



Window System, Dropping Type Power and Manual Performance/Stall 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 determine the operating performance characteristics of dropping, power and manual, window systems.

1.2 Applicability. This procedure applies to all passenger cars, light duty trucks and medium duty trucks having dropping, power or manual, window systems. The procedure also applies to midgates and endgates with dropping windows.

1.3 Remarks.

1.3.1 Power window system operating performance tests can be used to obtain the following data:

1.3.1.1 Travel time.

1.3.1.2 Average run current.

1.3.1.3 Peak run current (excluding motor start up).

1.3.1.4 Average stall current.

1.3.1.5 Average stall voltage.

1.3.1.6 Peak stall current.

1.3.1.7 Average run voltage.

1.3.1.8 Peak run voltage.

1.3.1.9 Peak stall force.

1.3.1.10 Plots of current and voltage vs. time.

1.3.2 Manual window system operating performance tests obtain data for the spindle torques required for window travel.

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.

- Front and Rear Side Closures Global Subsystem Technical Specifications (GSSTS).
- GM Teamcenter Stall Force Gage Math Data: AML79453.
- Vehicle Technical Specifications (VTS).

3 Resources

3.1 Facilities. Major Facility: GMNA Body Test Lab or a similarly equipped test facility.

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 GMNA Structural Development Laboratory to perform this test. Some equipment may be substituted at the discretion of the testing facility (as noted in the following) as long as it provides the same data and/or data record, with equivalent accuracy as specified herein or by the requestor.

- Torque Transducer (for manual systems).
- Power Window Test Controller.
- Includes 0 V to 20 V/50 A DC power supply.
- Wiring harness to connect motor terminal to console. Harness gage power and ground circuits shall be minimum 12 gage.
- Stall Force Gage (Required gage defined in Appendix B).
- Tape Measure.

3.2.1 Fixturing.

3.2.1.1 For framed door applications, regulators can be secured to either a door or a fixture. The doors are not required to be secured to a body.

3.2.1.2 For frameless door applications, regulators can be secured to either a door or a fixture, but a body is required when testing in a door.

3.2.1.3 For manual systems, spindle adapter (if using the handheld torque transducer).

3.2.2 Instrumentation.

3.2.2.1 Power Window Systems.

3.2.2.1.1 Power window test controller capable of producing X-Y plots, with a 0 V to 20 V minimum/50 A minimum DC power supply.

3.2.2.1.2 A stall force gauge (as defined in Appendix B) and sufficient wiring to connect it to the power window performance console.

3.2.2.1.3 Marking pen.

3.2.2.1.4 Linear measuring device (tape measure).

3.2.2.2 Manual Window Systems. Manual window operating performance console or handheld torque transducer, and appropriate control equipment capable of collecting, storing, and plotting data.

3.3 Test Vehicle/Test Piece.

3.3.1 One (1) door assembly including a manual or power window system and a complete glass guidance system, including belt strips, run channels and any items affecting window system performance.

3.3.2 Vehicle body and associated door mounting hardware, weatherstrips, etc., (refer to 3.2.1.2).

3.3.3 It is required that the test parts/assembly be dimensionally and performance assessed and serialized before testing is initiated (reference pre-test checklist).

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

Calendar time: 1 d

Test time: 1 h

Coordination time: 3 h

3.5 Test Required Information. The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested (reference Vehicle Technical Specifications (VTS)/Subsystem Technical Specifications (SSTS) paragraph numbers).

3.5.1 Power Window Specifications. The following specifications or information are required to run this test.

3.5.1.1 Stall time. The amount of time that power is supplied to the window system after the glass reaches a full up/full down position.

3.5.1.2 Power supply voltage settings (stall voltage or supply voltage).

3.5.1.3 Resistance of the wires between the power supply and the window motor (if a known supply voltage is used). 12 gage wire minimum required. Voltage shall be measured at motor terminals. Harness length should be minimized.

3.5.1.4 Location(s) on the window glass to measure stall force (reference Appendix B).

3.5.1.5 If new seals are installed, the length of time the seals are to be in compression prior to running the performance test specified in 4.3.1.2.

3.5.2 Manual Window Specifications. No specifications are required.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests and experience in the use of the referenced test equipment are critical to achieving the estimated times shown in "3.4 Test Time".

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.

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 procedure(s).

4.1.3 Facilities and/or Equipment Preparation. Record any instrumentation calibration information on Data Sheet A1.

4.2 Conditions.

4.2.1 Environmental Conditions. Environmental test conditions are defined in the CTS and SSTs.

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.

Deviations agreed to by Design Release Engineer (DRE) and Subsystem Validation Engineer (SVE).

4.3 Instructions.

4.3.1 Setup Instructions.

4.3.1.1 If not mounted on a body, secure the door in approximate design position to a door cart. If evaluating on a fixture, the regulator must be orientated in body position.

4.3.1.2 Glass must be maintained in full up position for a minimum of 24 h at 22 °C prior to start of test.

4.3.1.3 Motor temperature affects performance test results. If the power windows have been running durability tests, allow the motors to cool approximately 20 minutes with ambient air blowing on the motor prior to running performance tests.

4.3.1.4 Perform any functional/operational tests/evaluations as requested by responsible engineer. If the window system has not been previously cycled, cycle the window "full up" and "full down" a minimum of 5 times prior to the start of test to assure proper operation and seating of all system components. 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 Instructions.

Note: Based on the window system to be tested, go to 4.3.2.1 (power) or 4.3.2.2 (manual).

4.3.2.1 Power Window System.

4.3.2.1.1 Set the window test controller voltage to proper value defined in CTS/SSTS for a window performance travel time measurement plot. With window in full up position, roll window down, then up, then initiate data recording.

