

INCH-POUND

MIL-T-43624B
20 February 1991
SUPERSEDING
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MILITARY SPECIFICATION

THREAD, POLYESTER, SPUN

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers one type of thread made of spun, cut staple polyester fibers for machine sewing.

1.2 Classification. The thread size (ticket number and ply) shall be as specified (see table I and 6.2).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5019 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8310

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SPECIFICATION

FEDERAL

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

STANDARDS

FEDERAL

- FED-STD-191 - Textile Test Methods

MILITARY

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

- MIL-STD-129 - Marking for Shipment and Storage

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

American Society for Testing and Materials (ASTM) Standards

- D 3951 - Standard Practice for Commercial Packaging

(Applications for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3), in accordance with 4.3.

3.2 Government and contractor purchases. The requirements specified in 3.10, 3.11, 3.12 and the related provisions of section 4, and all of section 5 apply only to thread purchased directly by the Government. All other requirements apply both to thread purchased by a contractor as a component for an end item and to thread purchased directly by the Government.

3.3 Standard sample. When a standard sample is established (see 6.4), the thread shall match the standard for shade and shall be equal to or better than the standard sample with respect to all characteristics for which the standard is referenced.

3.4 Material. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.4.1 Yarn. The yarn for this thread shall be spun from cut-staple polyester (polyethylene glycol terephthalate) having a specific gravity within the range of 1.36 to 1.40.

3.4.1.1 Polyester. The use of any form of polyester waste is prohibited, such as, undrawn fiber, mixtures of denier, luster, cross sections and waste from any stage of fiber production; whether drawn, undrawn mixed or garnetted fiber. The contractor shall certify that each lot of polyester staple used conforms to the requirements specified herein, and shall identify the type of polyester used and the polyester producers commercial fiber designation (see 6.6 for denier and staple guidelines).

3.5 Color. The color (shade) shall be as specified in the applicable end-item specification or in the contract (see 6.2). The dyed thread shall conform to the applicable approved shade standard (see 6.4), when tested as specified in 4.4.3.

3.5.1 Colorfastness. The colorfastness of the dyed and finished thread shall be as specified in the applicable end item specification or as set forth in the contract (see 6.2 and 6.5), except that when requirements are not stated or referenced to a standard sample for colorfastness, the thread shall show "good" fastness to laundering (after 3 cycles), perspiration, and light, and dry heat when tested as specified in 4.4.3. When a standard sample for colorfastness is referenced, the thread shall be equal to or better than the standard sample for the specified colorfastness properties when tested as specified in 4.4.3.

3.6 Construction. The thread shall be made by twisting together two or more of the single yarns to meet the specified size, ply, and ticket number requirements.

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3.7 Twist direction. Unless otherwise specified (see 6.2), the single yarn shall be twisted "S" and the final plied twist shall be "Z" when tested as specified in 4.4.3.

3.8 Physical requirements. The finished thread shall conform to the applicable requirements in table I when tested as specified in 4.4.3.

TABLE I. Physical requirements

Ticket number (size)	Approximate		Length per pound (yarns)		Breaking force minimum	Elongation maximum
	Tex	Plies	Min.	Max.	Pounds	(percent)
120	20	2	22,001	26,400	1.2	20
100	25	2	18,001	22,000	1.7	20
70	30	2 or 3	14,001	18,000	2.2	20
50	40	2 or 3	11,701	14,000	2.7	20
40	45	2 or 3	9,201	11,701	3.3	20
30	60	2, 3 or 4	7,001	9,200	4.5	20
24	70	2, 3 or 4	6,001	7,000	5.7	20
20	85	2, 3 or 4	4,501	6,000	7.0	22
16	130	2, 3 or 4	3,401	4,500	9.5	22
12	180	2, 3 or 4	2,401	3,400	13.0	22

3.9 Soft finish. The thread shall have a soft finish with no luster other than that inherent in the polyester material.

3.9.1 Finishing materials. The finished thread shall have no chemical finishes or treatments other than those commonly used on commercial threads or those demonstrated to have no deleterious effects on the polyester fiber including effects in prolonged storage. No finish or treatment shall be applied for the purpose of increasing breaking force (see 4.4.3).

3.10 Knots and splices. The thread shall average not more than one full thread knot or splice per 1,000 yards (see 4.4.2.2).

3.11 Put-up. Unless otherwise specified (see 6.2), the thread shall be put-up in accordance with table II on commercial spools, cones, or tubes (herein-after referred to as holders). The average length per holder shall be not less than the specified nominal length minus 3.0 percent tolerance when examined (on a 10-holder basis) as specified in 4.4.3. 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 when examined as specified in 4.4.2.2.

