GM WORLDWIDE ENGINEERING STANDARDS	General Specification	GMW3121

Roof Rail Airbag Modules

1 Introduction 4
1.1 Purpose. 4
1.2 Applicability. 4
1.3 Remarks. 4
2 References 4
2.1 External Standards/Specifications. 5
2.2 GM Standards/Specifications. 5
2.3 Additional References. 5
3 Requirements 5
3.1 System/Subsystem/Component/Part Definition. 6
3.1.1 Appearance. Not applicable. 6
3.1.2 Content. 6
3.1.2.1 Physical Content. 6
3.1.2.2 Functional Content. 6
3.1.3 Ambient Environment. T 7
3.1.4 Interfaces. 7
3.1.4.1 Mechanical Interface. 8
3.1.4.2 Deployment Interface. 9
3.1.4.3 Electrical Interface. 10
3.1.4.4 Squeak, Rattle, and Other Audible Noise Avoidance – Vehicle Level. 10
3.1.5 Usage Definition. 10
3.2 Product Characteristics. 10
3.2.1 Performance Requirements. 10
3.2.1.1 Comply with Government Regulations. 11
3.2.1.2 Odor. 11
3.2.1.3 Squeak, Rattle, and Other Audible Noise Avoidance – Component Level. 11
3.2.1.4 Module Visible Cover Feel. 11
3.2.1.5 Resistance to Use and the Environment. T 11
3.2.1.6 Module Deployment Performance. 13
3.2.1.7 Electrical Stress. 14
3.2.1.8 Module Flammability - Internal Sources. 14
3.2.1.9 Module Flammability - External Sources. 14

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3.2.1.10 Module Performance after Heat Aging. 14
3.2.1.11 Conformité Européene (CE) Conformity. 14
3.2.2 Physical Characteristics. T 14
3.2.2.1 Dimensions and Capacity. 14
3.2.2.2 Mass Properties. 14
3.2.3 Reliability. 14
3.2.3.1 Reliability Evaluation Point. 14
3.2.3.2 Reliability Requirements. 14
3.2.3.3 Reliability Requirements. 15
3.2.4 Serviceability. 15
3.2.4.1 Maintenance. 15
3.2.4.2 Vehicle Repair and Module Replacement. 15
3.2.4.3 Pre-Delivery Inspection (PDI) Objectives. 16
3.2.5 User-System/Subsystem/Component/Part Interface. Not applicable. 16
3.3 Design and Construction. 16
3.3.1 Materials, Processes and Parts Selection Guidelines. 16
3.3.1.1 Material Guidelines. 16
3.3.1.2 Processes Guidelines. 16
3.3.1.3 Parts Guidelines. 16
3.3.2 Design Guidelines and Constraints. 16
3.3.2.1 Module Attachment. 16
3.3.2.2 Productivity. 16
3.3.2.3 Handling. 16
3.3.2.4 Production. 17
3.3.3 Identification and Marking. 17
3.3.3.1 Label Legibility. 17
3.3.4 Workmanship. (Cleanliness). 17
3.3.5 Interchangeability. Not applicable. 18
3.4 Documentation. 18
3.5 Support of System/Subsystem/Component/Part After Sale. 18
3.6 System/Subsystem/Component/Part Operator Training. 18
3.7 System/Subsystem/Component/Part Characteristics. T 18
3.7.1 System/Subsystem/Component/Part Definition. 18
3.7.1.1 Housing Requirements. 18
3.7.1.2 Cushion Requirements. 19
3.7.1.3 Inflator Requirements. 20
3.7.1.4 Propellant Stability. 21
3.7.1.5 Initiator Requirements. 21
3.7.1.6 Harness Requirements. 21

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3.7.1.7 General Connector Requirements. 22
3.7.1.8 Visible Cover Requirements. 22
4 Validation 25
4.1 General. 25
4.2 Validation Cross Reference Index. (VCRI). 25
4.3 Supporting Paragraphs. Not applicable. 26
5 Provisions for Shipping 26
6 Notes 26
6.1 Glossary. 26
6.2 Acronyms, Abbreviations, and Symbols. 28
7 Additional Paragraphs 29
7.1 All parts or systems supplied to this standard must comply with the requirements of GMW3059, Restricted and Reportable Substances. 29
8 Coding System 29
9 Release and Revisions 30

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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 document details the requirements for a roof rail-mounted Airbag Module component (hereinafter referred to as the Module) to be considered for airbag subsystems used on vehicles produced by General Motors Worldwide (GMW). As defined by the responsible Vehicle Engineering Center (VEC), the Module consists of a Roof Rail Airbag (RRAB). Any vehicle level and Module interface requirements contained herein, shall be addressed by the responsible VEC. The Module Supplier shall work cooperatively with the responsible VECs and any other component Suppliers in resolving any identified interface, design or function issues. The responsible VECs shall be the final arbiter of any vehicle and interface requirements.

