



Seat Belt Webbing Technical Specification

1 Scope

Note: Nothing in the specification supercedes applicable laws and regulations unless specific exemption has been obtained.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

This specification establishes the seat belt webbing requirements for 3 - point seat belt assemblies intended to provide design verification and compliance to the Federal Motor Vehicle Safety Standard (FMVSS) 209 and other global regulatory requirements for future General Motors (GM) vehicles. It defines common key physical and functional requirements enabling interchangeability between supplier systems for GM vehicles worldwide. This set of specifications is intended to provide uniform direction to the various engineers regarding the design requirements, testing, and validation of each seat belt system being developed for GM vehicles. In part, when validated to these requirements, the seat belt system will provide a reasonable and appropriate level of performance in real world crashes.

This specification does not apply to seat belt webbing used as buckle straps, guide loop straps, or in 2 - point seat belt assemblies.

1.1 Material Description. This specification describes a narrow woven fabric (polyester is used unless otherwise directed by GM Engineering) used in certain seat belt applications. The webbing described in this specification is only intended for use within retractor-side assemblies of 3 - point seat belts.

The material is constructed with a double needle loom using monofilament and multifilament weft yarns. The following data shall be made available: The Yarn Description (Source, Fiber Content, Denier, Twist Direction, turns per 25 mm, Luster, Cross-Section).

The material has knit selvages that are rounded and completely hide the weft reverse points of the monofilament.

1.2 Symbols. Not applicable.

1.3 Applicability. Webbing described in this specification is classified as being either:

Type A: Standard thickness webbing for use in most applications.

Type B: Slightly thinner webbing for use in selected applications where additional webbing will be needed to stow into a retractor that otherwise couldn't stow that length of webbing.

Type C: Low Elongation webbing for use in selected applications where a lower elongation rate is required. Low Elongation webbing is also thinner than Type A webbing.

Type D: High Elongation webbing for use in selected applications where a higher elongation rate is required. High Elongation webbing is also thicker than Type A webbing.

Except where explicitly indicated, there are no differences, other than thickness changes, in the requirements for Type A, Type B, Type C and Type D webbing.

1.4 Remarks. Seat belt webbing is a textile product that is an integral component of a seat belt assembly. Vehicle seat belts are intended to provide injury protection benefit to occupants of the vehicle in the event of a crash. Their primary function is to restrain an occupant (or child seat), and to reduce the risk or severity of injury by managing the occupant's kinetic energy.

Seat belt webbing must function in harmony with the rest of the seat belt subsystem, be as comfortable and unobtrusive as practicable, and be in visual harmony with the interior theme of the vehicle.

Webbing must also comprehend the differences in governmental and market requirements of the different countries in which it is sold.

In the event of a conflict between this specification and the documents cited herein, the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2 References

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

2.1 External Standards/Specifications.

ASTM D747-02	ISO 105-A01	ISO 105-B06	SAE J882
CMVSS 209	ISO 105-A02	ISO 105-X12	UN R16
FMVSS 209	ISO 105-A03	ISO 5084	
FMVSS 302	ISO 105-B02	ISO/IEC 17025	

2.2 GM Standards/Specifications.

GMW3059	GMW3235	GMW14141	GMW14334
GMW3116	GMW3417	GMW14162	GMW14831
GMW3205	GMW6992	GMW14270	GMW15634
GMW3232	GMW14102	GMW14317	GMW16853

2.3 Additional References.

- Tinius Olsen Scale (www.tiniusolsen.com).

3 Requirements

3.1 General Requirements. The tests referred to in the following requirements are based on historic performance which has been deemed satisfactory for meeting customer performance needs.

3.1.1 The use of "shall" in this document denotes a binding provision that must be met.

3.1.2 The use of "should" denotes a desired performance level or conformance, (e.g., materials specification) which, if not met, must be documented and approved by both the Design Release Engineer and the Seat Belt Subsystem Leadership Team.

3.1.3 Laboratory testing shall be performed by a laboratory that conforms to ISO/IEC 17025 and is acceptable to the responsible GM Department. Test reports must conform to 5.10.2 and 5.10.3 of ISO/IEC 17025. Supplier shall submit a letter of compliance.

3.1.4 Data Reporting. If it is required that the average of all individual readings for a specific test be reported, each individual reading that is included in the average must meet or exceed the specified requirements. Unless otherwise stated, if an individual reading for a specific test does not meet the requirements, the sample does not meet the requirements of the specification. Report all individual test results that do not meet the requirements of the specification.

3.2 Construction Requirements.

3.2.1 Physical Requirements.

3.2.1.1 General Guidelines. The properties of a specific construction shall be documented in the Seat Belt Webbing Material Construction Specification. See Appendix B.

3.2.1.2 Monofilament Weft Yarn. All webbing must be constructed using a monofilament yarn as one weft yarn. The monofilament yarn should measure (0.25 ± 0.015) mm.

