



Validation of Static Body Air Leakage

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. Determination of the air leakage from the passenger compartment of complete vehicles.

1.2 Applicability. For all passenger vehicles with enclosed passenger compartments.

1.3 Remarks. To provide information about air leakage in passenger compartments prior to conducting tests such as:

- HVAC validation.
- Body dust-infiltration.
- Carbon monoxide intrusion.
- Wind noise.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- Test report.
- Vehicle Technical Specification (VTS).

3 Resources

3.1 Facilities. Any area able to contain the vehicle to be tested and the necessary test equipment.

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 General.

3.2.1.1 One (1) airflow measurement device capable of measuring and producing ≥ 215 L/s.

3.2.1.2 One (1) laboratory temperature measuring instrument capable of measuring (0 to +50) °C.

3.2.1.3 One (1) laboratory pressure measurement device capable of measuring (0 to 110) kPa (atmospheric pressure).

3.2.1.4 One (1) laboratory pressure measurement device capable of measuring ± 300 Pa (body pressure).

3.2.1.5 Flexible tubing with diameters of 100 mm minimum (air flow equipment) and 7 mm minimum (pressure measurement).

3.2.1.6 Cardboard side window insert with an opening for the flexible tubes noted in 3.2.1.5.

3.2.1.7 Interior pressure tap piezometer ring (see suggested design in Figure 1A, Appendix A) for measuring interior body pressure.

3.2.1.8 Tape and 50 L or larger plastic bags for sealing leakage areas.

3.3 Test Vehicle/Test Piece. Passenger vehicle with HVAC system.

3.4 Test Time.

Calendar time: 1 day

Test hours: 1 h

Coordination hours: 1 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. One (1) technician.

4 Procedure

4.1 Preparation. The vehicle shall be prepared and equipped with devices according to 3.2 and 4.1.

4.1.1 One (1) of the vehicle front windows shall be opened, a cardboard window insert shall be made and sealed into the window opening.

4.1.2 The flexible tube ≈ 100 mm, from airflow machine shall be installed through front side of cardboard window insert and the tube shall be sealed at the insert opening.

4.1.3 The interior pressure tap shall be installed in an area where pressure tap is not influenced by airflow (location to be documented on Data Sheet B1, Appendix B). The flexible tubing ≈ 7 mm, shall be installed from the interior pressure tap through the window insert and sealed at insert opening. The tubing shall be connected to the body pressure sensing device (interior body pressure).

4.1.4 Care shall be taken to unseal all taped openings and sealed areas when the testing is complete.

4.2 Conditions.

4.2.1 Environmental Conditions. Temperature: (+10 to +30) °C.

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.

4.3 Instructions.

4.3.1 Test Method.

4.3.1.1 Ensure that all vehicle doors and windows are closed.

4.3.1.2 Record cabin pressure in Outside Air (OSA) Condition, low and high blower, full cold, A/C vent mode.

4.3.1.3 Record cabin pressure in OSA Condition, low and high blower, full hot, heater mode.

4.3.1.4 Turn off blower motor. Remove blower motor from the module and seal up the air inlet metal hole opening at the cowl with tape.

Note: If the HVAC system has a recirculation door, the blower motor shall not be removed. Instead of the door shall be switched into the recirculation position and the air inlet panel must be removed and the air inlet metal hole opening at the cowl shall be sealed with tape.

4.3.1.5 Pressurize the body to 125 Pa. Determine the leakage rate. This is the total body leakage rate as received.

4.3.1.6 Seal the body pressure relief valves. Pressurize the inside cabin air pressures to 125 Pa. Determine the leakage rate. This is the body leakage with the reliefs taped. Record data in the Data Sheet B1, Appendix B.

4.3.1.7 Subtract the leakage rate determined in 4.3.1.6 (relief sealed) from leakage rate determined in 4.3.1.5 (as received). This is the body pressure relief valve flow rate (controlled body leakage). Record on Data Sheet B1.

4.3.1.8 Repeat 4.3.1.5 through 4.3.1.7 at 30 Pa and 90 Pa inside cabin air pressures.

4.3.1.9 If required, determine the leakage rate through or around such areas as doors, windows, deck lids, trim panels, exterior handles, etc. This is done by sealing one area and determining the leakage rates similar

to 4.3.1.6. Subtract this leakage rate from that obtained without the specific area taped. This is the leakage rate through that specific area.

Note: Depending on the test objective, leakage through specific areas can be determined by first sealing all leakage areas. Then the seals can be removed from each area.

Note: This test can also be conducted at several pressure points to provide a curve of leakage versus pressure. Typical optional points are 30 Pa, 90 Pa, and 125 Pa.

4.3.2 Measuring Values and Data to be Recorded.

4.3.2.1 Pressure in Pa.

- Atmospheric.
- Interior.

4.3.2.2 Airflow in L/s.

- Airflow at test conditions.

4.3.2.3 Temperatures in Degrees C.

- Ambient (test conditions).

4.3.2.4 Relative Humidity in Percent.

- Relative humidity at test conditions.

4.3.2.5 Further Measurement Data.

- Vehicle data, mileage and description of the system to be validated.
- Test number and date.
- Name of the person in charge of the test.
- List of calibrated test equipment (Data Sheet C1, Appendix C).

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. The targets are defined by the Vehicle Technical Specification (VTS).

5.3 Test Documentation. With reference to this test procedure the results of the measurements shall be presented in a test report.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

7 Notes

7.1 Glossary.

HVAC: The Heating, Ventilating, and/or Air Conditioning system(s) including A/C-outlet mode, whether or not inclusive of a cooling capability.

OSA: Outside Air Condition in which all air enters the vehicle through the blower air inlet (BAI) external of the body.

Note: No recirculated air in this mode.

7.2 Acronyms, Abbreviations, and Symbols.

BAI	Blower Air Inlet
HVAC	Heating, Ventilation, Air Conditioning
Min.	Minimum
OSA	Outside Air

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