1.2 Applicability. This document applies to all roof rail mounted airbags for first impact or rollover Federal Motor Vehicle Safety Standards (FMVSS) 226 complaint Modules**.**

1.3 Remarks.

1.3.1 Mission/Theme. The Module supplements the protection offered by the vehicle structure, seat belt system, and interior trim for near-side side impact collisions and high severity frontal collisions (co-deployment). The Module is intended to reduce injury potential in those side impact accidents where there is a significant risk that the outboard occupants might otherwise be seriously injured, meet applicable regulations, and address General Motors Worldwide performance goals.

1.3.2 Classification. The Airbag Modules are components of the airbag subsystem. As defined by the responsible Vehicle Engineering Center (VEC), the airbag subsystem consists of a specified combination of Airbag Modules, Sensing and Diagnostic Module (SDM), vehicle wiring, Side Impact Sensors (SIS) and/or Automatic Occupant Sensing (AOS).

Airbag Module requirements consist of three parts:

- Part 1: GMW3109 Frontal Airbag Modules
- Part 2: GMW3115 Side Impact Airbag Modules
- Part 3: GMW3121 Roof Rail Airbag Modules

Airbag Module Verification (Validation) consists of seven parts (two of which have no documents assigned to them):

- Part 1: GMW3112 Verification of Requirements for Frontal Airbag Modules
- Part 2: GMW3118 Verification of Requirements for Side Impact/Roof Rail Airbag Modules
- Part 3: No Part 3 Exists
- Part 4: SAE/USCAR-24 USCAR-Inflator Technical Requirements and Validation
- Part 5: No Part 5 Exists
- Part 6: SAE/USCAR-28 Initiator Technical Requirements and Validation
- Part 7: GMW3133 Verification of Cover/Door Subcomponent for Frontal/Side/Roof Rail Airbag Modules

2 References

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

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2.1 External Standards/Specifications.

2000/53/EC	EN 10204	IEC 60068-2-38	SAE J1794
2007/23/EC	EU No. 1025/2012	ISO 1431-1	SAE/USCAR-21
CMVSS 101	FMVSS 101	ISO 20433	SAE/USCAR-24
CMVSS 107	FMVSS 201	GSO 98	SAE/USCAR-28
CMVSS 201	FMVSS 107	KMVSS 95	TRIAS 48
CMVSS 214	FMVSS 214	SAE J1128	UN R21
CMVSS 302	FMVSS 226	SAE J1344	UN R95
EEC 78/632	FMVSS 302	SAE J1351	

2.2 GM Standards/Specifications.

GMW3059	GMW3176	GMW14089	GMW15010
GMW3091	GMW3191	GMW14124	GMW15432
GMW3097	GMW3205	GMW14130	GMW15443
GMW3103	GMW3208	GMW14162	GMW15520
GMW3109	GMW3232	GMW14334	GMW15626
GMW3112	GMW3235	GMW14444	GMW15862
GMW3115	GMW3283	GMW14573	GMW16907 (ID)
GMW3116	GMW3286	GMW14688	GMW16323
GMW3118	GMW3402	GMW14797	GMW17261
GMW3133	GMW3417	GMW14864	
GMW3172	GMW8518	GMW14892	

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2.3 Additional References.

- Approved Paint on Plastic System (APOPS)
- CG1949 Validation Cross Reference Index (VCRI) Appendix G3 template for RRAB
- CG2503 Bar Code Content and Format Validation Form
- CG3378 Airbag Lot Acceptance Matrix
- GM part number 88861407
- GM Materials Approved Source List
- Part Number (PN) 1042911
- PN 12345002
- PN 88861407
- Program Specific Statement of Requirement (SOR), Appendix G3
- Squeak and Rattle Noise Glossary

3 Requirements

This section, including all subsections, defines the requirements for the Module. Specific validation procedures for each subsection are listed in Appendix G3 of the program specific SOR (CG1949 VCRI template) (see 4.2). The companion verification documents contain validation tests, procedures and documentation protocol.

