



Outside Door Handle Vertical Deflection Test

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. To evaluate the vertical deflection of the outside door handle by subjecting the handle to a specified force at a given location while measuring the vertical deflection in both the up and down directions at a specified point.

1.2 Applicability. The test is to evaluate the vertical deflection of a pull bar style outside door handle. The standard applies to all passenger cars, sport utility vehicles (SUV), and trucks having conventional swing open side door systems with a pull bar style outside door handle.

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.

- Component Technical Specification (CTS) for Outside Door Handles

3 Resources

3.1 Facilities. The facility should have all of the equipment listed in Section 3.2 and be capable of providing the conditions required in Section 4.2.

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.

Note: The following list(s) include fixturing and instrumentation typically used by the GM North America Body Test Laboratory to perform this test. Other equipment may be substituted at the discretion of the testing facility as long as it provides the same data and/or data record, with equivalent accuracy as specified herein or by the requestor.

3.2.1 Force gage with a capacity approximately 1.5 times the specified load to be applied. Force gage must have capability to be connected to data acquisition equipment.

3.2.2 Data acquisition equipment is required to record both the force gage data and the deflection read by the laser.

3.2.3 Laser head is required to measure the deflection of the handle.

3.2.4 Web strap (25 mm wide) is required to pull handle with force gage. Appendix A, Figure A1.

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3.2.5 Equipment required to make handle hold open block (Appendix A, Figure A2) and target flag for laser pickup (Appendix A, Figure A3).

3.2.6 The recommended equipment details are listed in Table 1. Other equipment may be substituted at the discretion of the test facility. The equipment details shall be listed in the test report.

Table 1: Recommended Equipment

Equipment	Model	Requirements	
Dewesoft Data Acquisition Unit Software	Sirius Multi8 X2	24 bit sp2 or higher	Error 0.1% of reading
Mark-10 Digital Force Gage	M5-50	250 N Range	Error 0.1% of range
Keyence Laser Head Laser Conditioner	IL-065 IL-1000	± 10 mm Range	Error 0.1% of range ~0.005 mm analog resolution

3.3 Test Vehicle/Test Piece.

3.3.1 One (1) vehicle, door, or fixture representing a door surface is required. If a vehicle is not used, the fixtured surface must be representative of the actual door for both shape and stiffness.

3.3.2 Door handle assembly.

3.4 Test Time. The following is an estimate of the amount of time (work hours) needed to perform this procedure. These times consider the preparation, test time, and analysis of data in capturing a total calendar time. Report writing, approval, processing, etc., are not part of these times.

Technician Resource: 4 h

Test Engineer Resource: 2 h

Data Analysis Resource: 2 h

Calendar Duration – Total: 1 d

3.5 Test Required Information. The requesting engineer is responsible for providing the CTS.

3.5.1 Point of load application on the handle. Appendix A, Figure A4.

3.5.2 Point of deflection measurement with laser. Appendix A, Figure A5.

3.5.3 Fastener torques.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests and experience in the use of the referenced test equipment is critical to achieving the estimated time shown in 3.4.

4 Procedure

4.1 Preparation.

4.1.1 Sample Inspection. The test and requesting engineers should inspect the test items to ensure all material listed in 3.3.1 through 3.3.2 is of correct design level and assembled properly. Measure and record any areas of visible deformation and/or breakage. Note especially any of these discrepancies in the handles and the areas immediately adjacent to the handles.

4.1.2 Sample Preparation. Ensure all fasteners necessary for handle assembly installation are torqued to their nominal specified values, unless otherwise directed by requestor.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in GMW17471 or by the requesting engineer, this test is to be run at ambient, typically the environmental conditions at the major test facility (3.1). Unless otherwise

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noted, ambient conditions are typically $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, relative humidity of $40\% \pm 20\%$, and atmospheric pressure equivalent to the local barometric pressure which is variable during any given day and from day to day.

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. Perform any functional/operational tests/evaluations as requested or as may be referenced in 2.3.

4.3.1.1 Specifically, cycle each handle system through at least five (5) full cycles to ensure proper operation and seating of all system components. Note any irregular sounds or erratic operation indicating a potential problem with the assembly or design, and verify observations with the requesting engineer.

4.3.1.2 Use a 25 mm wide web strap that has a grommet for the force gage hook to attach. Appendix A, Figure A1.

4.3.1.3 For a typical pull bar handle style, the center line of the pull force strap should be 35 mm from the inside rear corner of the handle. Appendix A, Figure A4. If the handle shape is not typical, consult with the requesting engineer to determine the location to apply strap based on the area on the outside handle where a customer would normally grip or apply force to open the door.

4.3.1.4 Create a triangular hold open block made of nylon or another low friction material. Position it at the rear inside of the handle near the handle slider/tower so that the handle is held in the full open position. The triangular block should have a single line of contact (minimize contact and influence on vertical movement) and allow the handle to move up/down freely. Appendix A, Figure A2. The block will be specific to the handle style and door sheet metal. The triangular hold open block is custom made to the handle style and sheet metal shape. If there are questions, consult with the requesting engineer.

4.3.1.5 Create a target flag for the laser to read. With the handle in the open position, adhere the flag to the end of the handle with the laser target location set to the most outboard and rearward surface location, Appendix A, Figure A3. The flag target shape is dependent on the surface of the handle and may be unique to a particular handle style. The flag target must allow for a consistent laser measurement location and allow the laser to read as close to the most outboard point on the outboard surface at the rear of the handle with it in the full open position. The actual flag design is not specified, but must allow the laser to be positioned as stated. The target flag design shown in Appendix A, Figure A3 and is only an example.

4.3.2 Test Operation Instruction.

4.3.2.1 Downward Pull. Before each force gage measurement, push the handle down to make sure that it is in the natural downward rest state. This is an important step in order to ensure the measurements are always taken from the same baseline vertical location, so that the total deflection value will not be influenced by the handle starting in a different vertical location. Using a hand held force gage that is connected to the data acquisition system and equipped with a hook accessory, engage the strap located on the handle with the hook, but do not start to pull. Hold the force gage in the downward direction. When the system is ready to record data, pull smoothly until the 50 N load is reached. It is ok to slightly go over the 50 N load since the data is being recorded and the actual deflection at 50 N can be determined during data processing. See Appendix A, Figure A6. Repeat the downward pull three times and record the data each time.

4.3.2.2 Upward Pull. Before each force gage measurement, push the handle down to make sure that it is in the natural downward rest state. This is an important step in order to ensure the measurements are always taken from the same baseline vertical location, so that the total deflection value will not be influenced by the handle starting in a different vertical location. Using a hand held force gage that is connected to the data acquisition system and equipped with a hook accessory, engage the strap located on the handle with the hook, but do not start to pull. Hold the force gage in the upward direction. When the system is ready to record data, pull smoothly until the 50 N load is reached. It is ok to slightly go over the 50 N load since the data is being recorded and the actual deflection at 50 N can be determined during data processing. See Appendix A, Figure A7. Repeat the upward pull three times and record the data each time.

4.3.2.3 Check to see if the handle assembly is still operational. Measure and record any areas of visible deformation and/or breakage. Note especially any discrepancies in the handle and the area immediately adjacent to the handle.

4.3.2.3.1 Repeat all functional checks which were performed in 4.3.1.

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