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TABLE II. Put-up on holders

Ticket number	Nominal length	
	(Yards)	per holder
120	12,000	or 24,000
100	12,000	or 24,000
70	6,000	or 12,000
50	6,000	or 12,000
40	6,000	or 12,000
30	6,000	or 12,000
24	6,000	or 12,000
20	3,000	or 6,000
16	3,000	or 6,000
12	3,000	or 6,000

3.11.1 Ready-made lockstitch bobbins. When thread is put up on lockstitch bobbins, the style of bobbin and length of thread thereon shall be as specified in the contract (see 6.2). Unless otherwise specified (see 6.2), ready-made lockstitch bobbins shall be put-up in either one-half or one gross pack.

3.12 Identification marking. Except when commercial identification markings are specified in the invitation to bid, each holder, except ready-made lockstitch bobbins shall have a label attached in such a manner as to remain in place and be clearly legible until all thread has been removed. Ready-made lockstitch bobbins shall have the label attached to the unit container (one-half or one gross pack). The label shall be printed with the information as specified below:

Stock number
Length (yardage and meters)
Direction of twist
Color
Ply
Size (ticket number)
Name of contractor
Nomenclature

3.13 Workmanship. The finished thread shall conform to the quality of product established by this specification.

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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 (examinations and tests) 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 Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4)

4.3 First article inspection. When a first article is required (see 3.1 and 6.2), it shall be examined for the defects specified in 4.4.2.1 and 4.4.2.2.

4.4 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.4.1.1 Certification. The polyester cut-staple material shall be accepted on the basis of a contractor's certificate of compliance with the requirements indicated in table III.

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TABLE III. Polyester cut-staple certification

Characteristic	Requirement paragraph
Specific gravity	3.4.1
Polyester identification	3.4.1.1
No mixture of denier, luster, cross sections, mixed, drawn or undrawn fibers or garnetted fibers	3.4.1.1
Any form of polyester waste	3.4.1.1
Producers commercial fiber designation	3.4.1.1

4.4.2 End item visual examination.

4.4.2.1 Thread on holder examination. Thread on the holder shall be examined for the defects listed in table IV. The lot size shall be expressed in units of one holder. The sample unit shall be one holder. The inspection level shall be S-3, and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0.

TABLE IV. Thread on holder defects

Examine	Defect
Identification label	Missing, incorrect, incomplete, illegible, or insecurely attached
Type holder	Other than specified
Surface condition	Loose or unattached ply 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 noticeable
Finish	Other than specified Uneven, lumpy, bare or thin spots

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4.4.2.2 Thread as unwound examination. The thread shall be examined while unwinding, for the defects listed in table V. All defects shall be counted regardless of their proximity to each other. The lot size for holders shall be expressed in units of one holder and the sample unit shall be one holder. For ready-made lockstitch bobbins, the lot size and sample unit shall be expressed in units of one-half gross pack or one gross pack (as applicable). The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

TABLE V. Thread as unwound defects

Examine	Defect
Continuous length	Not in one continuous length
Knots and splices	Averaging more than one full thread knot or splice per 1000 yards
Winding	Improperly or not firmly wound, resulting in kinks, knots, entangling, or slippage during unwinding, or otherwise affecting free unhampered unwinding of thread
Color	Other than specified, not uniform Uneven, apparent on successive layers or end to end
Tackiness or adhesion	Strands adhere to each other or to holder, affecting unwinding tension

4.4.2.3 Length examination. Ten holders from each lot shall be measured individually for thread length. Measurements shall be made on a winding machine over an accurate measuring clock under normal winding tensions. The values obtained shall be averaged, and this average shall represent the average length per holder in the lot. The lot shall be unacceptable if the length per holder is less than the amount specified minus the 3.0 percent tolerance (see 3.11).

4.4.3 End item testing. The end items shall be tested as indicated in table VI. The methods of testing specified in FED-STD-191, wherever applicable, and as listed in table VI shall be followed. The lot size shall be expressed in units of one holder (or if bobbins, one gross of holders). The sample unit shall be one wound holder or sufficient bobbin holders to provide enough thread for the applicable tests. The inspection level shall be S-1, and the AQL, expressed in terms of test failures per hundred units, shall be 6.5.