The use of "**shall**" in this document denotes a binding provision that must be met unless a deviation is granted by the responsible VECs. Deviations to "**shall**" requirements will only be considered and, if approved, granted by the responsible VECs after evaluating appropriate available technologies and balancing all Module and restraint system performance considerations.

"**Should**" denotes a preference, or desired conformance that must be tested and, if not met, must be documented and disclosed by the Supplier and approved by the responsible VECs. "**Should**" requirements must be met unless non-compliance has been approved by the responsible VECs.

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The term "airbag" refers to the airbag subsystem and not a specific component (i.e., the cushion).

Unless otherwise noted, all requirements apply over the environments (see 3.1.3 "Ambient Environment") and the Module reliability evaluation point (see 3.2.3.1). If requirements stated herein are not objectively defined, the responsible VECs **shall** be the final arbiter of these requirements.

3.1 System/Subsystem/Component/Part Definition. The Roof Rail Airbag Module provides supplemental restraint for the vehicle's outboard occupants in near-side side impact collisions as described herein by deploying a cushion when commanded by the Module's sensing unit.

In this document, the term "visible cover" refers to an optional subcomponent of the Module and is characterized by a Class A show surface. Any reference to or requirement associated with a visible cover is not applicable to a Module that does not contain a Class A show surface.

3.1.1 Appearance. Not applicable.

3.1.2 Content.

3.1.2.1 Physical Content. Program and VEC specific Module content and interface requirements shall be defined in a program specific SOR. All Module baseline and optional content shall be subject to the requirements stated within this document.

3.1.2.2 Functional Content. The Module shall provide the following functions:

- The Roof Rail Airbag Subsystem sensors will be in a constant state of readiness and will determine if the vehicle is in a crash scenario status or in standby status.
- If the vehicle is in a crash scenario status the sensor will send a signal to the Sensing and Diagnostic Module (SDM) to deploy the Roof Rail Airbag Module.
- Upon a signal from the sensor, the SDM will activate the Module inflation device and cause the inflation of the airbag.
- When the Module inflation device is activated, the airbag shall deploy and inflate between the vehicle side structure/side glass area and the outboard occupants. The RRAB cushion deployment trajectory to be within 25 mm of cross-car upper garnish.
- The Module will provide a means of retention for the vehicle's occupants should there be multiple impacts or vehicle roll-over, provided roll-over sensing technology is available that can detect such crash events.

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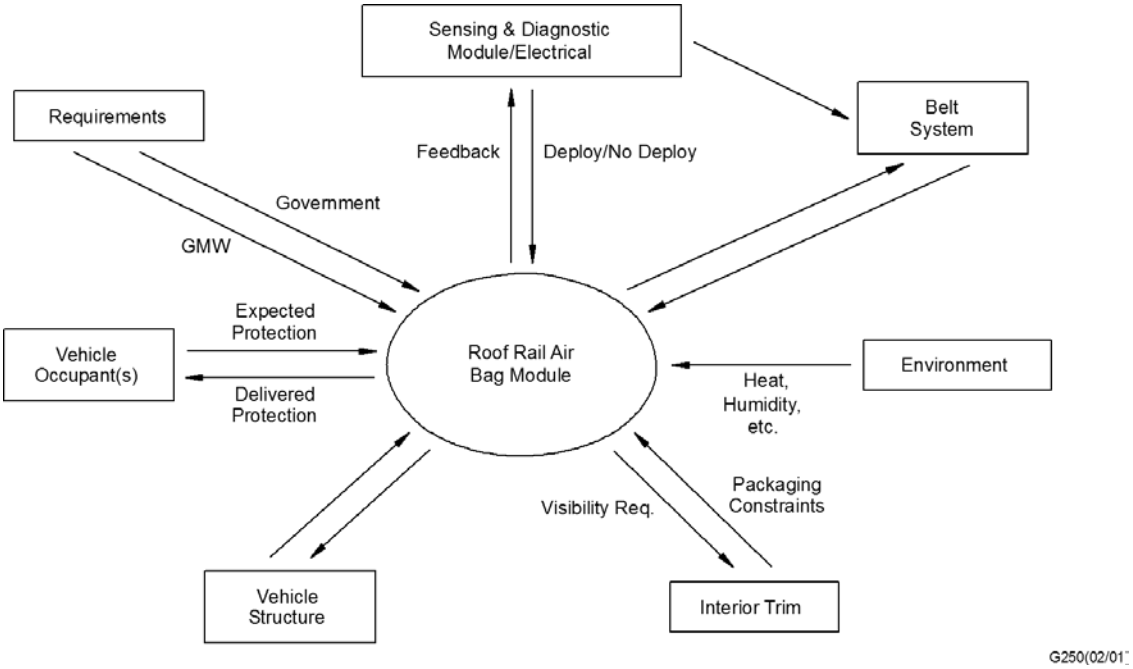
The Roof Rail Airbag Module Functional Context diagram follows in Figure 1.

