



Floor Console Armrest Performance 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. Performance testing of standalone and center console mounted armrests.

1.2 Applicability. Applicable to all armrests located between front or rear seats. Depending on the design, the test set might change. Test procedures will show for what sort of armrest it is applicable for.

1.3 Remarks.

1.3.1 Armrest Type Definitions. Definitions of the different armrest constructions used within this standard are defined within the Glossary.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3059

GMW14264

GMW14359

2.3 Additional References.

- CG1958 Floor Console VCRI Statement of Requirements (SOR) Appendix G3 Template. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- Floor Console Subsystem Technical Specification (SSTS).
- SOR Appendix C2 of the Statement of Requirements.

3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Facilities.

3.1.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.1.2 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.

3.1.1.3 An approved GM certified lab with an adequate bedplate or equivalent work surface necessary for mounting the test sample and associated test fixtures appropriate for the procedure to be run.

3.1.1.4 Climatic chamber.

3.1.1.5 Universal testing machine or similar equipment which can measure force and displacement.

3.1.1.6 Durability test stand.

3.1.2 Equipment. Measuring devices shall be recorded in Appendix A, Data Sheet A1.

3.1.2.1 Force gauge.

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3.1.2.2 Tape measure or ruler.

3.1.2.3 A 20 mm diameter stamp for use with force gauge.

3.1.2.4 A 127 mm diameter stamp for use with universal testing machine.

3.1.2.5 Hook or similar device for testing latch lever and anti-theft protection system.

3.1.2.6 A 3.0 kg mass with a surface dimension of 50 mm x 200 mm.

3.1.2.7 5.0 kg mass.

3.1.2.8 Rigid holding fixture or vehicle buck.

3.1.2.9 Recording instrument for cycle counting.

3.1.2.10 Cycling device.

3.1.3 Test Vehicle/Test Piece. Complete armrest including all relevant parts to check the system.

3.1.4 Test Time. Each test and/or some tests are combined into a single setup.

Calendar time: 20 d

Test time: 120 h

Coordination time: 8 h

3.1.5 Test Required Information. Not applicable.

3.1.6 Personnel/Skills. Not applicable.

3.2 Preparation. See respective tests in Section 4.

3.3 Conditions.

3.3.1 Environmental Conditions. Tests within this standard may be performed at environmental conditions representative of vehicle profile. The specific conditions are detailed in each requirement within this standard. Also, engineering judgment (agreement with GM's Design Release Engineer (DRE)), according to the vehicle profile and the value added, is needed to define the temperature range (e.g., $-30\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$) to $(+85\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C})$, or as defined in the Floor Console Subsystem Technical Specification (SSTS).

3.3.2 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.

3.4 Instructions. See respective tests in Section 4.

3.5 Data.

3.5.1 Calculations. Not applicable.

3.5.2 Interpretation of Results. See respective tests in Section 4.

3.6 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.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

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3.7.1 Test Sample Size. The sample size for each test is included in CG1958 Floor Console Validation Cross Reference Index (VCRI). The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

3.7.2 Test Result Documentation. The results shall be entered in the relevant in Appendix A, Data Sheet A2 through Data Sheet A9. The data collected for stiffness and abuse loads F14 through F22 shall include force versus displacement and shall be provided in a plot.

3.7.3 Deviations from Test Procedure. Deviations from the requirements of the test procedures shall have been agreed upon by the Validation Engineer. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4 Requirements and Procedure

4.1 General Requirements. Samples of components or material released to this standard shall be tested for conformity with the requirements of this GM standard and approved by the responsible GM department prior to the start of delivery of production level components or materials.

4.1.1 The armrest shall be checked for conformance to the current development, drawing or release status before each test.

4.1.2 All fasteners shall be present, undamaged and correctly installed. If this is not the case, the fasteners shall be supplemented or corrected.

4.1.3 The floor console shall be mounted in a vehicle, buck, or fixture which represents the in vehicle mounting conditions including any interface to the Instrument Panel.

4.1.4 Variables are defined for performance values which are not explicitly listed. The values are defined within Tables B1, B2, and B3. Deviations of the values shall be entered within SOR Appendix C2 and ADVPR plan.