4.3.2.1.2 Record window voltage and current draw data with the window moving from full up position to full down position with a 350 ms stall and then returning back to the full up position with another 350 ms stall. When systems contain Power Window Electronics (PWE), stall time shall be controlled by PWE.

4.3.2.1.3 Set window test controller voltage to proper value defined in CTS/SSTS for stall force measurement plot. Move window from full up position down approximately 125 mm.

4.3.2.1.4 Using 3.5.1.4 (Appendix B, Figure B2) to determine the stall force location along the top edge of glass, install the stall force gauge. Secure the stall force gauge such that no independent movement from the glass can be perceived.

4.3.2.1.5 For windows with PWE, disable the obstacle detection function using the window test controller or de-normalizing the PWE by removing power for 5 s.

4.3.2.1.6 Record window voltage, current and stall force data while executing the following procedure:

- a. Power/stall the regulator into the stall force gage.
- b. Apply voltage after armature stops turning for 350 ms.
- c. Record peak stall force.
- d. Power the regulator down to approximately the starting position.

4.3.2.1.7 Repeat steps 4.3.2.1.1 thru 4.3.2.1.4 for all desired windows.

4.3.2.1.8 After all window performance plots are collected (see Figure A1 for stall force plot and Figure A2 for performance plot), enable the obstacle detection function. Reset the window voltage back to the desired value (typically 13.5 V for window durability cycling) on all windows. For systems with PWE's, run each window full up, full down then full up again. This will normalize PWE windows.

4.3.2.2 Manual Window System.

4.3.2.2.1 Handheld Torque Transducer Method.

4.3.2.2.1.1 Plug in the instrumentation.

4.3.2.2.1.2 Adjust the power supply voltage for spindle drive mechanism.

4.3.2.2.1.3 Remove the window manual handle. Place the torque gun with the appropriate spindle adapter on the regulator spindle (See Appendix A, Figure A3). Operate the gun to determine which button corresponds to up and to down, and move the glass to the full up position.

4.3.2.2.1.4 Use the handheld torque transducer to run the window to the down position, and plot the torque vs. time curve. Repeat this graph creation as the window glass is run back to the up position. The up and down torque vs. time curves are typically overlaid on the same graph. Label the two curves for the up and down travel appropriately. Also record the test date, number of window cycles, test temperature, work order number, platform, door identification and any other appropriate information on the graph. See Figure A4.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. Data Sheet A2, in Appendix A, is to be used to record and report the data from the testing.

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.

Design Position: Orientation of a body part in the position it assumes when attached to a built vehicle on level ground.

Door Overcrown: A designed interference condition that exists between the door upper frame or header and body, when the door is in the closed position, to prevent water leaks and wind/road noise.

Note: A similar condition exists for the window of a headerless door when it reaches the "full up" position.

Dropping Window: A window system that opens and closes by sliding vertically up and down.

Stall Force (Power Window Systems): For this procedure, it is defined as the force exerted by the window system against the upper horizontal glass run seal when the glass is traveling upward.

Stall Torque (Manual Window Systems): The maximum available torque provided by the test equipment (currently 5.6 N·m).

Torque Gun or Gun: Slang terms used in the text to represent the Handheld Torque Transducer mentioned in 3.2.1.2 and 3.2.2.2.

7.2 Acronyms, Abbreviations, and Symbols.

DRE	Design Release Engineer
GSSLT	Global Subsystem Leadership Team
GSSTS	Global Subsystem Technical Specifications
No.	Number
PWE	Power Window Electronics
RO	Rated Output
SSFG	Spring Stall Force Gage
SVE	Subsystem Validation Engineer
VTs	Vehicle Technical Specifications

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW15081

9 Release and Revisions

This standard was originated in February 2006. It was first approved by the Global Glass Guidance SSLT in July 2006. It was first published in August 2006.

Issue	Publication Date	Description (Organization)
1	AUG 2006	Initial publication.
2	JUN 2011	Updated GMN procedure references to GMW procedures thru out. Changed section 4.3.2.2.1.3 and 4.3.2.2.2.6 to allow any data acquisition equipment to be used, instead of only XY time based plotter option. Updated Figure A2 to change TWO to Activity request. (Glass Guidance GSSLT)
3	FEB 2017	2.3 removed “EDS performance software package” wording. Changed “performance console” to “test controller” in 3.2 and 3.2.2.1.1. 4.3.2.1 updated entire section on power window controller test instructions. Eliminated the term “megadac” from sections 4.3.2.2.1.3 and 4.3.2.2.2.6. Deleted previous Figure 2, performance window test screen. Changed all figure numbers and references to compensate for deleted figure. Updated Figures 3 and 4, plots for stall force and performance. Deleted section B1.6 pertaining to SI units; no longer applicable. (Body – Side Closures GSSLT)
4	AUG 2019	Updated procedure for new global stall force gage release. Added: Appendix B, requirement for test fixture/door for framed door in 3.2.1.1, requirement for test fixture/door for framed door in 3.2.1.2, requirement for covering serialization of door components in 3.3.3, test wire harness detail in 3.5.1.3. Clarified requirements for test controller in 3.2.2.1.1. Defined: Test wire harness gage in 3.2, Stall time in 4.3.2.1.2, gage position on glass in 4.3.2.1.4, Denormalization Method in 4.3.2.1.5, and the Stall Force Measurement Process in 4.3.2.1.6. (Body – Side Closures GSSLT)

Appendix A

Data Sheet A1: Instrument Calibration

Report No. _____

Submit this data sheet with the other data sheets when the information is not otherwise preserved in the testing laboratory records.

Test Procedure No. _____

Test Date _____

	Instrument Description	Instrument Number	Calibration Date	Next Calibration Due Date
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Recorded by _____

(signature)

Date _____