Figure 1: Roof Rail Airbag Module Functional Context Diagram



& And

3.1.3 Ambient Environment. The Module shall be exposed to the varying environmental conditions. Environmental elements which may impact the appearance, function and/or performance of the Module include, but are not necessarily limited to, altitude differentials, humidity, temperature, solar exposure, dust, ozone, salt spray, sulfur dioxide, perspiration, manufacturing contaminants, cleaning contaminants, vibrations, dynamic shock, electromagnetic interference, coffee, tea, cola, ketchup, milk chocolate, isopropyl alcohol and paint thinner. Evaluation is through static deployments, durability vehicles, sled and barrier testing.

3.1.4 Interfaces. Figure 2 shows the block diagram for the Module and interfaces prior to deployment.

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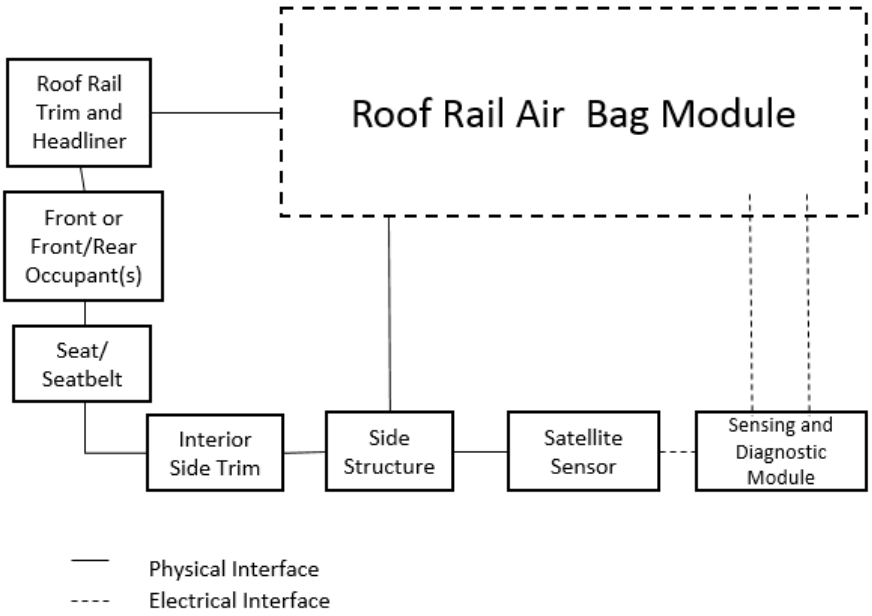
Figure 2: Module Interfaces - Pre-Deployment



3.1.4.1 Mechanical Interface. Module interface development to meet the following requirements shall be jointly done on a systems basis by the responsible VECs, the Interior Trim Suppliers, and the Module Supplier. The responsible VECs and Module Supplier shall cooperate to resolve all design and functional interface issues.

The Module shall be compatible with the roof rail structure as well as the interior trim (i.e., headliner, A-, B-, C-pillar trim, etc.)

3.1.4.1.1 Material Interface/Compatibility. This requirement applies to material interfaces/compatibility for the Module and its subcomponents as well as for the Module and mating subsystem/component interfaces. The physical properties of all subcomponents of the Module shall be compatible so as not to adversely affect the requirements stated herein. All production Module visible cover colors shall be evaluated.

Module subcomponents and interface subsystems/components:

- Shall not adhere to other Module subcomponents or interface subsystems/components.
- Shall not chemically react with other Module subcomponents.
- Shall not be adversely affected by other Module subcomponents in any way.

The material expansion/contraction characteristics of the Module and the mating subsystems/components shall be compatible throughout the conditioning temperature ranges defined in 3.2.1.5.1 "Temperature".

