

MIL-T-38377A(USAF)

28 September 1978

SUPERSEDING

MIL-T-38377 (USAF)

17 February 1965

## MILITARY SPECIFICATION

### TAPE, TEXTILE, ARAMID

This specification is approved for use by the Air Force Materials Laboratory, Department of the Air Force, and is available for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification establishes requirements for three types of aromatic polyamide tape (ribbon).

1.2 Classification. The tape shall be of the following types, as specified (see 6.2).

- Type I = Breaking strength, 300 pounds.
- Type II = Breaking strength, 1,000 pounds.
- Type III = Breaking strength, 3,000 pounds.

#### 2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### MILITARY

MIL-W-43334

Webbing and Tape, Textile,  
Packaging and Packing Of

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the Air Force Materials Laboratory, MXA, WPAFB, Ohio 45433 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 8315

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STANDARDS

FEDERAL

FED-STD-191 Textile Test Methods

MILITARY

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

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

FEDERAL TRADE COMMISSION

Textile Fiber Products Identification Act, Effective 3 March 1960.

(Application for copies should be addressed to the Federal Trade Commission, Washington, D.C. 20580.)

3. REQUIREMENTS

3.1 Yarn. The yarn shall be a nonmelting, aromatic polyamide. The yarn shall not begin to char at a temperature below 675°F when tested as specified in Table I.

3.2 Weave.

3.2.1 Body. The body weave shall be a conventional 2-up and 2-down right-hand twill.

3.2.2 Selvage. Unless otherwise specified, the selvage weave for Type I shall be a double plain weave of a conventional hatband type. Types II and III shall have no additional selvage ends.

3.3 Color. The tape shall be Olive Green.

3.4 Construction and physical properties. The tape shall conform to the properties specified in Table II.

Table I. Testing of component.

Component	Characteristic	Requirement reference	Test method of Fed Std 191 or test reference
Yarn	Denier	Table II	4021 <u>1/</u>
	Ply	Table II	Visual <u>2/</u>
	Twist	Table II	4054
	Carbonization	3.1	1534 <u>3/</u>

- 1/ Denier shall be calculated as follows, and shall be reported to the nearest whole number:

$$\text{Denier} = \frac{\text{Weight of specimen in grams} \times 9842.5}{\text{Length of specimen in yards}} \quad (1)$$

- 2/ One determination per sample unit and results reported as pass or fail.
- 3/ The supplier's certificate of compliance showing that the yarn identified in 6.3 was used may be submitted in lieu of test method.

3.5 Width. The width of the tape shall be  $2 \pm 0.0625$  inches.

3.6 Length and put-up. Unless otherwise specified, tape shall be put up on spools of 120 yards minimum and 150 yards maximum length. No spool shall contain more than three lengths, and no length shall be less than 40 yards (see 6.2).

3.7 Identification of product. Each spool shall have a ticket (identification tag) attached with not finer than 5-ply cotton string doubled to not less than 6 inches. The ticket shall be made of paper-board not less than 0.020 inch in thickness and the color shall be manila or light in intensity to permit easy reading of printed, stamped, or typed markings. Handwritten entries shall be prohibited. The ticket shall have clipped corners at the end where a reinforcing patch (with or without a metal eyelet) is firmly affixed for attaching the tying strings. The ticket shall be legibly marked with water-insoluble ink with the following information:

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- a. Nomenclature
- b. Number and date of this specification
- c. Type
- d. Yardage
- e. Manufacturer's identification number
- f. Contract number; name of contractor
- g. Stock number
- h. Date of manufacturer (month and year)
- i. Name of manufacturer (if not the same as contractor).

Table II. Construction and physical requirements.

