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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3787

Issued 4-1-86

Submitted for recognition as an American National Standard

THREAD, PARA-ARAMID
Intermediate Modulus

1. SCOPE:

1.1 Form: This specification and its supplementary detail specifications cover para-aramid materials in the form of thread.

1.2 Application: Primarily for use in sewing clothing, equipage, and air delivery and safety equipment.

1.3 Classification: The requirements specified herein and in the applicable detail specifications define each type of thread by weight (length per lb) and breaking strength as shown in the detail specification titles.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D123 - Terminology Related to Textiles
ASTM D1788 - Rigid Acrylonitrile-Butadiene-Styrene (ABS) Plastics
ASTM D4101 - Propylene Plastic Injection and Extrusion Materials

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Specifications:

PPP-P-50 - Packaging and Packing of Thread for Domestic and Overseas Shipment

2.3.2 Federal Standards:

FED-STD-191 - Textile Test Methods

2.3.3 Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

3. TECHNICAL REQUIREMENTS:

3.1 Detail Specification: The requirements for a specific thread shall consist of all requirements specified herein in addition to the requirements specified in the applicable detail specification. In case of conflict between requirements of this specification and requirements of the applicable detail specification, requirements of the detail specification shall govern.

3.2 Material:

3.2.1 The yarn used in the thread shall be a para-aramid, intermediate modulus type (See 8.1).

3.2.2 Thread Finish: Thread shall be waxed or finished so that it will have a smooth, dressed surface suitable for high-speed machine sewing. For additional structural integrity, 0.5 to 1.0% by weight of a resinous finish, such as polyvinyl butyral, may be applied (See 8.3).

3.3 Properties: Thread shall conform to the requirements specified in the applicable detail specification, determined on the thread supplied and in accordance with the following test methods:

3.3.1 Weight: FED-STD-191, Method 4010.

3.3.2 Breaking Strength: FED-STD-4100. One determination per sample unit; report result as "pass" or "fail".

3.3.3 Direction of Twist; Initial and Final: FED-STD-191, Method 4050.

3.3.4 Number of Plies and Composition of Plastic Tubes: A vendor's certificate of conformance shall be acceptable for determining conformance to these requirements.

3.3.5 Finish: Visual inspection.

3.3.6 Twist; Turns per Unit Length: 4.5.1.

3.4 Quality: Thread, as received by purchaser, shall be clean and free from foreign materials and from imperfections detrimental to usage of the thread.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of thread shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser, as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the thread conforms to the requirements of this specification and the applicable detail specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to the following requirements are classified as acceptance tests and shall be performed on each lot of thread:

Requirement	Paragraph Reference
Weight (length per lb)	See Detail Specification
Breaking Strength	See Detail Specification
Quality	3.4

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification and the applicable detail specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of thread to a purchaser, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient thread shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A lot shall be all thread of a single weight produced in a single production run under the same fixed conditions and presented for vendor's inspection at one time. A lot may be packaged and delivered in small quantities under the basic lot approval provided lot identification is maintained.

4.3.1.2 The sample unit shall be one holder or sufficient holders to provide enough thread for the required tests. The lot size shall be expressed in units of one holder, or gross of ready-wound bobbins. The acceptance quality level (AQL) for each requirement shall be 6.5 test failures per 100 units. The inspection level shall be MIL-STD-105, Level S-1.

4.3.1.3 Visual Examination:

4.3.1.3.1 Thread on Holder: The thread shall be examined on the holder and the defects listed in Table I counted. The sample unit shall be one holder except that for ready-made bobbins the sample unit shall be one gross. The lot size shall be expressed in units of one holder except that for ready-made bobbins the lot size shall be expressed in units of one gross. The AQL shall be 4.0 defects per 100 units and the inspection level shall be MIL-STD-105, Level S-3.

4.3.1.3.2 Thread as Wound: The thread shall be examined by unwinding and defects listed in Table I shall be counted regardless of their proximity to each other. Sample unit and lot size shall be as in 4.3.1.3.1.

TABLE I

THREAD DEFECTS

Requirement	Defects on Holders
Identification label	Missing, incorrect, incomplete, illegible, or insecurely attached
Type of holder	Other than specified
Surface condition	Cut, tear, chafe, or slip affecting strength of thread or interfering with easy location of end and initial unwinding
Cleanliness	Dirt, spot, or stain clearly visible
Finish	Other than specified

TABLE I (Continued)

THREAD DEFECTS

Requirement	Defects on Holders Defects as Unwound
Continuous length	Not in continuous lengths
Knot	Size FF and finer thread shall average not more than one thread knot per 2 oz (55 g); size 3 and heavier thread shall average not more than 1 thread knot per 4 oz (115 g).
Winding	Improperly or not firmly wound, resulting in kinks, knots, entangling, or slippage during unwinding, or otherwise affecting unwinding of the thread.
Tackiness or adhesion	The strands adhere to each other or to holder, affecting unwinding tension.

4.3.1.3.3 Net Weight per Holder: The sample unit shall be 10 wound holders, taken at random from the lot. Sample size shall be one sample unit regardless of lot size. Holders shall be weighed individually, and the net weight of the thread determined. The values obtained shall be averaged, and this average shall represent the net weight of thread per holder in the lot. The lot shall be unacceptable if the net weight of thread per holder is less than the specified weight, minus a 3% tolerance.

