



Door Lock System, Key Lock Cylinder - Strength 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 torsional strength of the door key cylinder system by subjecting it to specified loads.

1.2 Applicability. This standard applies to all passenger cars, light duty trucks, and medium duty trucks having any swing open doors, sliding side doors, lift gates, end gates, or any other door design having an outside key cylinder which actuates any of the door's systems.

1.3 Remarks. Not applicable.

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.

- Subsystem Technical Specifications (SSTS)
- Vehicle Technical Specifications (VTS)

3 Resources

3.1 Facilities. The facility should have all of the equipment listed in 3.2 through 3.2.2 and be capable of providing the conditions required in 4.2 through 4.2.2.

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 lists include fixturing and instrumentation typically used by 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.

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3.2.1 Fixturing.

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

3.2.1.2 Torque Wrench and Key Adapter. See Appendix A, Figure A1.

3.2.2 Instrumentation. Torque wrench with a capacity approximately 1.5x the load to be applied. See 3.5.1.

3.3 Test Vehicle/Test Piece.

3.3.1 One (1) fully assembled door including all sheet metal parts and reinforcements.

3.3.2 The entire locking assembly, including the lock module, key cylinder, and attaching lock rods. Any instructions pertaining to lubrication or adjustments must be followed, unless testing to worst case conditions, per 3.5.

3.3.3 The key for the cylinder is also required. It is advisable to obtain two (2) or more keys in case one (1) key is broken during the test.

Note: It is recommended that the door assembly 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. The estimates may vary considerably depending on early component failures (and subsequent availability of replacement parts), varying requirements for frequency of environmental test conditions, scheduling problems for test facilities, test equipment malfunctions, scheduling of overtime and or multiple shifts, actual readiness of test samples upon receipt, unique or additional request for detailed test information, running multiple samples, times shown are for one (1) system, etc.

These times consider 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 h

Engineer resource: 1 h

Calendar duration (total): 1 d

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). Include Door Lock System and Lock Cylinder Strength Test, Rear End Doors (SSTS), Key Cylinder and Key System Strength Test, and Front and Rear Side Doors (SSTS).

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 or information are required to run this test.

3.5.2.1 The maximum torque, and directions, that the key cylinder system must be able to withstand without any perceivable degradation in function.

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3.5.2.2 Any specific functional checks or measurements.

3.5.2.3 Any specific test temperature or test conditions.

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.

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 through 3.3.3 is of correct design level and assembled properly.

4.1.1.1 Inspect the key and remove any burrs that may be present.

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.

4.1.3 Facilities and/or Equipment Preparation. Record the instrumentation calibration information on Appendix A, Data Sheet A1, or an equivalent document.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this document's text or by the requesting engineer, this test is to be run at -30 °C, 80 °C, and ambient, typically the environmental conditions at the major test facility (3.1.1). Unless otherwise noted, ambient conditions are typically 22 °C ± 3 °C, relative humidity of 40% ± 5%, 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 Section 2, especially any functional checks required by the requesting engineer. These functional checks may include any key cylinder system tests such as minimum key torque, lock/unlock rotation angle, key insertion effort, etc. These same functional checks will be performed again after the Door Lock System (Key Cylinder) - Torsional Strength Test (SSTS) is completed to verify any degradation that may have resulted. Measure and record any areas of visible deformation and/or breakage. As applicable, note any irregular sounds or erratic operation indicating a potential problem with design, manufacture, or assembly, and verify observations with the requesting engineer.

4.3.2 Test Operation Instruction.

4.3.2.1 Insert the key into the cylinder and rotate the key to the full locked position.

4.3.2.2 Using the torque wrench and the key adapter, apply the specified torque (3.5.1 through 3.5.2.3 for specification information) in the locked direction. Make sure the centerline of the key coincides with the centerline of the head of the torque wrench. See Appendix A, Figure A1 for setup illustration. Record all results on Appendix A, Data Sheet A2.

4.3.2.3 Repeat 4.3.2.1 and 4.3.2.2 in the unlocked position.

4.3.2.4 Repeat all functional checks, which were performed earlier in 4.3.1, and note any degradation that may be shown from the repeat of these tests.

4.3.2.5 As an optional test, additional torque may be applied to the cylinder until loss of function. A torque wrench with larger capacity may be needed to accommodate the higher torque.

4.3.3 Posttest Instructions. Measure and record any areas of visible deformation and/or breakage. Note especially any of these discrepancies in the cylinder, the area immediately adjacent to the cylinder, and the key itself.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

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