4.1.5 Subjective evaluation shall be performed according to GMW14264.

4.1.6 Environment Conditions. All requirements in 4.2 through 4.7, and 4.9 shall be performed at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$. All other requirements for each test must be fulfilled within a temperature range specified within this standard.

4.1.7 Force Application Device. The force application device for all test conditions is the 20 mm stamp with the exception of 4.2.5.1.1 Latch Release Force (F) for a Lever Style Latch (F8) and 4.3.3 Vertical Loading in Down Position (F14.2).

4.1.8 Method of Choosing Force Application Location. The location of the force application is detailed in 4.2 and 4.3. In the case where the stamp cannot be placed on a continuous surface at the indicated location, the force application area can be moved to the closest continuous surface to the intended location.

4.1.9 Requirement Application. The determination of the application of the forces, force type, force title, and rate of force application by armrest type per Figure 1 are indicated in Table 1.

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Figure 1: Armrest Types

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Table 1: Application of Requirements by Armrest Type

Force Label	Force Type	Force Title	Rate of Force Application (mm/s)	Requirement Application Based on Armrest Types	
				Console Mounted Armrest	Standalone Armrest
F1.1	Actuation	Sliding Force	50 ± 10	Yes ^{Note 1}	Yes ^{Note 1}
F1.2	Actuation	Sliding Detent Force	50 ± 10	Yes ^{Note 1}	Yes ^{Note 1}
F2	Actuation	Upward Folding Force	50 ± 10	No	Yes ^{Note 1}
F3	Actuation	Downward Folding Force	50 ± 10	No	Yes ^{Note 1}
F4	Actuation	Upward Inclination Adjustment Force	50 ± 10	Yes ^{Note 1}	Yes ^{Note 1}
F5	Actuation	Downward Inclination Adjustment Force	50 ± 10	Yes ^{Note 1}	Yes ^{Note 1}
F6	Actuation	Standalone Armrest Detent Engagement Force	≤ 5	No	Yes ^{Note 1}
F7	Actuation	Standalone Armrest Detent Release Force	≤ 5	No	Yes ^{Note 1}
F8	Actuation	Latch Release Force	≤ 5	Yes ^{Note 1}	Yes ^{Note 1}
F9	Actuation	Latch Engagement Force	≤ 5	Yes ^{Note 1}	Yes ^{Note 1}
F10	Actuation	Opening Force	50 ± 10	Yes ^{Note 1}	No
F11	Actuation	Closing Force	50 ± 10	Yes ^{Note 1}	No
F12	Actuation	Console Mounted Armrest Detent Engagement Force	≤ 5	Yes ^{Note 1}	No
F13	Actuation	Console Mounted Armrest Detent Release Force	≤ 5	Yes ^{Note 1}	No
F14.1	Stiffness	Vertical Loading of Front in Down Position	≤ 5	Yes	Yes
F14.2	Abuse				
F15.1	Stiffness	Horizontal Loading of Front in Down Position	≤ 5	Yes	Yes
F15.2	Abuse				
F16.1	Stiffness		≤ 5	Yes	Yes

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Force Label	Force Type	Force Title	Rate of Force Application (mm/s)	Requirement Application Based on Armrest Types	
				Console Mounted Armrest	Standalone Armrest
F16.2	Abuse	Lateral Loading of Front in Down Position			
F17.1	Stiffness	Lateral Loading of Rear in Down Position	≤ 5	Yes	Yes
F17.2	Abuse				
F18.1	Stiffness	Vertical Loading of the Standalone Armrest in Folded Up Position	≤ 5	No	Yes
F18.2	Abuse				
F19.1	Stiffness	Horizontal Loading of Standalone Armrest in Folded Up Position	≤ 5	No	Yes
F19.2	Abuse				
F20.1	Stiffness	Horizontal Loading in Open Position	≤ 5	Yes	No
F20.2	Abuse				
F21.1	Stiffness	Axial Loading in Open Position	≤ 5	Yes	Yes
F21.2	Abuse				
F22.1	Stiffness	Vertical Loading in Open Position	≤ 5	Yes	No
F22.2	Abuse				
F23.2	Abuse	Abuse Loading of Anti-Theft Lockable Storage Box	≤ 5	Yes ^{Note 1}	Yes ^{Note 1}

Note 1: Requirement applies if armrest is equipped with this feature.