3.2.1.3 Woven Pattern. All seat belt webbing shall contain the GM World Twill pattern.

3.2.1.4 Thickness (SAE J882).

3.2.1.4.1 Type A Webbing. Test material as received (3.2.2.1) and after Common Environmental Conditioning (3.2.2.2) shall have a thickness of (1.21 ± 0.04) mm. After hex bar abrasion (FMVSS 209, S5.1d), webbing shall have a thickness no greater than 1.28 mm.

3.2.1.4.2 Type B Webbing. Test material as received (3.2.2.1) and after Common Environmental Conditioning (3.2.2.2) shall have a thickness of (0.8 ± 0.03) mm. After hex bar abrasion (FMVSS 209, S5.1d), webbing shall have a thickness no greater than 0.92 mm.

3.2.1.4.3 Type C Webbing. Test material as received (3.2.2.1) and after Common Environmental Conditioning (3.2.2.2) shall have a thickness of (1.16 ± 0.03) mm. After hex bar abrasion (FMVSS 209, S5.1d), webbing shall have a thickness no greater than 1.22 mm.

3.2.1.4.4 Type D Webbing. Test material as received (3.2.2.1) and after Common Environmental Conditioning (3.2.2.2) shall have a thickness of (1.25 ± 0.03) mm. After hex bar abrasion (FMVSS 209, S5.1d), webbing shall have a thickness no greater than 1.34 mm.

3.2.1.5 Width. All webbing shall have a width of 48.00 mm maximum under no load and 46.00 mm minimum under $(10\,018 \pm 218)$ N load (980 daN according to UN R16, (9786 ± 450) N according to FMVSS 209, S5.1a). Test material as received per 3.2.2.1 and measure width during breaking-strength test, 3.2.3.1.

3.2.1.6 Uniform Edge.

3.2.1.6.1 Type A Webbing. All webbing must have uniform, smooth, round edges measuring (1.3 ± 0.2) mm. Inspection shall be performed as stated in Appendix A.

3.2.1.6.2 Type B Webbing. All webbing must have uniform, smooth, round edges measuring (1.0 ± 0.2) mm. Inspection shall be performed as stated in Appendix A.

3.2.1.6.3 Type C Webbing. All webbing must have uniform, smooth, round edges measuring (1.3 ± 0.2) mm. Inspection shall be performed as stated in Appendix A.

3.2.1.6.4 Type D Webbing. All webbing must have uniform, smooth, round edges measuring (1.3 ± 0.2) mm. Inspection shall be performed as stated in Appendix A.

3.2.2 Standard Test Conditions and Requirements. Webbing samples are to be subjected to the following specified conditions prior to testing. **Note:** Seat Belt System Level conditioning requirements are covered in GMW14831. Parameters specific to webbing are listed as follows.

3.2.2.1 Room Temperature Conditioning (As Received). Unless otherwise specified, the material shall be tested under standard conditions, (23 ± 2) °C and $(65 \pm 2/-5)\%$ Relative Humidity (covers both FMVSS and UN regulations).

Condition specimens for a minimum of 24 h prior to testing or until moisture equilibrium is reached. Unroll specimens and place on shelf no thicker than one layer. If specimens are tested outside the controlled environment, they shall be tested within 5 minutes of removal.

3.2.2.2 Common Environmental Conditioning. Expose material within a closed space at 80 °C over water for 24 h. Next, subject material to one 24 h cycle in the following sequence:

3.2.2.2.1 Dry heat soak 6 h at 100 °C, attained within 80 minutes.

3.2.2.2.2 Cold soak 6 h at 0 °C, attained within 20 minutes.

3.2.2.2.3 Ambient soak remainder of the 24 h cycle at 23 °C.

3.2.2.3 Special Light Conditioning. Refer to FMVSS 209, S5.1(e) Demonstration Procedure for Resistance to light and UN R16; 7.4.1.2 Conditioning of Straps and Break-strength test (static) Light Conditioning for the test requirements. See 3.3.8 for FMVSS 209 color retention requirement.

3.2.2.4 Special Heat - Conditioning per UN R16. Refer to UN R16 for the details for Special Heat Conditioning.

3.2.2.5 Special Cold - Conditioning per UN R16. Refer to UN R16 for the details for Special Cold Conditioning.

3.2.2.6 Special Water - Conditioning per UN R16. Refer to UN R16 for the details for Special Water Conditioning.

3.2.3 Tensile Strength (FMVSS 209, S5.1(b) and UN R16). For all tensile tests a minimum of three samples shall be tested and reported in Appendix B, Data Sheets B1 and B2.

3.2.3.1 As Received 3.2.2.1. Webbing shall have a minimum tensile strength of 25 kN. The lowest strength test sample shall not be less than 90% of the highest strength test sample (group of three samples tested).

