\%$
- Pre-soak: -9°C test temperature, $80\% \pm 10\%$ RH

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.2.2.1 Vehicle and Wind Speeds. Vehicle and wind speeds as specified in Table 2 (see 4.3.1). Wind speed for pre-soak can be modified to accelerate test.

4.2.2.2 Electrical Power Supply. All electrical systems are supplied by the internal vehicle power supply.

Note: Heating Ventilation and Air Conditioning (HVAC) blower motor can be operated during soak with an auxiliary power source to prevent frost build-up on motor brushes and commutator.

4.2.2.3 Spray and Soak. See test overview in Table 2. The engine oil temperature shall be equal to the test temperature ($\pm 1^{\circ}\text{C}$) prior to Spray and Soak. Water shall be applied to glazed surfaces according to 4.3.3. The frost shall cure for 30 minutes.

4.2.2.4 Test. Headlights (low beam), electrical heated windshield, backlight defogging system and heated seats (if standard equipment) are switched on to maximum performance. Windshield wipers may be operated for certain vehicles as defined by the VTS (default configuration is wipers off).

4.2.2.5 Gear Steps or Drive Positions. The specified dynamometer speeds are driven at road load (on level road without acceleration). See Table 1.

For repeat measurements on vehicles with automatic transmissions, it shall be ensured that the same dynamometer speeds are driven at the same lowest engine speeds (see 4.3.3.7).

4.2.2.6 Dynamometer Loading. Dynamometer loading to be set to road load at a vehicle mass of curb weight plus driver.

4.2.2.7 Defrosted Area. See 7.1.

Table 1: Gear Steps or Drive Positions

Transmission	Speed: 50 km/h
Manual transmission - 4 speed	3rd gear
Manual transmission - 5 speed	3rd gear
Manual transmission - 6 speed	4th gear
Manual transmission - 7 speed	4th gear
Automatic transmission	D

Note: Change gear if driver notification appears or engine revolutions per minute (rpm) is over 2100 min⁻¹ (2100 rpm). See note in 4.3.3.7.

4.3 Instructions.

4.3.1 Climatic Tunnel Schedule. See Table 2.

Table 2: Climatic Tunnel Schedule

	Ambient	HVAC Mode	Dyno Speed	Wind Speed	Duration
1 Pre soak	-9 °C x 80% RH	N/A	0 km/h	30 km/h	Until engine oil reaches -4 °C
2 Spray	-4 °C x 90% RH	N/A	0 km/h	0 km/h	Spraying of windows
3 Soak	-4 °C x 90% RH	N/A	0 km/h	15 km/h	30 minutes
4 Test	-4 °C x 90% RH	Full Hot, Defroster, high fan	50 km/h	50 km/h Note 1	40 minutes from time of engine start

Note 1: See 4.3.3.7.

4.3.2 Measuring Values and Data to be Recorded. Measurement techniques defined in GMW15845 shall be followed.

4.3.2.1 Temperatures °C. The following temperatures shall be recorded:

- Ambient.
- Coolant, Front Heater In.
- Coolant, Front Heater Out.
- Coolant, Cylinder Head or Under Thermostat.
- Coolant, Radiator Out.
- Engine Oil (Oil Dipstick).
- Air, Defroster Left Windshield.
- Air, Defroster Right Windshield.
- Air, Defogger Left Side Window.
- Air, Defogger Right Side Window.
- Air, Rear Left Side Window Defogger (if applicable).
- Air, Rear Right Side Window Defogger (if applicable).

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Page 3 of 9