Requirement	Type I	Type II	Type III
Weight (yds/lbs) min	100	30	12
Breaking strength, lb:			
Unaged (min)	300	1,000	3,000
Aged (% of unaged) (min)	85	85	85
Elongation, % (min)	12.0	12.0	-
Ends, min:			
Total	150	480	358
Selvage	16	-	-
Warp yarns, denier and ply	200/1	200/1	200/4
Turns per inch, single	6.5-8.5	4.0-6.0	-
Turns per inch, ply	-	-	2.5-3.5
Filling picks per inch, min	70	34	24
Filling yarn, denier and ply	100/1	200/2	200/4
Turns per inch, single	6.5-8.5	-	-
Turns per inch, ply	-	2.0-4.0	2.5-3.5
Air permeability (ft <sup>3</sup> /min/ft <sup>2</sup> )	75±20	-	-

3.8 Fiber identification. Each spool of tape shall be labeled, ticketed, or invoiced for fiber content in accordance with the Textile Fiber Products Identification Act, effective 3 March 1960.

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3.9 Workmanship. The finished tape shall be clean, evenly woven, and shall conform to the quality and grade of product established by this specification. The occurrence of defects shall not exceed the levels set by the applicable acceptable quality levels.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Quality conformance inspection. Except where otherwise specified, inspection shall be in accordance with MIL-STD-105.

4.2.1 Inspection of component. The component listed Table II shall be tested for the characteristics specified in accordance with the referenced test methods. The sample unit shall be one cone, tube, or spool and the lot size shall be expressed in units of one cone, tube, or spool each. The sample size shall be in accordance with inspection level S-1 of MIL-STD-105 and the acceptable quality level for each characteristic shall be 4.0 test failures per 100 units:

4.2.2 Examination of the end item. Defects found during the examination shall be classified in accordance with 4.2.2.1, 4.2.2.2, and 4.2.2.3.

4.2.2.1 Yard-by-yard examination. The required yardage of each spool shall be inspected and visual defects classified as listed in Table III. The defects found shall be counted regardless of their proximity to each other, except where two or more defects represent a single local condition of the tape, in which case only the more serious defect shall be counted. A continuous defect shall be counted as one defect for each warpwise yard, or fraction thereof, in which it occurs. The sample unit for this examination shall be 1 linear yard. The sample size shall be in accordance with inspection level III of MIL-STD-105. The acceptable quality level shall be 0.40 major defects and 1.50 total defects per 100 units (yards). The lot size shall be expressed in units of 1 linear yard each. An approximate equal number of yards shall be examined from each spool selected. The number of spools from which the sample is to be selected shall be in accordance with Table IV of this specification.

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TABLE III. Classification of defects.

Defect	Description 1/	Major	Minor
Abrasion marks.....	Resulting in rupture of yarns or in nap sufficient to obscure the identity of any yarns exceeding 10 percent of width or 1 inch in length.....	X	
Broken or missing end.....	Two or more regardless of length or a single end exceeding 6 inches in length.....	X	X
Broken or missing pick.....	Single end under 6 inches but exceeding 1/4 inch.....	X	
Coarse or light filling bar.....	Two or more regardless of extent..... Resulting in noticeable difference in stiffness or thickness of tape and extending for more than 1/4 inch in the length direction.....	X	
Cut, hole, or tear.....	Resulting in noticeable difference in stiffness or thickness of tape and extending for 1/4 inch or less in the length direction.....	X	X
Drop-ply.....	Any cut, hole, or tear..... Clearly noticeable, or more than 2 ends within same length and extending over 9 linear inches or more.....	X	
Edges.....	Clearly noticeable, on 1 or 2 ends within same length and extending over 9 linear inches or more..... Frayed, slack or otherwise poorly constructed and exceeding 1/4 inch in length.....	X	X
Fine or light filling bar, light place.....	Clearly noticeable.....	X	
Floats or skips.....	Multiple, 1/2 inch or more in combined warp and filling directions..... Single float or skip over 1 inch..... Multiple, less than 1/2 inch in combined warp and filling directions..... Single float or skip over 1/2 inch but not exceeding 1 inch if in the warp..... Single float or skip over 1/4 inch but not exceeding 1 inch if in the filling.....	X X	X X X

TABLE III. Classification of defects. (Continued)