3.2.3.2 After Common Environmental Conditioning (3.2.2.2). All types of webbing must retain at least 80% of the average strength determined in 3.2.3.1.

3.2.3.3 After Hex Bar Abrasion per FMVSS 209, S5.1(d). All types of webbing must retain at least 80% of the average strength determined in 3.2.3.1.

3.2.3.4 After Light - Conditioning.

3.2.3.4.1 After Light – Conditioning per FMVSS 209, S5.1(e). All types of webbing shall retain at least 75% of the average strength determined in 3.2.3.1.

3.2.3.4.2 After Light – Conditioning per UN R16. All types of webbing shall retain at least 75% of the average strength determined in 3.2.3.1 after tested to all three conditions called out in ISO 105-B02, normal conditions, low effective humidity, and high effective humidity.

3.2.3.5 After Heat - Conditioning per UN R16. All types of webbing shall retain at least 75% of the average strength determined in 3.2.3.1.

3.2.3.6 After Cold - Conditioning per UN R16. All types of webbing shall retain at least 75% of the average strength determined in 3.2.3.1.

3.2.3.7 After Water - Conditioning per UN R16. All types of webbing shall retain at least 75% of the average strength determined in 3.2.3.1.

Note: The technical service conducting the UN tensile strength tests may dispense with one or more of these tests if the composition of the material used or information already available renders the test or tests superfluous.

3.2.4 Stiffness. Stiffness shall be determined according to ASTM D747-02 method using a Tinius Olsen Tester. The Tinius Olsen Stiffness Tester, Model 02007001, 0.70 J (6 in/lb) capacity, shall be used with an additional 45 g of added weight. The distance between the center clamp and the flex post shall be 12.5 mm. Die cut an additional ten specimens 75 mm in length and approximately 30 mm in width in the warp direction and midway between the selvages. Die cut an additional ten specimens in the filling direction 25 mm in width. The cut must be parallel to the filling yarns. The filling length will be the width of the webbing. Each group of ten specimens will be divided in two groups of five; five specimens will be tested face side up and five specimens will be tested face side down. Each warp specimen will have enough yarns removed from each side of the longer dimension until a width of 25 mm is obtained. Trim the filling yarns close to the exposed warp yarns. Condition the prepared specimens to 24 h in the standard atmosphere. To test, place the end of one specimen (face side up) into the clamping device and tighten. Rotate the clamping device, by hand, until the sample just touches the flex post. Continue to rotate the clamping device until a reading of one is indicated on the load scale. Zero the angle indicator and start the machine. Take the reading at 60 degrees for the warp direction and 60 degrees for the filling direction. Report the individual results for the face side up and face side down specimens in each direction.

Note: The total weight of the individual weights must be (45 ± 1) g. Do not use the numbers stamped on the face of each weight.

3.2.4.1 Lateral Stiffness. The bending moment of the webbing as received (3.2.2.1), as well as after Common Environmental Conditioning (3.2.2.2) and hex bar abrasion (FMVSS 209, S5.1d) shall be (45 to 65) on Tinius Olsen scale.

3.2.4.2 Longitudinal Stiffness. The bending moment of the webbing as received (3.2.2.1), as well as after Common Environmental Conditioning (3.2.2.2) and hex bar abrasion (FMVSS 209, S5.1d) shall be 65 maximum on Tinius Olsen scale.

3.2.4.3 Stiffness Ratio. The stiffness ratio, found by dividing the Longitudinal Stiffness by the Lateral Stiffness, shall be no greater than 1.3.

3.2.5 Flammability. All webbing must meet the flammability requirements of GMW3232 test methods.

3.2.6 Elongation. As received (3.2.2.1) Type A and Type B webbing shall have an elongation of (10 to 12)%, Type C webbing shall have an elongation of (5 to 7)%, and Type D webbing shall have an elongation of (12 to 14)% when subjected to 11 120 N of tensile force (when tested per FMVSS 209, S5.1(c)).

3.2.7 Emission Testing. Covered by emission testing are the following vehicle interior air quality requirements: Odor according to GMW3205, Fogging according to GMW3235, Volatile Organic Compound (VOC) and Semi-Volatile Organic Compound (SVOC) according to GMW15634.

3.2.7.1 Requirement. According to GMW16853.

3.2.7.2 Procedure. For required tests, procedure and limits see Table "Overview of Test Procedures required for the Individual Materials and Part Approvals" and Table "Emission Requirements for Interior Material/Parts/Assembly List" according to GMW16853.

3.2.8 Resistance to Curvature after Hex Bar Abrasion (FMVSS 209, S5.1d). Webbing must not exhibit curvature in excess of that identified in Appendix A.

3.2.9 Resistance to Waviness after Hex Bar Abrasion (FMVSS 209, S5.1d). Webbing must not exhibit waviness in excess of that identified in Appendix A.