

MIL-C-87129A
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SUPERSEDING
MIL-C-87129(USAF)
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MILITARY SPECIFICATION

* CORD, FIBROUS, ARAMID BRAIDED

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

- * 1.1 Scope. This specification covers braided aramid, intermediate modulus of elasticity coreless cord.

- * 1.2 Classification. The coreless braided cords shall be of the types as specified in paragraph 3.1.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

UU-T-81 - Tag, Shipping and Stock.

MILITARY

- * MIL-C-3131 - Cordage, Packaging of.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: AFWAL/MLSE, ATTN: Standardization Manager, Wright-Patterson AFB, OH 45433-6533 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

* FSC 4020

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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, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Material. The yarn used in the manufacture of the cords shall be a para-aramid, intermediate modulus of the denier and twist specified in table I (see 6.3). Plied yarns shall be made by twisting the specified number of ends of producer's twist singles to the number of turns specified.

3.2 Construction and physical requirements. The finished braided cord shall conform to the requirements specified in table I, when tested as specified in 4.2.1 and 4.2.5. The cord shall be braided on braiding machines having the number of carriers specified in table I for the applicable type, and the machines shall be regulated to give a two over and two under conventional stitch, except for type I which shall be 1 up and 1 down basket or diamond.

3.2.1 Lapping of ends. In the manufacture of the cord, no more than one carrier shall be allowed to be run off per length of cord specified in table II for the applicable type. When carrier ends run off, they shall be spliced a minimum distance of 5 inches to a maximum of 10 inches in length. When splicing, the outgoing carrier ends shall be joined with the new ends and hand braided for four to five picks, and the tail of the splice shall be run into the center of the braided cord. The approximate center of each overlap shall be marked by inserting a bright red thread through the sleeve.

3.3 Put-up. The length of the cord on the spools shall be as specified by the procuring activity (see 6.2). The ends of all cords shall be taped or sewed to prevent fraying.

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TABLE I. Physical requirements.

Type	Breaking strength (lb./min.)	Carriers	Ends/ carrier	Total ends	Basic yarn denier	No. singles yarns for final plied yarn	Yarn twist (turns/inch)	Picks/ inch	Length/lb. (ft.-minimum)
I	25	4	1	4	200	1	5	9	13500
II	50	8	1	8	200	1	5	18	6450
III	100	8	1	8	400	1	5	12	3240
IV	300	16	1	16	200	3	2.5	15	1080
V	500	16	1	16	1000	1	4	12.5	720
VI	750	16	1	16	1500	1	3	10.5	425
VII	1000	16	1	16	1000	2	2.1	10	338
VIII	1500	16	1	16	1500	2	1.8	8	200
IX	2000	16	1	16	1500	3	1.0	6.5	135
X	4000	16	1	16	1500	6	1.0	5.5	67
XI	5000	24	1	24	1500	5	1.0	5.5	58
XII	6500	24	1	24	1500	6	1.0	4	50
XIII	200	16	1	16	400	1	5.0	14	1800
XIV	2750	16	1	16	1500	4	1.0	9	100
XV	225	12	1	12	200	3	4.0	16	1500
XVI 2/									
XVII 3/	10000	16	16	256		1			22

1/ Half of the carriers 5 twist, and the other half of the carriers 2 twist.

2/ Type XVI deleted. Use type X.

3/ This is a 10,000 pound cord; each carrier has 16 ends braided together.

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TABLE II. Carrier run-off.

Types	Distance between carrier run-offs (ft.-minimum)
I, II, III, IV, XIII, XV	100
V, VI	50
VII	40
VIII	25
IX, XIV	20
X, XI, XVII	5

3.4 Identification. Each spool (reel) of cord shall have a ticket (identification tag) or label attached to it for identification purposes. The ticket shall conform to the requirements for type B, class 1, size 4 or 5 of UU-T-81. The ticket shall be made of not less than 15 point paper stock and shall have a minimum tearing resistance of both directions (total) of 850 grams. When labels are used, the label shall be attached in such a manner as to remain in place and be clearly legible until all cord has been removed. The ticket or label shall be legibly printed, stamped, or typed with water insoluble ink. Handwritten entries shall be prohibited. The ticket or label shall contain the following information:

- a. Nomenclature
- b. Specification number
- c. Length
- d. Contract number and date
- e. Date of manufacture (month and year)
- f. Supplier's name.