4.2 Armrest Actuation Performance. Armrest Actuation requirements apply to the armrest mechanisms actuation forces. The requirements are listed in Table B1.

4.2.1 Sliding Force. The Sliding Force requirement is applicable for sliding armrests with continuous resistance.

4.2.1.1 F1.1 Sliding Force. The stamp shall be applied along the armrest centerline at the front and back of the armrest when the armrest is folded down. The measurement shall be performed in both sliding directions over the entire sliding distance. See Figure 2.

4.2.1.2 F1.2 – Sliding Detent Force. For sliding armrests with intermediate detents, the force that is measured above the sliding is to be measured. The force is measured as the difference between:

- the maximum force when engaging the detent and
- the Sliding Force (F1.1) measured within 25 mm before detent engagement.

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The location in which this measurement is to be taken is based on the design of the part and where the detent beings. The force should be measured into and out the detent.

4.2.2 Folding Force. This requirement is applicable for standalone armrests which rotate from a horizontal (folded down) to a vertical (folded up) position.

4.2.2.1 F2 - Upward Folding Force. The stamp shall be applied vertically from below to the released and folded down armrest centered on the armrest at a distance of 20 mm from the front edge of the lower surface of the structure part, and shall push it into the folded up position until just before the locking point. See Figure 3.



Figure 2: Sliding Force Application

4.2.2.2 F3 - Downward Folding Force. With the armrest folded up, the stamp shall be centered on the armrest at a distance of 20 mm from the front edge and shall push the armrest into the folded down position. See Figure 3.



Figure 3: Upward and Downward Folding Force Application

4.2.3 Inclination Adjustment Force. The Inclination Adjustment Force applies for armrests which have a release mechanism that allows the armrest to move to a specific inclination angle and then holds that position when the release mechanism is released.

4.2.3.1 F4 - Upward Inclination Adjustment Force. With the inclination release mechanism disengaged, the stamp shall be centered on the armrest at a distance of 20 mm from the front edge. The armrest shall be pushed from the down position to the position with the maximum inclination.

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4.2.3.2 F5 - Downward Inclination Adjustment Force. With the inclination release mechanism disengaged, the stamp shall be centered on the armrest at a distance of 20 mm from the front edge. The armrest shall be pushed from the position with the maximum inclination to the down position.

4.2.4 Standalone Armrest Detent Force. The Standalone Armrest Detent Force requirement applies to a standalone armrest with a feature that holds the armrest in the folded up position such that there is a purposeful higher force above the Upward Folding Force (F2) and/or Downward Folding Force (F3).

4.2.4.1 F6 - Standalone Armrest Detent Engagement Force. The force is measured as the difference between:

- a. the maximum force when engaging the detent and
- b. the Upward Folding Force (F2) measured within 25mm before detent engagement.

4.2.4.1.1 The stamp shall be centered on the armrest at a distance of 20 mm from the front edge. The force shall be applied normal to the structure part when positioned just before the detent engagement. The force shall push the armrest until the armrest reaches the detent position. See Figure 4.

4.2.4.2 F7 - Standalone Armrest Detent Release Force. The force is measured as the difference between:

- a. the maximum force when disengaging from the detent and
- b. the Downward Folding Force (F3) measured within the first 25 mm after detent release.

4.2.4.2.1 The stamp shall be centered on the armrest at a distance of 20 mm from the front edge. The force shall be applied normal to the outer surface of the armrest. The force shall push the armrest until it is released from the detent position. See Figure 4.

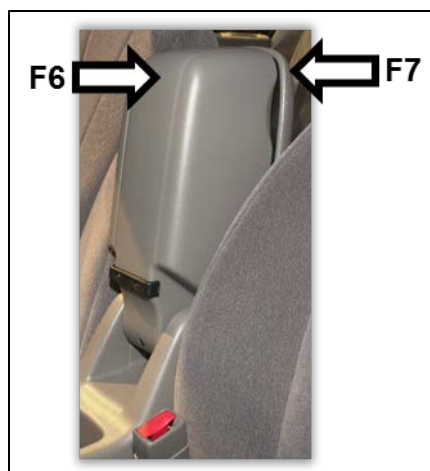


Figure 4: Standalone Armrest Detent Engagement and Release Force Application

4.2.5 Latch Force. The Latch Force requirement applies when there is a lever or a button release for the armrest latch.

4.2.5.1 F8 - Latch Release Force. The release force shall be tested with the armrest in the down and latched position. If the latch is not accessible with the force gauge, the latch can be tested by actuation the latch with the armrest in the open or folded up position. If this method is employed, it must be noted in the test report and Data Sheet A7.