4.3.1.4 When a statistical sampling plan in accordance with MIL-STD-105, other than as specified herein, has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1, and the report of 4.6.1 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample thread shall be approved by purchaser before thread for production use is supplied, unless such approval be waived by purchaser. Results of tests on production thread shall be essentially equivalent to those on the approved sample thread.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production thread which are essentially the same as those used on the approved sample thread. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material, processing, or both and, when requested, sample thread. Production thread made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be in accordance with the following:

4.5.1 Twist Testing: Determination of twists per inch (25.4 mm) in the individual cords (strands) shall be in accordance with FED-STD-191, Method 4050, and shall be performed in conjunction with the determination for final twist. After recording the final twist value and while the individual cords (strands) are straight between the jaws, all cords (strands) but one shall be cut out and removed. The clamp shall then be opened, the slack drawn through, and the cord (strand) reset under the specified tension. The jaw shall then be rotated until all twist has been removed, as determined by free passage of the needle between the filaments. The twists per inch (25.4 mm) shall be calculated following FED-STD-191, Method 4054. Capstan or drum type clamps shall be used. Five determinations shall be made per sample unit.

4.6 Reports:

4.6.1 The vendor of thread shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the thread conforms to the other technical requirements of this specification and the applicable detail specification. This report shall include the purchase order number, AMS 3787 and the applicable detail specification number, vendor's thread designation, lot number, specified thread weight, and quantity.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3787 and the applicable detail specification number, contractor or other direct supplier of thread, supplier's thread identification, part number, and quantity. When thread for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of thread to determine conformance to the requirements of this specification and the applicable detail specification and shall include in the report either a statement that the thread conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the thread may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the thread represented and no additional testing shall be permitted. Result of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Put up: Thread shall be put up on a nominal weight per holder basis on commercial straight paper tubes, single-head plastic tubes, single head wooden spools, or skeins (hereinafter referred to as holders) as specified by purchaser in accordance with Table III. When put-up on ready-made lockstitch bobbins is specified, the style of bobbin and the length of thread thereon shall be as specified by purchaser. The average weight per holder shall be not less than the specified weight minus a 3.0% tolerance, determined on a 10 holder basis. The thread shall be put up in one continuous length per holder and shall be so wound that each turn and layer is free from entanglement.

TABLE III

PUT-UP

Letter or Number Size	Type of Holder	Net Weight
All letter sizes	Single wood spools	1 oz (28 g)
All letter sizes and number sizes 3, 5, and when specified, 6	Single head plastic	4, 8, and 16 oz (115, 225, and 450 g)
Number sizes 6 and 8; sizes 3 and 5 when specified	Straight paper tubes	8 or 16 oz (225 and 450 g)
All letter sizes	Skein	1 oz (28 g)

5.1.1.1 Plastic Tubes: Shall be single-head plastic tubes and shall be made from either acrylonitrile or polypropylene conforming to the following requirements:

5.1.1.1.1 Acrylonitrile: Tubes shall be acrylonitrile-butadiene-styrene (ABS) rigid plastic conforming to ASTM D1788, Type A, grade 3, and the following:

Tensile Yield Stress, min	8,000 psi (55 MPa)
Modulus of Elasticity in Tension, min	400,000 psi (2,750 MPa)
Rockwell Hardness (R Scale), min	105
Specific Gravity, 23°/23°C (73°/73°F), max	1.2
Chemical Resistance to 40-hr immersion in heptane at 23°C ± 2 (73°F ± 4), weight change, max	5%

5.1.1.1.2 Polypropylene: The tubes shall be molded from a virgin polypropylene homopolymer conforming to ASTM D4101.

5.1.2 Each holder shall have a durable label or tag legibly marked with not less than the following information and attached in such a manner as to remain in place until all thread has been removed from the holder:

THREAD, PARA-ARAMID
AMS 3787/*
LENGTH PER POUND (kg) _____
MANUFACTURER'S IDENTIFICATION _____
QUANTITY _____
LOT NUMBER _____

*Insert applicable detail specification number.

5.1.3 Individual holders shall be wrapped in a suitable protective film and packed in an exterior shipping container in such a manner that the thread, during shipment and storage, will be protected from exposure to moisture, weather, or any other normal hazard.

5.1.4 Each shipping container shall be legibly marked with not less than the following information in such a manner that the markings will not smear or be obliterated during normal handling or use:

THREAD, PARA-ARAMID
AMS 3787/*
PURCHASE ORDER NUMBER _____
MANUFACTURER'S NAME _____
MANUFACTURER S MATERIAL DESIGNATION _____
DESCRIPTION _____
LOT NUMBER _____
NET WEIGHT _____

*Insert applicable detail specification number.

5.1.5 Containers of thread shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the thread to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.1.6 For direct U.S. Military procurement, packaging, packing, and marking shall be in accordance with PPP-P-50, Level A, Level B, or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.1, 5.1.3, and 5.1.5, will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification and the applicable detail specification number in all quotations and when acknowledging purchase orders.