The Module Supplier shall cooperate with the responsible VECs to optimize Module-to-mating subsystem fit and compatibility over all conditioning temperatures. The responsible VEC shall judge and be the final arbiter of Module level fit and compatibility over all conditioning temperatures.

3.1.4.1.1.1 Material Transfer to Interior Components. The Module should not transfer materials by off-gassing or other means to vehicle windows and other interior components.

The aluminum foil sample shall be < 2 mg mass increase when tested according to GMW14444 (Fogging, GMW3235).

The responsible VEC shall be the final arbiter of material transfer.

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3.1.4.1.2 Attachment. The Module shall be secured to the roof rail and other vehicle structure in a manner which meets or exceeds all fit, vibration, deployment and life cycle requirements of this specification. All attachments shall be qualified per the Module layout drawing and/or as approved by GM Fastener Engineer prior to usage. The number of fasteners and attachment points shall be minimized as required for a specific application. Fasteners < M6 should not be used. Loose washers shall not be used. The clamp power of every screw joint shall be managed without follow-up. All screw joints shall be capable of being installed with standard tools. The Module should be self-located by separate guide elements and by integrated guiding-in fasteners.

The Module should be compatible with design for assembly philosophy. Mounting locations shall be jointly determined by the responsible VEC, the Module Supplier, and the Interior Trim Suppliers. The responsible VECs shall be the final arbiter for mounting locations and attachment schemes.

The Modules chosen reference points should directly meet those elements which give the part its position in the vehicle and should be placed in one installation direction. A Module should only fit one position without adjustments or incorrect positioning possibilities.

There shall not be discernible movement of the Module and/or visible cover relative to the roof rail after the Module is installed in the vehicle and while the vehicle is being used in its intended function.

The responsible VEC shall be the final arbiter for all Module attachment/movement requirements.

3.1.4.1.2.1 Attachment Insertion/Removal Cycles and Forces. The force required to insert and seat the Module into the vehicle structure should not exceed 45 N. Snap-in attachments should provide audible feedback when fully seated. No damage that affects the fit or function of the Module, interior trim, and/or fastening elements shall occur during installation and removal. Removal shall be easily accomplished using standard servicing techniques.

The Module design shall accommodate a total of three insertion/removal cycles. The responsible VEC shall be the final arbiter for all Module related insertion/removal requirements.

3.1.4.1.3 Interface with the Headliner/Interior Trim and Attached Components. The Module shall not pinch, cut or abrade any electrical wires when installed in the vehicle. The Module Supplier shall assess Module fit before deployment and shall verify compatibility between the Module and the mating subsystems/components.

The Module shall not restrict the inclusion of typical interior headliner/interior features, including, but not limited to, assist handles, coat hooks, seat belt guide loops, and auxiliary lights.

The Module shall not affect the shape or design position of the headliner/interior trim after the Module is installed in the vehicle and while the vehicle is being used in its intended function.

The responsible VEC shall be the final arbiter of all Module and mating subsystem/component interfaces.

3.1.4.2 Deployment Interface. In this section, the term deployment system encompasses the Module, and also includes but is not limited to the Module subcomponents (e.g., fasteners, ramps, inflator bracket), interfacing body structure, body subcomponents (e.g., sunroof Module, roof rack) and all interfacing interior trim and components that provide a path for deployment or potential interaction with the RRAB deployment path (e.g., inside door handle, door trim, seats, seatbelts).

During deployment, with or without occupant loading, the deployment system shall not provide any sharp or rough surfaces for the cushion and/or the occupant to contact. The cushion shall not receive tears or cuts from the deployment system or from other vehicle components (e.g., the side door window, sun visor, assist handle brackets and pillar trim) which could result in impaired occupant restraint.

The cushion shall not cause any interior components (e.g., pillar trim) to fragment or separate from the vehicle other than those designed to separate in a controlled manner. This requirement shall not relieve the interior component Suppliers of the requirement to provide robust designs that shall withstand Airbag (AB) deployment.

During deployment, with or without occupant loading, the deployment system shall not fragment or separate in any manner which could result in impaired occupant restraint or injury. The deployment system should not fracture or damage the side door window.

Through film analysis of the deployment and occupant interaction, as well as with post deployment inspections, the Supplier shall demonstrate that no cushion tears or interfaces which could impair occupant restraint are created as a result of the deployment interfaces, the headliner/interior trim, and/or the vehicle structure.

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