



Determination of Decklid and Liftgate Closing Behavior

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. This procedure includes four purposes/methods for determination of rear closure closing behavior.

1.1.1 Generation of a characteristic closing curve for fully latching by determination of a maximum allowable closing weight from a specified closing height.

1.1.2 Generation of a characteristic closing curve for fully latching by determination of a maximum closing height with a specified closing weight.

1.1.3 Determination of a closing height with a fixed closing weight.

1.1.4 Determination of a closing weight with a fixed closing height.

1.2 Applicability. This procedure applies to all passenger vehicles having a manual decklid and liftgate system and excludes power closures.

Note: This standard should be used for development purposes only.

Note: This standard is useful for evaluating closing behavior on free-rise decklid or on some closures where it is difficult to locate a velocity meter.

Note: For global programs, all assembly plants must use the same evaluation method. The preferred method is described in the Liftgate and Decklid subsystem technical specifications (SSTS).

1.3 Remarks.

1.3.1 Generation of a characteristic closing curve regardless of constant height or constant weight evaluation can be used for rear closures:

- Without self-latching from free-fall height (preferable starting point: free-fall height)
- Without free-fall feature (preferable starting point: 300 mm)

The characteristic closing curve is built on a customer rear closure closing evaluation performed on three (3) vehicles. The test vehicles are taken from the same batch with rear closures aligned/adjusted within production tolerance (from the lower build tolerance to the upper build tolerance).

1.3.2 The determination of weight and height must be in accordance with the customer requirement for a good closing behavior.

1.3.3 Due to a noticeable influence of the test results, it is important:

- To distinguish between "aged" and "green" seals
- To consider test temperature, especially for rear closures with gas strut feature
- To consider vehicle position (level, incline and decline)
- To position the closing weight always at the same position within a vehicle line

1.3.4 The detected results according to this test method:

- Can be used for evaluation of the closing behavior in production (Audit)
- Give a prediction if the customer requirement for a good closing behavior is fulfilled

1.3.5 Another method for evaluation of the closing behavior is the determination of the maximum allowable closing velocity.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14264

2.3 Additional References.

- Subsystem Technical Specification (SSTS) External Closure Actuation Decklid and External Closure Actuation Liftgate
- Vehicle Technical Specification (VTS) External Closure Actuation Decklid and External Closure Actuation Liftgate

3 Resources

3.1 Facilities. Test area with a level floor surface and a room temperature of $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.

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 Hardware.

3.2.1.1 Floor jack and jack stands with enough travel to raise the vehicle to a specified incline and/or decline angle.

3.2.2 Instrumentation.

3.2.2.1 Closing weight device, No. W500618 (Figure A5).

3.2.2.2 Spacer: A self-made, hold-open tool appropriate to vehicle line requirement.

3.2.2.3 Measuring tape (length: approximately 1.5 times the specified closing height).

3.3 Test Vehicle/Test Piece. A complete vehicle with all necessary components installed.

3.4 Test Time.

	Generation of a Characteristic Closing Curve	Determination of Closing Height and/or Closing Weight
Calendar time:	3 d	1 d
Engineering time:	6 h	2 h
Technician time:	1 d	3 h

3.5 Test Required Information. The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested (reference VTS/SSTS paragraph numbers if applicable). (See 2.3.)

Testing worst-case scenarios may uncover some potential problems. Discuss with the requesting engineer if testing should include some worst-case scenarios. Depending on which test is being performed and which level of parts or systems is being tested, consider if any of the following may apply: tolerance stack-ups, build variations, misalignment, minimum/maximum fastener torque(s), lubrication, environmental extremes, location of customer-representative load application, symmetry (Left Hand vs. Right Hand), color, mold or die source, etc.

The following specifications or information are required to run this test:

3.5.1 Load application location on decklid or liftgate (with or without spoiler).

3.5.2 Seal margin.

3.5.3 Bumper pre-load.

3.5.4 Outer panel gap and flushness.

3.5.5 Door and window position.

3.5.6 Movable roof position.

3.5.7 HVAC condition.

3.5.8 Environmental conditions (especially for rear closures with gas strut feature).

3.5.9 Rear closure adjustment (upper or lower tolerance borderline to target: "as received").

3.5.10 Test method (constant closing height or weight: compilation of a characteristic closing curve).

3.5.11 Closing height by using a spacer (value: location).

3.5.12 Closing weight (value: location).

3.5.13 Evaluation with "green" and/or "aged" seals.

3.5.14 Required time for the seal set ("green" to "aged" seal).

3.5.15 Vehicle level requirement, i.e., incline or decline.

Note: The angle of incline or decline may greatly affect the closing efforts of rear closures. Testing in the inclined and declined condition simulates customer use when parked on a driveway with a slope or when parked on a hill.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests.

4 Procedure

4.1 Preparation.

4.1.1 Vehicle Setup.

4.1.1.1 Ensure that the decklid and liftgate components are present and properly assembled. The closure adjustment should be within the range of tolerance (upper and lower tolerance: borderline and target). In most cases, the test will be performed after a visual "OK-check" in an "as received" condition without measuring any values. If it is requested to be run in a specifically adjusted condition, follow the applicable procedure(s).

4.1.1.2 Allow the vehicle to acclimate to the environmental conditions in the test area for an appropriate time to allow the vehicle systems to reach test room temperature before the test starts.

4.1.1.3 Turn the ignition on and turn the HVAC to Recirculation mode. After the HVAC has achieved the desired mode, turn the ignition off.

4.1.1.4 Close all doors, all windows, movable roofs and any other closures.

4.1.1.5 Position and fix the closing weight in the middle of the rearmost horizontal rear edge of the decklid according to Figure A1 or above the rearmost bottom line of the back glass according to Figure A2 for liftgates.

4.1.1.6 Position the spacer according to Figure A3 (Constant Height Method) or use a measuring tape according to Figure A4 (Constant Weight Method) between the rear-lower hem edge of the closure and seal.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this document's text or by the requesting engineer, the test shall be performed at an ambient temperature of $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.

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 Setup Instructions.

4.3.1.1 Position the test vehicle on a level floor surface. Other incline angles may be tested if specified in 3.5.15. If required, the vehicle angle needs to be adjusted using the jacks such that the vehicle incline is within 1° of the desired test condition.

4.3.1.2 When testing the **Constant Height Method**, the rear closure shall be opened to the required height (spacer, Figure A3). With the reasonable closing weight at the right position of the rear closure, remove the spacer carefully. With a successively higher or lower load, close the closure until it fully latches three (3) times with the same minimum load. **Record the minimum closing weight.**

4.3.1.3 When testing the Constant Weight Method, the minimum closing height for fully latching must be investigated. The minimum closing height is detected as soon as the rear closure latches three (3) times from