4.2.5.1.1 Lever Style Latch. A hook shall be applied to the lever centerline at the rearward edge. The hook shall be pulled vertically upwards until the latch is released. See Figure 5.

4.2.5.1.2 Button Style Latch. When the latch release is a button, a stamp shall be applied to the button with the armrest in the latched position.

4.2.5.1.2.1 The width of the button shall be measured to determine which force specification is appropriate. See Figure 5.

4.2.5.1.2.2 To measure the force, the stamp shall be used to push normal and at the center of the button. The button shall be pushed until the latch is released.

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4.2.5.2 F9 - Latch Engagement Force. The armrest shall be folded down until just before the latch begins to engage. The stamp, centered on the armrest at a distance of 20 mm from the front edge, shall push the armrest vertically downward until the latch fully engages. See Figure 5.

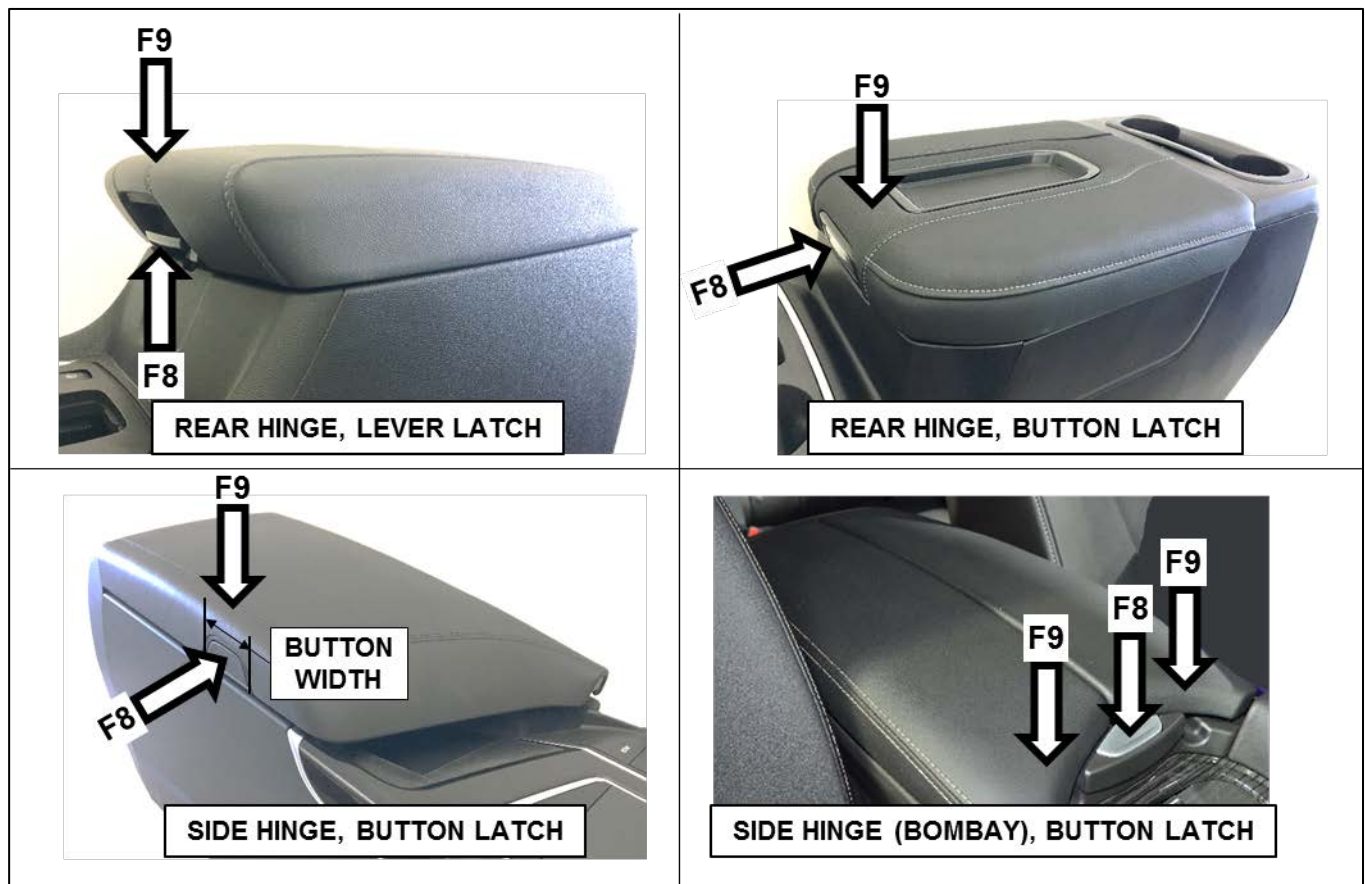


Figure 5: Latch Release and Engagement Force Application for Various Armrest Designs

