



Seal Pressure Mapping

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. To obtain real-time or static, color-coded, pressure/force/contact profiles for primary seals, glass-run-channel systems, belt-strips, and any other soft-seal surface.

1.2 Foreword. Not applicable.

1.3 Applicability. Closures for **all** cars, trucks, and component level systems.

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.

Door-in-White (DIW) Subsystem Technical Specifications (SSTS)

3 Resources

3.1 Facilities. Measurement system sensors may be susceptible to the test environment (temperature, humidity, and atmospheric noise). Best results are obtained when tests are conducted in a climatically controlled and shielded environment.

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 Body Test Lab 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 Tekscan/Iskan pressure mapping system or equivalent with appropriate data acquisition and data storage devices.

3.2.2 Tekscan/Iskan measurement sensors or equivalent. A variety of sensors should be on hand that correlate to the expected pressure ranges to be measured. Door primary and belt-strip seals will typically be best paired with low range (0 kPa to 48 kPa) sensors, and door glass-run channels may require slightly higher range sensors (0 kPa to 207 kPa), especially if seal gaps are tight, materials are stiff, or sensors need to be bent around the glass edge.

3.2.3 Tekscan/Iskan pressure mapping system calibration equipment (dead weights or variable force calibration station, equilibration bladder fixture, etc.) or equivalent.

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3.2.4 Wax pencil or **china** marker and pad of paper.

3.3 Test Vehicle/Test Piece. For this test, a fully trimmed vehicle or body is preferred, however, it is understood that a fully trimmed vehicle is typically not available at the time this test is conducted in the Vehicle Development Process. A partially assembled vehicle body or an individual door may be used provided that the door subsystem and all of the parts that interface with the door are present on the body.

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

These times consider preparation time, actual test time, and analysis of data in capturing a total calendar time. Report writing, proper approval(s), processing, etc., are not part of these times.

Calendar time:	1 day
Test hours:	8 hours
Coordination hours:	0 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Training of the evaluator by an experienced pressure mapping user is of the utmost importance in order to assure accurate, repeatable data.

4 Procedure

4.1 Preparation.

4.1.1 Sample Inspection.

4.1.1.1 The test and requesting engineers should inspect the test items to insure all material listed in 3.3 is of correct design level and assembled properly.

4.1.1.2 Note any areas of seal deformation or irregularities before performing the test. This may aid in analyzing test results.

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).

4.1.2.1 Determine if measurements are to be taken on new (green) seals or aged seals. New seals must remain in a compressed state for 48 h to be considered aged.

4.1.2.2 Determine if glass run channel seal measurements are to be taken with the door on body fully closed and latched or with the door off the body. Door header position may vary and will affect seal pressure readings.

4.1.2.3 All measurement surfaces should be clean and dry (seal and mating surface). Any moisture or grit residing on the test sample will affect the accuracy of the test data.

4.1.2.4 Measure and record door to body seal margins for primary seal measurements. Check with the requesting engineer to ensure these margins are satisfactory and if they need to be adjusted prior to testing.

4.1.3 Facilities and/or Equipment Preparation.

4.1.3.1 Calibration. The pressure mapping system calibration should be rechecked every 20 to 30 recordings.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this document's text or by the requesting engineer, the typical environmental conditions for this test are the temperature, humidity and pressure at the major test facility as in 3.1. Unless otherwise noted, these conditions are typically 22 °C ± 3 °C, relative humidity of 40% ± 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 Record all pertinent information relative to the test sample, including vehicle number, Vehicle Identification Number (VIN), make, model, supplier, seal Compression Load Deflection (CLD), etc. on test notes.

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4.3.2 Using the wax pencil or **china** marker and a scrap sensor similar to the one calibrated (scrap sensor gives footprint of where and how test sensor will fit at measurement point), mark and identify the individual locations around the seal perimeter that are going to be recorded. Then transfer a drawing of the test area and test locations onto the test notes with special notation to sensor orientation.

4.3.3 Position the measurement sensor at locations provided on Data Sheets A1 thru A3 for the door, glass, and auxiliary seals respectively. Make sure that there is good, even contact, sensor noise is of the minimum, and that the sensor is distorted as little as possible. Capture the data on the appropriate data sheet. As data is recorded, take time to note seal pressure level (do not exceed sensor range), contact width, and profile (number of **ribs**, **stuffers**, etc.) adding these observations to the test notes for reference when the data is analyzed.

Note: When measuring seal contact area some systems may include noise from the sensor in the calculation. The result would indicate a larger contact area than is present with the sample. Sensor noise (folded sensor, creased sensor) must be minimized for this measurement. When using Tekscan sensors average the raw data and minimize the window to isolate the seal section reading from extraneous noise.

5 Data

5.1 Calculations. Establish the absolute value associated with each file.

5.1.1 Measure the width of sensor in millimeters.

5.1.2 Assess the proper contact area-lighted pixels.

5.1.3 Determine the pressure from sensor reading.

5.1.4 Compute the Seal Force (Width X Pressure).

5.1.5 Assess Contact Width based on width of pixels.

5.1.6 Compare results to Door-in-White (DIW) Subsystem Technical Specification (SSTS) Section 3.2.1.2.8 for Primary/Glass Seal Requirement.

5.1.7 Contact pressure, force, contact area, etc., and record on a separate data sheet.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. Establish the absolute value associated with each file (kPa, force, contact area, etc.) and record on separate data sheets (see Data Sheets A1 thru A3 with Figures A1 thru A6).

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

7 Notes

7.1 Glossary.

Iscan System (version 4.20I): A Windows 98 (or newer) based software package which allows data transfer into other Windows-based applications such as Microsoft Office. The Iscan software package allows data, which was originally recorded while using the Tekscan measurement system, to be displayed, orientated, edited, and analyzed.

Tekscan System: An advanced Personal Computer (PC) based pressure measurement/recording system which allows viewing of real-time pressure distribution across a sensor array. Adjustable gain electronics allow for sensitivity variation in relation to the application. Iscan system (version 4.20I).

7.2 Acronyms, Abbreviations, and Symbols.

CLD	Compression Load Deflection
DIW	Door-in-White
GSSLT	Global Subsystem Leadership Team
PC	Personal Computer

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