



Mounting Forces for Weatherstrips with U-Channel Design

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. This standard describes three (3) test methods for measuring mounting forces for U-Channel glass run designs.

1.1.1 Method A: Run Channel Insertion Force is designed to determine the mounting force (insertion force) of a glass run channel into the U-Channel.

1.1.2 Method B: Recovery Force is designed to determine the force required to compress a glass run channel to U-Channel dimensions and to check for sufficient elasticity of the profile after the compression is removed.

1.1.3 Method C: Glass Insertion Force is designed to determine the forces required to insert a glass pane into a flocked or coated glass run channel upper section (header section).

1.2 Applicability. These test methods are applicable to all U-Channel glass run designs.

2 References

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

2.1 External Standards/Specifications.

ISO 7500-1 ISO 9513

2.2 GM Standards/Specifications.

GMW3136 GMW14685

3 Resources

3.1 Facilities.

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.

3.2.1 Test Machine. The test machine shall fulfill the following requirements: the force measuring device of the test machine shall correspond to ISO 7500-1 Class 1; the deflection measuring device shall correspond to ISO 9513 Class 0.2. The test machine shall be such that the required test velocity can be maintained.

3.2.2 Indentor Blade. Length of 100 mm $\pm$ 2 mm and a width of 2 mm $\pm$ 0.1 mm, made of steel or aluminum.

3.2.3 Roll Out Table/Floating Fixture. Fixture shall allow/ensure centering of the test pieces during measurement (Appendix A, Figure A2).

3.2.4 Test Glass Pane. Dimensions 200 mm $\pm$ 2 mm $\times$ 40 mm $\pm$ 1 mm, radius on the corners of 10 mm, polished edges to GMW3136, edge number 1/ESG, glass thickness shall be vehicle specific. Test glass pane shall be cleaned prior to each test with ethanol or 2-propanol (see Appendix A, Figure A4).

3.2.5 Roller. Used to mount the profile into the glass run channel retainer (weatherstrip holding fixture). See Appendix A, Figure A5.

3.2.6 Glass Run Channel Retainer (Weatherstrip Holding Fixture). Length of 300 mm $\pm$ 5 mm, remaining dimensions shall be specified on the relevant part drawing or math data file.

3.3 Test Vehicle/Test Piece. Cut weatherstrip section 100 mm $\pm$ 2 mm in length. If not otherwise specified, a minimum of three (3) samples shall be tested, cut from at least three (3) finished parts for each test method.

3.4 Test Time. Reference the lab test procedure(s) in Section 4 for timing details.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Per laboratory accreditation requirements.

4 Procedure

4.1 Preparation. Cut samples from finished parts as directed in 3.3.

4.2 Conditions.

4.2.1 Environmental Conditions. The minimum time between manufacturing and testing shall be 72 h. The test pieces shall be maintained at a temperature of +23 °C $\pm$ 5 °C and 50% $\pm$ 5% relative humidity for at least 24 h prior to test and shall be free from strain during this period.

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 Method A - Run Channel Insertion Force.

4.3.1.1 Mount the indenter blade into the cross head of the test machine and place the glass run channel retainer on the roll-out table/floating fixture parallel to the indenter blade. (If necessary, the test arrangement can be shown by a test sketch on the relevant part drawing). Example of a test sketch and a force displacement diagram is shown in Appendix A, Figure A1.

4.3.1.2 Place the test piece on the glass run channel retainer such that it is positioned in line with the indenter blade.

4.3.1.3 Zero the force measuring device and press the test piece completely into the retainer at a uniform speed of 50 mm/minute $\pm$ 5 mm/minute. A force-displacement diagram shall be recorded.

4.3.2 Method B - Recovery Force.

4.3.2.1 Mount a flat compression plate into the cross head of the test machine and zero the force measuring device. The pressure foot shall be adjusted plane parallel to the test piece support with gap width indicated as "profile width afterwards" in the test sketch on the drawing. (Example for test sketch, see Appendix A, Figure A3). The length of the pressure foot shall be at least the length of the test piece; the surface shall comply with GMW14685.

4.3.2.2 The test piece shall be placed between the pressure foot and the test piece support such that the force is applied in the specified direction as indicated on the relevant part drawing. The test piece is located between the pressure foot and support such that the basis is in a vertical position. This position can be controlled by means of a rail, which shall be removed for the test. If both thighs are different in length, the longer thigh of the glass run channel shall be positioned downwards.

4.3.2.3 The test piece is deflected by the pressure foot to the final dimension shown on the drawing at a rate of 30 mm/minute $\pm$ 3 mm/minute. A force-displacement diagram shall be recorded.

4.3.2.4 After deflection, the pressure foot returns to the dimension "profile width afterwards" with the same speed. The test is passed if the test piece remains between the pressure foot and the support.

4.3.3 Method C - Glass Insertion Force.

4.3.3.1 Mount the test piece in the glass run channel retainer by pressing in at two (2) different points and rolling a roller back and forth along the test piece for one (1) complete to and fro movement. The test arrangement shall be shown by a test sketch on the relevant part drawing.

4.3.3.2 Fix the test glass pane into the cross head of the test machine and zero the force measuring device. The glass run channel retainer with the test piece shall be attached to a roll out table/floating fixture such that it is positioned at design nominal with respect to the glass pane.

4.3.3.3 The glass run channel retainer with the test piece shall be attached to a roll out table/floating fixture such that it is positioned at design nominal with respect to the glass pane. Pre-flex the seal at nominal position as follows:

- The test glass pane shall be pressed into the test piece at a uniform speed of 50 mm/minute $\pm$ 5 mm/minute approximately 1 mm from the bottom of the profile.
- This procedure shall be performed five (5) times without measuring the force.
- The sixth insertion shall be recorded by a force displacement diagram. (Example of a force displacement diagram is shown in Appendix A, Figure A6.)

4.3.3.4 Remove the glass run channel retainer with the test piece from the roll out table/floating fixture and position the fixture to the 0.5 mm outboard position. Securely attach fixture such that it cannot move during measurement. Insert the test glass pane into the test piece at a uniform speed of 50 mm/minute $\pm$ 5 mm/minute approximately 1 mm from the bottom of the profile, recording the force displacement curve.

4.3.3.5 Position the glass run channel retainer with the test piece to the 2 mm inboard position. Securely attach fixture such that it cannot move during measurement. Insert the test glass pane into the test piece at a uniform speed of 50 mm/minute $\pm$ 5 mm/minute approximately 1 mm from the bottom of the profile, recording the force displacement curve.

4.3.3.6 Plot all force displacement curves on one (1) graph (Appendix A, Figure A7).

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. With reference to this test procedure, the results shall be represented in a test report. The report shall include the following:

- Complete identification of the specimen.
- Conditioning of the test specimen.
- Test conditions, including method used.
- Any deviations to the test method.
- For all Methods (A, B, and C), report the peak load obtained during test.
- For Method B, report if test piece remains between pressure foot and support.

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. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

GSSLT Global Subsystem Leadership Team