3.5 Workmanship. The finished cord shall conform to the quality and grade of product established by this specification. The occurrence of defects shall not exceed the applicable acceptable quality levels.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, 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

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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.

4.1.1 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Inspection for acceptance. Sampling and inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be tested in accordance with all the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified or qualified in this specification or applicable purchase documents. In addition, inspection shall be performed for the requirements in table III and will be accepted on a supplier's certificate of compliance thereto.

Table III. Component tests.

Characteristics	Requirement reference	FED-STD-191 test method
Material identification	3.2	<u>1/</u>
Twist	Table I	4054
Ply	Table I	Visual <u>1/</u>
Denier	Table I	4021

1/ Supplier's certificate of compliance is accepted for this requirement.

4.2.2 Examination of the end item for visual defects. The defects specified in table IV shall be counted regardless of their proximity to each other, except where two or more defects represent a single local condition in which case only the more serious defect shall be counted. The sample unit for the examination shall be one spool (reel). Ten percent of the length contained on each sample unit, but not less than 100 feet, shall be subjected to the visual examination. The lot size for this examination shall be expressed in units of spools (reels). The inspection level shall be level III. The acceptable quality level (AQL) shall be zero critical defects, 1.5 major defects, and 6.5 total defects (major and minor combined) per 100 units.

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TABLE IV. Visual examination.

Examine	Defect	Classification		
		Critical	Major	Minor
Appearance and workmanship	Any cut	X		
	Abrasion, chafed area or distortion in the orientation of yarns	X		
	Kinks, knots or unevenly braided resulting in open places, breaks in continuity of braid, or soft spots	X		
	Floats; broken, projecting or missing ends or picks	X		
	Over 1 knot per 10 linear yards in plied yarns	X		
	One knot per 10 linear yards in plied yarns		X	
Type	Other than specified	X		
Color	Other than specified		X	
Cleanliness	Spot or stain - clearly noticeable <u>1/</u>			X
	Objectionable odor			X
Identification	Omitted, incorrect, illegible, insecurely attached			X
	Ticket or label not as specified			X
	Handwritten entries			X

1/ At normal inspection distance (approximately 3 feet).

4.2.3 Examination for length and winding. The sample unit for this examination shall be one spool (reel). The inspection level shall be S-3 and the AQL shall be 4.0 percent defective. For lots consisting of 500 or fewer units, the sample size shall be 10 and the acceptance number 1. The lot size shall be the number of spools (reels) in the lot. Defects shall be as listed in 4.2.3.1 and 4.2.3.2.

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4.2.3.1 Length. Defects with regard to length shall be considered to exist if any of the following are determined during inspection:

- a. The length is less than specified or more than 10 percent in excess of the length specified
- b. Length is less than marked on ticket or label.

4.2.3.2 Winding. Defects with regard to winding shall be considered to exist if any of the following are determined during inspection:

- a. Improperly or not firmly wound resulting in kinks, knots, entangling or slippage during unwinding, or otherwise affecting free unhampered unwinding of cord
- b. Put-up not as specified
- c. Any end not taped, sewed, or heat sealed
- d. Any knot or splice
- e. Cord not in a continuous length.

4.2.4 Examination of preparation for delivery requirements. An examination shall be made to determine that the packaging, packing and marking requirements of section 5 of this specification are complied with. The examination shall be in accordance with provisions of MIL-C-3131, except that the inspection level shall be S-2 and the AQL shall be 2.5 defects per 100 units.

4.2.5 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 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 in accordance with table VI. All test reports shall contain the individual values utilized in expressing the final result. The sample unit for testing shall be one spool (reel) of cord. The lot shall be unacceptable if one or more units fail to meet any requirements. The lot size shall be expressed in units of spools (reels).