4.2.6 Opening and Closing Force. The Opening and Closing Force requirements are applicable for console mounted armrests which rotate from a horizontal (down) to vertical (open) position.

4.2.6.1 F10 – Opening Force. With the armrest latch released, the hook or stamp shall be centered on the bottom armrest surface at a distance of 20 mm from the front edge. The force shall be applied normal to the surface until the armrest reaches the point where the detent engagement force (F6) begins or to the fully opened position. See Figure 6.

4.2.6.2 F11 - Closing Force. The stamp shall be centered on the upper armrest surface at a distance of 20 mm from the front edge. Starting from (1) the open position or (2) after the armrest is released from the detent as measured in the Console Mounted Armrest Detent Release Force (F13), the force shall be applied normal to the surface. The force shall be applied until it reaches the latch engagement location. See Figure 6.

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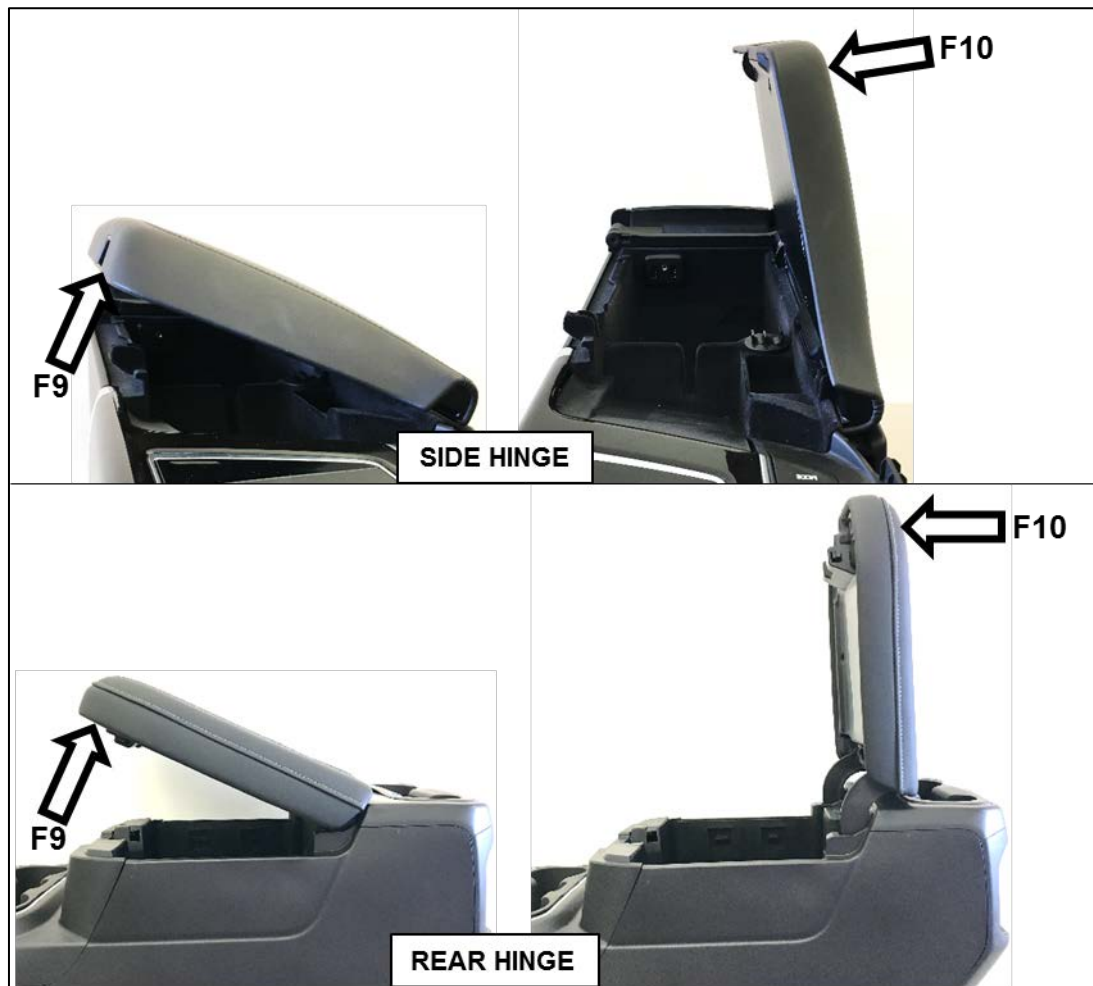