Defect	Description <sup>1/</sup>	Major	Minor
Hitchback crack.....	Clearly noticeable opening between adjoining picks, or warpage tension area over part of the width resulting in noticeable light or heavy places.....		X
Jerked-in filling, slough-off, slug.....	More than twice the thickness of the normal yarn.....		X
Kinks.....	More than 3 in any 9 linear inches.....	X	
Knots.....	More than 2 knots in any 9 linear inches.....	X	
Mispick, double pick.....	Single knot with untrimmed ends extending more than 1/16 inch from surface of tape.....		X
Slack end.....	Two or more across the full width.....	X	
	Single across the full width.....		X
	Two or more in the same length, jerked in between picks, or forming clearly noticeable loops on the surface of tape.....	X	
Slub (slug), or gout.....	Single jerked in between picks, or forming clearly noticeable loops on surface of tape.....		X
	More than twice the thickness of the yarn (or ply, if plied).....		X
Smash.....	Any smash.....	X	
Spot, stain, or streak.....	Any clearly noticeable dirt, rust, grease, oil spot, stain or streak.....		X
Tight end.....	Clearly noticeable.....	X	
Tight pick or tight filling..	Resulting in rolling of tape.....	X	
Twist or distortion.....	Twisted or distorted. Will not lay flat upon application of manual pressure.....		X
Weak, soft, or tender spot...	Any weak, soft, or tender spot.....	X	
Width.....	Beyond specified tolerances.....		X
Wrong draw.....	Extending for more than 9 inches.....		X

<sup>1/</sup> The term clearly noticeable shall be interrupted to mean visible normal inspection distance (approximately 3 feet).

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Table IV. Sample size.

Lot size in yards	Sample size in spools	Maximum number of defects acceptable in sample
Up to 1,200 <sup>1/</sup> .....	5	0
1,201 to 3,200....	7	0
3,201 to 10,000...	10	0
10,001 to 35,000..	15	0
35,001 to 150,000.	25	1
150,001 and over..	35	1

<sup>1/</sup> If a lot contains fewer than 5 spools, each spool in the lot shall be examined.

4.2.2.2 Overall examination. Each defect listed herein shall be counted no more than one in each spool examined. The sample unit for this examination shall be one spool. The sample size and acceptance number shall be as shown in Table IV. The lot size shall be expressed in units of 1 linear yard each.

#### Defects

Objectionable odor.  
Overall uncleanness.  
Uneven weaving throughout.

#### 4.2.2.3 Examination for length.

4.2.2.3.1 Individual spool. Each spool in the sample shall be examined for the defects listed herein. The sample unit for this examination shall be one spool. The sample size and acceptance number shall be as shown in Table IV. The lot size shall be expressed in units of 1 linear yard each.

#### Defects

Gross length less than specified minimum length or more than specified maximum length.  
Gross length more than 2 yards less than gross length marked on spool ticket.  
Any length less than the allowable minimum.  
Any spool containing more than the allowable number of lengths.



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4.2.2.3.2 Total yardage. The lot shall be unacceptable if the total of the actual gross lengths of spools in the sample is less than the total of the gross lengths marked on spool tickets.

4.2.3 Examination for compliance with Textile Fiber Products Identification Act. During the examination of individual spool for length, each spool in the sample shall be examined for conformance to the Textile Fiber Products Identification Act. Each spool not labeled in accordance with this act shall be a defect. The lot shall be unacceptable if two or more of these defects occur.

4.2.4 Examination of preparation for delivery requirements. An examination shall be made to determine that packaging, packing, and marking requirements comply with section 5 of this specification. Defects shall be scored in accordance with the list herein. The sample unit shall be one shipping container fully prepared for delivery with the exception that it need not be sealed. Defects of closure listed herein shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 and the acceptable quality level shall be 4.0 defects per 100 units.

Examination	Defect
Marking (exterior and interior).	Omitted, incorrect, illegible, of improper size, location, sequence or method of application.
Materials.....	Any component missing or damaged.
Workmanship.....	Inadequate application of components, such as: incomplete closure of case liners, container flaps, loose strapping, inadequate stapling. Bulging or distortion of containers.
Weight.....	Net weight exceeds requirements.

