



Sewing Thread

1 Scope

1.1 Material Description. This standard describes material 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.

ISO 105-A03	ISO 105-X12	ISO/IEC 17025	SAE J1960
ISO 105-B06	ISO 9001		

2.2 GM Standards/Specifications.

GMW3010	GMW3221	GMW3417	GMW14141
GMW3059	GMW3259	GMW6992	

2.3 Additional References.

- Thread Match to Chart available at www.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 prior to testing until moisture equilibrium is reached. If specimens are tested outside the conditioned environment, they 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 engineering department 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 matching color leather or vinyl 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 Chart. GM may, at its discretion, recommend the substitution of one (1) approved GM color for another depending on end use. The Thread Match to Chart recording acceptable substitutions can be found in www.gmsupplypower.covisint.com/web/portal/home under the Document Library tab.

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 Test Data. All testing is to be performed by a laboratory that conforms to ISO/IEC 17025 or ISO 9001 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 may not be formally recognized by an outside accreditation agency.

3.1.5 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 Table A3.

3.1.6 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	90	55	20
Airbags/Seat Decorative	135	89	25
Seat Belt Webbing	150 or 135	100	22
Hand Stitch (Decorative Stitch)	200	125	22
Delustered Serging Yarn	280	75	30
Embroidery	30	17	20

3.1.7 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 A2, page 1 and page 2). New color combinations will require submission of the Laboratory Data Form which can be found at www.gmsupplypower.covisint.com/web/portal/home, under the Document Library tab.

3.2.1 Tensile and Elongation (GMW3010, Code C). 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 separation of 500 mm $\pm$ 5 mm. 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 3.2.7.2 and 3.2.7.3 has been completed, the strength retention shall be 65% or greater of the as-received results for polyamide based threads. 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. The elongation shall be measured during the tensile test at break. Elongation values shall conform to values specified on the appropriate Thread Construction Specification Form (Appendix A, Table A1).

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

3.2.3 Twist. 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 mm $\pm$ 1.5 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 using the forms in Appendix A, Table A2, page 1 and page 2, in average turns per 25 mm and overall twist direction.

3.2.4 Twist Balance. 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.

3.2.5 Finish 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 preceding information, the solvent 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).

3.2.6 Resistance to Mildew (GMW3259). Test a minimum 10 m sample of thread material to the procedure of GMW3259. The threads shall show neither mildew growth nor exhibit mildew odor.

3.2.7 Colorfastness to Light. Prior to exposing, wrap a single layer of thread 50 mm wide parallel to the long dimension around a 67 mm $\times$ 140 mm piece of sample mounting card. An acceptable change in appearance is defined as noticeable value (lightness) and/or chroma (saturation) change with minimal hue change after exposure. A rating of ≥ 4 to 5 per ISO 105-A03 grey scale for color change is required.

3.2.7.1 Natural Weathering Exposure (GMW3417). Samples are to be tested under glass to 105 K Total Normalized Radiation (TNR) Langleys (102 °C) with intermediate results recorded at 12.5 K, 25 K and 65 K Langleys. Samples are to be tested under tempered clear glass to the following requirements GMW3417-L1-F2-G1-T number where number and durations are defined as follows:

- High ultraviolet polyester shall meet 105 000 TNR Langleys at 102 °C with intermediate results at 55 000 TNR Langleys.
- Low ultraviolet serging, embroidery threads shall meet 20 000 TNR Langleys at 85 °C with intermediate results at 10 000 TNR Langleys.
- All other threads shall meet 55 000 TNR Langleys at 93 °C with intermediate results at 25 000 TNR Langleys.

3.2.7.2 Interior Xenon Arc Method (ISO 105-B06, Condition 5). All threads are to conform to the testing conditions as specified on the individual Thread Construction Specification Form (Appendix A, Table A1). High ultraviolet polyester shall be tested to 451 kJ/m², all other thread constructions test to 150 kJ/m².

3.2.7.3 Exterior Xenon Arc Method (SAE J1960). Test only for threads used on the exterior of the vehicle. Threads are to conform to the testing conditions as specified on the individual Thread Construction Specification Form (Appendix A, Table A1).