Figure 6: Opening and Closing Force Application for Various Armrest Designs

4.2.7 Console Mounted Armrest Detent Force. The Console Mounted Armrest Detent Force requirement applies to a console mounted armrest that has a feature that holds the armrest in the open position such that there is a purposeful higher force above the Opening Force (F10) and/or Closing Force (F11).

4.2.7.1 F12 - Console Mounted Armrest Detent Engagement Force. The force is measured as the difference between:

- the maximum force when engaging the detent and
- the Opening Force (F10) measured within 25 mm before detent engagement.

4.2.7.1.1 The stamp shall be centered on the armrest at a distance of 20 mm from the front edge. With the armrest just before the detent engagement position, the force shall be applied normal to the lower surface. The force shall push the armrest until it reaches the detent position. See Figure 7.

4.2.7.2 F13 - Console Mounted Armrest Detent Release Force. The force is measured as the difference between:

- the maximum force when disengaging from the detent and
- the Closing Force (F11) measured within the first 25mm after detent release.

4.2.7.2.1 The stamp shall be centered on the armrest at a distance of 20 mm from the front edge. With the armrest in the detent position, the force shall be applied normal to the outer surface. The force shall push the armrest until it is released from the detent position. See Figure 7.

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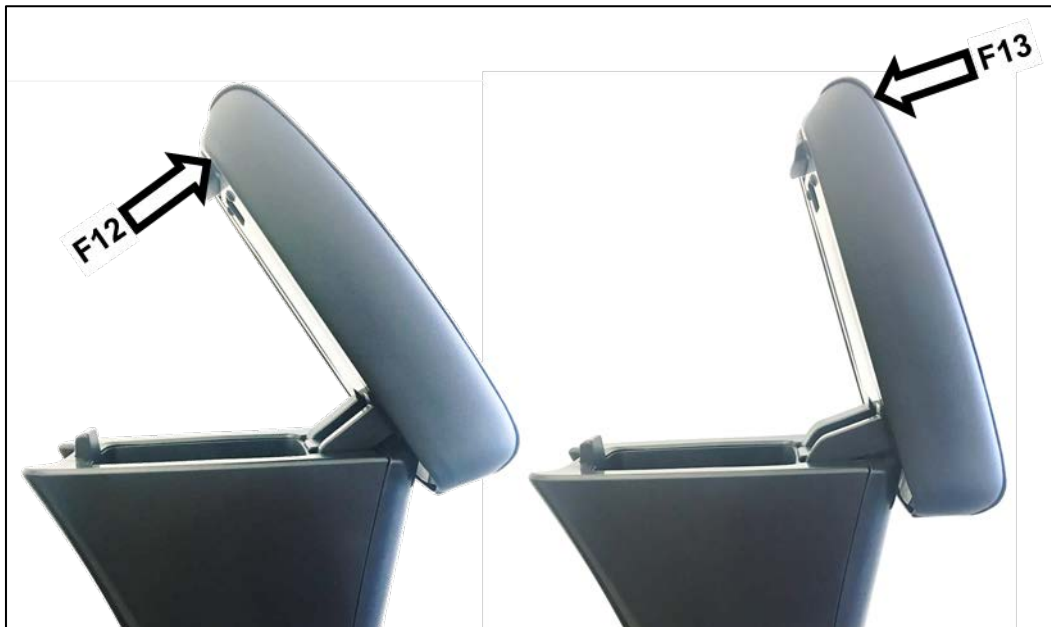


Figure 7: Console Mounted Armrest Detent Engagement and Release Force Application

4.3 Armrest Stiffness and Abuse. The armrest stiffness and abuse requirements are paired requirements such that the same locations are tested for both stiffness and abuse. The designations of the forces and requirements are indicated in Table 2.