4.3 Testing of the end item. The methods of testing specified in FED-STD-191, wherever applicable, and as listed in Table V shall be followed. The physical and chemical values specified in section 3 apply to the average of the determinations made on a sample unit for test purposes as specified in the applicable test methods. The sample size shall be as follows:

Lot size (yards)	Sample size
800 or less.....	2
801 to 10,000.....	3
10,001 and over.....	5

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The lot shall be unacceptable if one or more units fail to meet any requirement specified. The lot size shall be expressed in units of 1 linear yard. The sample unit for testing shall be 10 yards.

4.3.1 Breaking strength and elongation (unaged). The breaking strength and elongation tests of the unaged tape shall be in accordance with 4.3.1.1 for types I and II, and in accordance with 4.3.1.2 for type III. The strength and elongation shall be reported as the average of five tests made on each sample. In addition, for type III material the optional test conditions used as listed in 4.3.1.2 shall be reported on the plant test report.

4.3.1.1 Types I and II. The test shall be conducted in accordance with method 5100, FED-STD-191, except as follows:

- a. The test specimen shall be full width and the warp tests only shall be determined.
- b. The jaws of the clamp shall be at least 1/2 inch wider than the full specimen width.

4.3.1.2 Type III. The test shall be conducted as specified in 4.3.1.1. In addition, the following exceptions to method 5100, FED-STD-191 are optional:

- a. Split-drum type jaws (see 6.5).
- b. No-load rate of jaw separation at 4 inches/minute.
- c. Distance between the jaws or centers of holding drums increase to a maximum of 10-1/2 inches.
- d. In lieu of an elongation recording device on the testing machine, the elongation determination shall be in accordance with the following:
  - (1) Minimum distance of 5 inches between bench marks on test specimen.
  - (2) Maximum extension at 90 percent of breaking load.

4.3.2 Breaking strength (aged). The size of the specimens for oven aging shall be the same as specified in 4.3.1. The specimens shall be placed in an oven at  $500^{\circ} + 10^{\circ}\text{F}$  for 4 hours. Upon removal, the specimens shall be conditioned at  $70^{\circ} + 2^{\circ}\text{F}$  and  $65 + 2$  percent relative humidity for 4 hours and tested for breaking strength as specified in 4.3.1. The loss in breaking strength due to the aging treatment shall be reported as percent loss from the unaged specimens.

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Table V. Test methods.

Characteristic	Requirement reference	Test method of FED-STD-191 or	Number of determinations per individual sample unit	Results reported as 1/
Texture:				
Ends.....	Table II	5050 <sup>2/</sup>	3	Nearest whole number
Picks per inch..	Table II	5050	3	Nearest whole number
Weight.....	Table II	5040	3	Nearest 0.1 yd
Breaking strength:				
Unaged.....	Table II	4.3.1	--	---
Aged.....	Table II	4.3.2	--	---
Elongation.....	Table II	4.3.1	--	---
Weave.....	3.2	Visual	1	Pass or fail
Air permeability..	Table II	5450 <sup>3/</sup>	--	---

1/ When the data in the "number of determinations" and "results reported as" columns are not specified, they shall be as required by the referenced test method.

2/ Determinations shall be made on full width of tape.

3/ Except that the fabric orifice shall have an area of 1 square inch.

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5. PACKAGING

5.1 Packaging, packing, and marking. Packaging, packing, and marking of tape shall be as specified for nylon webbing in MIL-W-43334.

5.2 Age: The tape shall be not more than 2 years old from the date of manufacture to the date of delivery.

6. NOTES

6.1 Intended use. The tape covered by this specification is intended for use in the fabrication of parachute canopies of tape-type construction known as ribbon parachutes.

6.2 Order data. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type (see 1.2).
- c. Quantity.
- d. Selvage weave for type I (if other than specified in 3.2.2).
- e. Length and put-up (if other than specified in 3.6).
- f. Selection of applicable levels of packaging and packing (see 5.1).

6.3 Nomex manufactured by E. I. duPont deNemours and Co., is an acceptable yarn.

Custodian:  
Air Force - 11

Preparing Activity:  
Air Force - 11

Review Activities:  
Air Force - 11, 67

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