4.2.5.1 Length per pound. The specimen shall be subjected to a tension load equal to 1 percent of the minimum specified breaking strength for the applicable type. While the specimen is under the load, a length of 10 feet shall be measured to the nearest 1/4 inch and marked off. This length shall then be cut out and weighed; and the length per pound, using the 10-foot length measurement determined under load, shall be calculated to the nearest 0.1 foot.

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TABLE V. Test methods. 1/

Characteristic	Requirement reference	Test method	Determinations per sample unit	Results as reported
No. of carriers Picks per inch Ends per carrier Total ends	Table I	Visual	3	Average of 3 determinations to nearest whole number
Length per pound	Table I	4.2.5.1	3	Average of 3 determinations to nearest 0.1 foot
* Breaking strength and elongation	Table I	4108 2/ 3/	1 4/	Breaking strength to nearest: - 1 pound (for types I, II, III, IV, V, VI, XIII, XV) - 5 pounds (for types VII, VIII, IX, X, XI, XII, XIV, XVII) Elongation to nearest 0.1 percent

- 1/ Tests to determine compliance with specification requirements including quantity of delivery may be made under prevailing atmospheric conditions except in settlement of dispute in which case the tests shall be made upon material which has reached equilibrium under Standard Conditions as defined in FED-STD-191.
- 2/ The cord shall be under a pre-tensioned load equal to 1 percent of the minimum specified breaking strength for the applicable type.
- 3/ The pulling clamp shall have a speed of $2 \pm 1/2$ inches per minute.
- 4/ One determination of breaking strength shall be made from each spool (reel) in the sample size and reported as the breaking strength of that spool (reel). If the breaking strength of the single determination of any one spool (reel) is below the specified minimum requirement for the type of cord being tested, three additional determinations shall be conducted from the same spool (reel) and the average of the four determinations shall be reported as the breaking strength of that spool (reel).

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TABLE VI. Sampling for tests.

Number of spools in lot	Sample size
5 and under	2
16 up to and including 40	3
41 up to and including 110	5
111 up to and including 300	7
301 up to and including 500	10
501 and over	15

5. PACKAGING

5.1 Preservation. Packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A and C. The cord, put up on spools (reels), shall be packaged in accordance with the applicable requirements of MIL-C-3131.

5.2 Packing. Packing shall be level A, B, and C as specified (see 6.2).

5.2.1 Levels A, B, and C. The cord shall be packed in accordance with the applicable requirements of MIL-C-3131.

5.3 Marking. In addition to any special markings required by the contract or order, interior packages and shipping containers shall be marked in accordance with MIL-C-3131.

6. NOTES

6.1 Intended use. Cord covered by this specification is intended for use in cargo-type parachutes.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification
- b. Type required (see 1.2 and table I)
- c. Put-up (see 3.4)
- d. Selection of applicable levels of packing and packaging (see 5.1 and 5.2).

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6.3 Acceptable yarn. Kevlar 29 manufactured by the E.I. DuPont de Nemours and Company is an acceptable yarn.

6.4 Twisting precautions.

- a. Feed roll speed should be as follows for various Kevlar yarns and twist levels:

<u>Yarn denier</u>	<u>Twist (turns per inch)</u>	<u>Feed roll speed (yards per min.)</u>
200	5.0	70
400	4.0	90
1000	4.0	60
1500 and greater	1.8	20

- b. Slightly heavier travelers than those used for nylon yarn should be used.
- c. High humidity should be maintained to minimize electrostatic charge between filaments.

6.5 Winding precautions. Anti-wear wide tension gates (Leesona Corporation), or their equivalent, should be used.

* 6.6 Definitions.

- a. Carrier - a moving holder for a package of yarn used on a braiding machine.
- b. Denier - the weight in grams of 9000 meters of the material.
- c. End - an individual yarn.
- d. Pick - a filling yarn.

6.7 Change from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - GL
Navy - AS
Air Force - 20

Preparing activity:
Air Force - 20

(Project 4020-0277)

Review activities:
Air Force - 11, 99, 82
DLA - IS

User activity:
Navy - MC, SH
Air Force - 45

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

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2. DOCUMENT TITLE

Cord, Fibrous, Aramid Braided

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐ VENDOR☐ USER☐ MANUFACTURER☐ OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)