



Sewing Thread

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/Material Description. This standard describes requirements for threads and yarns suitable for automotive sewing applications.

1.2 Symbols. The construction code or finish symbol defines the material construction and will be assigned by the appropriate materials engineer during initial construction approval.

1.3 Applicability. Sewing applications covered by this standard include embroidery, join sews, tack downs, seatbelt sews, hand-sews, serging yarns, and serge loopers.

2 References

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

2.1 External Standards/Specifications.

ASTM D2256	ISO 105-A03	ISO/IEC 17025	SAE J2527
ISO 105-A02	ISO 105-X12		

2.2 GM Standards/Specifications.

GMW3059	GMW3259	GMW6992	GMW14162
GMW3221	GMW3417	GMW14141	GMW14270

2.3 Additional References.

- GM SupplyPower can be found at <https://gmsupplypower.covisint.com/web/portal/home>.

3 Requirements

3.1 General Requirements.

3.1.1 Standard Conditions (GMW3221, Code A). All test specimens shall be brought to equilibrium in standard conditions for temperature and moisture and tested in that state as defined in GMW3221, Code A, unless the test method indicates that standard conditioning is not required. Condition specimen for a minimum of 24 h immediately before testing or until moisture equilibrium is reached. If specimens are tested outside the conditioned environment, the specimens shall be tested within ten (10) minutes of removal.

3.1.2 Visual Evaluation of Automotive Trim (GMW6992). The color, pattern, aesthetics, and other related qualities shall be approved by the appropriate GM Appearance Develop Lead as an acceptable match to the standard when viewed under conditions set forth in GMW6992. See the appropriate Construction Specification for Pattern and Finish information.

3.1.2.1 Submission for Color and Construction Review. For each color, submit at least two (2) card windings and a 10 cm sew-in to black leather or black plastic roll good materials, to the appropriate Appearance Materials Engineer. Submit Laboratory Data Forms and Thread Construction Specification Forms. See Appendix A, Tables A1 through A3.

3.1.2.2 Lubrication Removal. The color and pattern must be evaluated in the expected end use condition. For example, if there is a lubrication applied for the sewing process that is removed during the sewing process, it

must also be removed on a representative sample before or during evaluation in a manner replicated by the sewing process.

3.1.2.3 Thread Match To Colors. GM may, at its discretion, recommend the substitution of one (1) approved GM color for another depending on end use. For questions and further information about approved GM Match to Colors, contact the GM Thread Appearance Develop Lead.

3.1.3 Deviations from Defined Test Methods. Deviations from the conditions of any test method shall have been agreed upon between supplier and vehicle manufacturer. All deviations shall be specified on the component drawings, material specifications, etc., and shall be indicated on test certificates, reports, etc.

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

3.1.4.1 Modifications. 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.

3.1.4.2 Re-Verification. 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.

3.1.5 Laboratory Accreditation. All testing is to be performed by a laboratory that conforms to ISO/IEC 17025 and is acceptable to General Motors. Test reports must conform to ISO/IEC 17025. Refer to Appendix A, Table A2, page 1 and page 2. A letter of conformance is required.

Note: Conformance to ISO/IEC 17025 is defined as the laboratory meets the requirements but is not required to be formally recognized by an outside accreditation agency.

3.1.6 Construction Code. Construction code is an alphanumeric code that defines the type of thread by chemistry, weight, and finish of thread. Construction Code examples are listed in Table A3.

3.1.7 Nominal Values. The nominal values for typical applications are shown in Table 1. Actual values are to be specified in the appropriate Thread Construction Specification Form (Appendix A, Table A1).

Table 1: Nominal Values

Application	Linear Density (TEX)	Tensile (N)	Elongation (%)
Join	90	40	20
Heavy	105	60	20
Airbags/Seat Decorative	135	90	25
Seat Belt Webbing	150 or 135	100	22
Hand Stitch (Decorative Stitch)	200	125	22
Delustered Serging Yarn	280	75	30
Embroidery	30	18	20

3.1.8 Thread Construction Specification. The required properties are dependent on the end use of the thread construction. The specific requirements are specified by, and the material shall conform to the appropriate thread construction specification. All fields of the Thread Construction Specification Form (Appendix A, Table A1) must be completed, input not applicable (N/A) for fields that do not apply.