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TABLE VI. End item tests

Characteristic	Requirement paragraph	Test method
Color (shade)	3.5	4.5.1 and 4.5.2
Colorfastness to:		
Laundrying (after 3 cycles)	3.5.1	5610 <u>1/</u> <u>2/</u>
Perspiration	3.5.1	5680
Light	3.5.1	5660
Dry heat	3.5.1	5642 <u>3/</u>
Direction of twist:		
Individual yarn	3.7	4050
Final ply	3.7	4050
Number of plies	3.8	Visual <u>4/</u>
Length per pound	3.8	4010 <u>5/</u>
Breaking force	3.8	4100
Elongation	3.8	4100
Finish	3.9	<u>6/</u>
Finish material limitation	3.9.1	<u>6/</u>

- 1/ The test specimens shall be dried after each of the 3 laundering cycles.
- 2/ The color transfer cloth evaluation shall not apply. No appreciable change in shade or loss of color of the tested specimen shall be visual when compared to the untested thread retained.
- 3/ The temperature in the heating device at which the specimen will be tested shall be 351°F to 376°F.
- 4/ One determination shall be made per sample unit, and the results reported as "pass" or "fail".
- 5/ In cases of dispute, the length per pound of the thread shall be determined on thread without finish. Procedure for the removal of the finish shall be as specified in 4.5.1.
- 6/ Unless otherwise specified a certificate of compliance shall be submitted and will be acceptable for the stated requirement.

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4.4.4 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2, and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

<u>Examine</u>	<u>Defect</u>
Marking (exterior and interior)	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application
Materials	Any component missing, damaged, or not as specified
Workmanship	Inadequate application of components, such as: incomplete sealing or closure of flap, improper taping, loose strapping or inadequate stapling Bulged or distorted container
Content	Number per container is more or less than required

4.5 Methods of inspection.

4.5.1 Finish removal procedure. Before evaluation for shade matching and testing for colorfastness, the sample of thread shall be wet drycleaned in accordance with Method 5622 of FED-STD-191, (disregarding reference to the standard sample). Excess solvent shall be removed by centrifuging or wringing. The sample shall then be rinsed in distilled water at 120°F to 160°F and dried at a temperature not exceeding 180°F. The dried sample shall then be conditioned for a minimum of 4 hours prior to evaluation for shade match or colorfastness. Colorfastness tests shall be as specified in table VI.

4.5.2 Shade matching procedure. The sample shall be wound or prepared for examination in a manner similar to that for the standard shade sample. The color of the sample shall match the standard sample when viewed under filtered tungsten lamps that approximate artificial daylight and that have a correlated color temperature of 7500 ± 200 K, with illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2300 ± 200 K.

5. PACKAGING

5.1 Preservation. Preservation shall be level A, B, or Commercial as specified (see 6.2).

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5.1.1 Levels A, B, and Commercial preservation. The thread shall be preserved in accordance with the applicable requirements of PPP-P-50.

5.2 Packing. Packing shall be Level A, B or Commercial as specified (see 6.2).

5.2.1 Levels A, B, and Commercial. The thread shall be packed in accordance with the applicable requirements of PPP-B-50.

5.3. Marking. In addition to any special marking required by the contract or purchase order, shipping containers shall be marked in accordance with MIL-STD-129 or ASTM D 3951 as applicable.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The thread is intended for use in durable press items of apparel.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Ticket number and ply required (see 1.2 and 3.8).
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- d. Color required (see 3.5).
- e. Colorfastness properties required (see 3.5.1).
- f. When a first article is required (see 3.1, 4.3, and 6.3).
- g. Direction of twist if other than specified (see 3.7).
- h. Put-up required (see 3.11).
- i. Style of bobbin and length of thread for ready-made lock-stitch bobbins (see 3.11.1).
- j. Levels of preservation and packing (see 5.1 and 5.2).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of Federal Acquisition Regulation (FAR) 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

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6.4 Sample. For access to samples, address the contracting activity issuing the invitation for bids or request for proposal, or as directed by the contracting activity.

6.5 Colorfastness. Normally, colorfastness requirements for thread are to be specified in keeping with those specified for the basic material into which the thread will be sewed (see 3.5.1).

6.6 Denier and staple guidelines. Polyester cut staple having a minimum tenacity of 5.0 grams per denier, 1.25 to 1.50 denier per filament, and cut staple length of 1-1/2 inches minimum has been determined as basis for meeting thread physical requirements.

6.7 Subject term (key word) listing.

Durable press clothing
Sewing
Staple
Stitching
Yarn

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MILITARY INTERESTS

Custodians:

Army - GL
Navy - NU
Air Force - 11

Preparing activity:

Army - GL
(Project 8310-0177)

Review activities:

Army - MD
Air Force - 99
DLA - CT

User activity:

Navy - MC

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-T-43624B

2. DOCUMENT DATE (YYMMDD)
1991 February 20

3. DOCUMENT TITLE

THREAD, POLYESTER, SPUN

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

e. DATE SUBMITTED (YYMMDD)

(1) Commercial

(2) AUTOVON

(If applicable)

8. PREPARING ACTIVITY

a. NAME

U.S. Army Natick RD&E Center

b. TELEPHONE (Include Area Code)

(1) Commercial

508-651-4532

(2) AUTOVON

256-4532

c. ADDRESS (Include Zip Code)

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Defense Office of Standardization Office