



Door Lock System, Inside Manual Lock Actuator - Strength Test

1 Scope

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. The purpose of this test procedure is to evaluate the strength of the inside manual lock actuator by subjecting it to specified loads. The strength of the lock itself is proven in the component state. The reason for this test is to determine if the lock, the mounting method, and all linkages and connections to the lock actuator will withstand the strength load, yet still function properly. It will determine possible damage modes when subjected to ultimate loads.

1.2 Foreword. This standard measures the maximum force or torque the lock system must be able to withstand without any perceivable degradation in function in both the locked, and unlocked, directions.

1.3 Applicability. This standard applies to all passenger cars, light duty trucks, and medium duty trucks having conventional, swing open door systems. This standard also applies, without modification, to sliding side doors, and station wagon end gates.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15820

2.3 Additional References. Release Documentation including:

- Subsystem Technical Specifications – SSTS.
- Vehicle Technical Specifications – VTS.

3 Resources

3.1 Facilities. GM North America Body Test Laboratory, or similarly equipped laboratory.

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 description includes 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 Fixturing.

3.2.1.1 If the door is not on a body, it must be rigidly clamped to a fixture, such as a laboratory door cart, that can constrain it in a fixed position.

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3.2.1.2 Force gage or torque wrench accessories, as required, to push, pull, or turn the specific type of lock actuator being tested. See Appendix A, Figures A1 and A2 for typical lock actuator illustrations.

3.2.2 Instrumentation.

3.2.2.1 Torque wrench(s) with a capacity approximately 1.5 times the specified torque load.

3.2.2.2 Force gages with a capacity of at least 1.5 times the specified loads.

3.3 Test Vehicle/Test Piece. A test vehicle/test piece is one (1) fully assembled door, including interior trim, and the entire locking assembly, the lock module, attaching lock rods or cables, interior lock components, and surrounding trim.

Note: Trim may affect lock system efforts.

3.3.1 It is recommended that the door assembly, especially those parts affecting the lock system performance, be dimensionally certified before testing is started.

3.4 Test Time. The following is an estimate on the amount of time (work hours) needed to perform this procedure.

Note: These time estimates are approximate averages. Actual times vary considerably depending on early component failures and subsequent availability of replacement parts, testing to varying multiples of cycle lives, varying requirements for frequency of environmental test conditions, scheduling problems for test facilities, test equipment malfunctions, scheduling of overtime and/or multiple shifts, scheduling of witnesses for tests, actual readiness of test samples upon receipt, unique or additional requests for test detailed test information, running multiple samples (times shown are one (1) system), etc.

3.4.1 These times consider typical preparation and other downtime, actual test, and analysis of data in capturing a total calendar time. Report writing, approval, processing, etc., are not part of this time.

Technical Resource: 2 hours

Engineer Resource: 1 hour

Calendar Duration – (total): 1 day

3.5 Test Required Information. The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested. Reference VTS/SSTS if applicable.

3.5.1 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 torques.
- Lubrication, environmental extremes.
- Location of customer representative load application.
- Symmetry – (left hand versus right hand).
- Color.
- Mold or die source, etc.

3.5.2 The following specifications are required to run this test.

3.5.2.1 Loads or torques to be applied to the actuator as applicable, both for strength testing and for ultimate load testing.

3.5.2.2 Environmental Test Conditions.

3.5.2.3 Load Orientation.

3.5.2.4 Fastener Torques.

Note: Additional specifications may be required for other types of lock systems.

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 times shown in 3.4.1.

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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 is of correct design level and assembled properly. Measure and record any areas of visible deformation and/or breakage. Note especially any discrepancies in the manual lock actuator and the area immediately adjacent to the actuator.

4.1.2 Sample Preparation. This test is normally run on the test subject in an as-received condition. If it is requested to be run in a specifically adjusted condition, follow the applicable procedures.

4.1.2.1 Ensure all fasteners are torqued to the minimum specified values, unless otherwise specified in 3.5.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise noted, these conditions are typically $22^{\circ}\text{C} \pm 3^{\circ}\text{C}$, 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.

4.3.1.1 Perform any functional/operational tests/evaluations as requested or as may be referenced in 2.2. Refer to GMW15820 for typical functional tests for the lock actuator. These same functional checks will be performed again after the Door Lock System, Inside Manual Lock Actuator - Strength Test (GMW15832) is completed.

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

4.3.2 Test Operation Instructions.

4.3.2.1 Test operation for linear motion actuators.

4.3.2.1.1 Consult with the requesting engineer to determine a force application point on the lock actuator by considering typical customer usage. The force application point should be as close to the center of the available loading surface as possible. It is suggested that a sketch or drawing be made showing the load application point.

4.3.2.1.2 Attach the appropriate accessory, hook attachment, flat target shape, or specially made attachment, to the hand held force gage. Hold the force gage so that it remains parallel to the direction of motion of the lock actuator throughout the entire travel. See Appendix A, Figure A1 for sample setup illustrations.

4.3.2.1.3 Apply a specified abusive force (3.5.1.1) to the lock actuator by pushing or pulling, depending on actuator style using a smooth and constant effort. This will reduce the possibility of false readings due to sudden starts or stops. Apply force to the actuator in both the locking and unlocking directions. Record the results on Appendix A, Data Sheet A2.

4.3.2.1.4 Repeat all functional checks which were performed in 4.3.1.1.

4.3.2.1.5 As an optional test, additional force may be applied to the actuator in either direction until breakage or loss of function occurs. Establish a direction of actuation (based on damage mode) and any incremental load steps with requesting engineer. Prior to performing this optional test, check for deformation. A force gage with larger capacity may be needed to accommodate the higher loads.

4.3.2.2 Test Operation for Rotational Motion Actuators.

4.3.2.2.1 Apply a specified torque to the lock actuator using a torque wrench and a suitable adapter. Make sure the centerline of the lock actuator coincides with the centerline of the head of the torque wrench. Apply the torque to the actuator in both locking and unlocking directions. Record the results on Appendix A, Data Sheet A2. Refer to Appendix A, Figure A2 for an illustration.

4.3.2.2.2 Repeat all functional checks which were performed in 4.3.1.1.

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