3.2 Construction and Color Requirements. New constructions will require submission of the Thread Construction Specification Form (Appendix A, Table A1), and the Laboratory Data Form (Appendix A, Table 2, page 1 and page 2). New color combinations will require submission of the Laboratory Data Form. Editable versions of Appendix A Table A1 and A2 datasheets can be found on GM SupplyPower. All visual evaluations of tested specimen must be conducted under the conditions set forth in GMW6992.

3.2.1 Tensile and Elongation (ASTM D2256, Option A1). Material shall be tested both as received and after the appropriate accelerated light exposure. Test five (5) specimens, taken from at least 9 m apart from the spool, using a nip to nip jaw gauge length of $500 \text{ mm} \pm 5 \text{ mm}$ and a jaw separation rate of $300 \text{ mm/minute} \pm 10 \text{ mm/minute}$. Disregard the 20 s to break requirement. An initial tension shall be applied to the specimen sufficient to remove any slack but not enough to stretch the thread more than 0.1%. Report the average and the three (3) sigma variation. No individual test result shall be less than the minimum value required in the Thread Construction Specification, Appendix A, Table A1.

Note: If automatic sampling equipment is used, three (3) sets of five (5) specimens should be tested where each set is taken from at least 20 m apart from the spool. The average of each set should be reported along with the three (3) sigma variation of all data points.

3.2.1.1 Tensile Strength. The required tensile strength is dependent on the end use of the thread construction. The specific requirement can be found on the appropriate Thread Construction Specification, Appendix A, Table A1. For new GM constructions, the material will be approved to a tensile strength requirement established given the desired application and subsequently included on the Thread Construction Specification Form (Appendix A, Table A1).

3.2.1.2 Tensile Strength after Exposure. After Xenon exposure per 3.2.8.2 or 3.2.8.3 has been completed, the strength retention shall be 65% or greater of the as-received results for nylon. All polyester threads shall maintain at least 50% of the original as-received tensile strength.

Note: Only required for first surface color matched threads.

3.2.1.3 Elongation. Elongation at break shall be reported. Elongation values shall conform to values specified on the appropriate Thread Construction Specification Form (Appendix A, Table A1).

3.2.2 Yarn Size. For construction approval only. Thread size, in linear density (TEX), must be reported and maintained per appropriate Thread Construction Specification.

3.2.3 Volumetric Density. For construction approval only. Report the volumetric density in kg/m^3 to the nearest tenth for use in the GM Material Property Database (GMMPD). Test three (3) specimens.

3.2.4 Twist. For construction approval only. Five (5) specimens, taken from at least 9 m apart from the spool, shall be tested using a twist tester (Suter or equivalent). The gauge length shall be $255 \text{ mm} \pm 1.5 \text{ mm}$, and the tension applied through the non-rotating clamp shall be 30 g of force. Requirements can be found on the appropriate Thread Construction Specification Form (Appendix A, Table A1). Report the results in average turns per 25 mm and overall twist direction.

3.2.5 Twist Balance. For construction approval only. The thread shall twist loosely or not at all when one (1) m is drawn without tension from the side of the spool and looped on itself.

3.2.6 Finish. For construction approval only. The use of lubrication finish must be limited to amount needed for manufacture and sewing requirements. Report the percent lubricant and the percent resin. Also include the method used to obtain the data. Individual requirements can be found on the appropriate Thread Construction Specification Form (Appendix A, Table A1).

Note: If solvent extraction is used to determine the percent of lubrication, the solvent used must be reported.

Note: Some thread applications do not allow the use of silicone-based lubrications; threads for this purpose will be designated as such in the finish symbol and specified on the Thread Construction Specification Form (Appendix A, Table A1).

3.2.7 Resistance to Mildew (GMW3259). For construction approval of thread containing natural fibers only. Test a minimum 10 m sample of thread material to the procedure of GMW3259. There shall be no visible mildew growth on the thread. There shall be no mildew odor to the thread after testing.