Table 2: Stiffness and Abuse Guidelines

Force Identification	Force Type	Physical Test Requirement
FXX.1	Stiffness	Requirements per Appendix B, Table B2. Measurements to be taken in one of two locations: - At the force application point - On opposing surface at point aligned with force direction when testing F16.1, F17.1, F19.1, F20.1 and F21.1. See Figure 8.
FXX.2	Abuse	No impairment of function to the armrest mechanisms or objectionable visible damage following application of abuse loads listed in Appendix B, Table B2.

4.3.1 When testing and measuring the deflection of an armrest in any position, the force shall be applied to a hard plastic substrate such that the recorded deflection shall not include any deflection due to the compression of any trim cover material and/or foam laminate or pad. This applies to force applications F14.1, F15.1, F16.1, F17.1, F18.1, F21.1, and F22.1. The removal of the cover material and/or foam laminate or pad is acceptable but not necessary as well for the abuse forces applied at the same location. See Figure 9.

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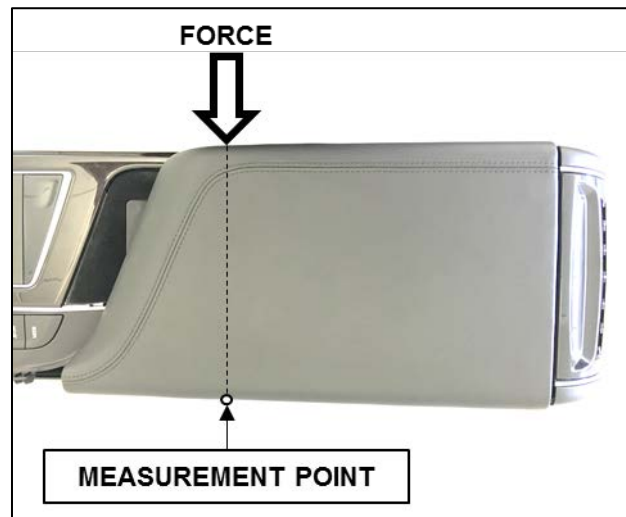


Figure 8: Deflection Measurement Method Using Opposite Surface



Figure 9: Removal of Armrest Skin and Foam

4.3.2 Console Mounted Armrest Closing Abuse. This test is to simulate a customer closing the armrest rapidly.

4.3.2.1 Perform latch force testing per 4.2.5 (F8 and F9).

4.3.2.2 Place the armrest in the open position.

4.3.2.3 Apply a force to the armrest that causes the armrest to travel from the full open positioned to the down position in < 0.25 s.

4.3.2.4 Open the armrest and check for any visible change to the appearance of the latch components.

4.3.2.5 Repeat latch force testing per 4.2.5. The forces shall not change by more than 30%.

4.3.3 F14.1 and F14.2 - Vertical Loading of Front in Down Position. The armrest in down position shall be loaded vertically from above.

4.3.3.1 F14.1 Vertical Loading of Front in Down Position - Stiffness. The force shall be applied with the 20 mm stamp centered on the armrest at a distance of 20 mm from the front edge. See Figure 10.

4.3.3.2 F14.2 Vertical Loading of Front in Down Position - Abuse. The force shall be applied with the 127 mm stamp centered on the armrest at a distance of 20 mm from the front edge. See Figure 10.

4.3.3.2.1 For sliding armrests, the F14.2 abuse load shall be repeated with the armrest in the full-forward position.

4.3.4 F15.1 and F15.2 - Horizontal Loading of Front in Down Position. The front of the armrest shall be loaded in a horizontal direction using the stamp placed along the armrest centerline. See Figure 10.

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