SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3890A

Issued MAY 1970
Revised SEP 1996
Reaffirmed JUN 2005

Superseding AMS 3890

Graphite Yarn, Non-Structural
5 Ply Yarn, 720 Filaments

1. SCOPE:

1.1 Form:

The product shall consist of 5-ply yarn having 720 continuous filaments per ply and a maximum of 4 turns per inch (25.4 mm).

1.2 Application:

This yarn has been used typically for weaving graphite cloth and fabric of various shapes and constructions for fabrication of components used in ablation applications, but usage is not limited to such applications.

1.3 Safety-Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 578 Specification for Glass Fiber Yarns
ASTM D 1512 Carbon Black- pH Value
ASTM D 3176 Ultimate Analysis of Coal and Coke

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

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2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

2.3 SACMA Publications:

Available from Suppliers of Advanced Composite Materials Association, 1600 Wilson Boulevard, Arlington, VA 22209.

SRM 12 Lot Acceptance of Carbon Fibers

3. TECHNICAL REQUIREMENTS:

The product shall conform to the requirements shown in Table 1 and 3.7.

(R) TABLE 1 - Properties

Paragraph	Property	Requirements	Test Method
3.1	Assay Carbon, % by weight, min	99.0	ASTM D 3176
3.2	Ash Content, % by weight, max	1 .0	4.5.1
3.3	pH	6.5 to 10.0	ASTM D 1512
3.4	Filament Diameter, inch	0.00028 to 0.00032	ASTM D 578
3.5	Density of Filament, gm/cc, min	1.4	
3.6	Breaking Strength, lbs/ply, min	2.0	ASTM D 578

3.7 Quality:

Yarn, as received by purchaser, shall be uniform in quality and condition, and free from foreign materials and from imperfections detrimental to usage of the yarn.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspections:

The manufacturer of the yarn shall supply all samples and shall be responsible for all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the yarn conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Assay carbon (3.1), density of filament (3.5), and breaking strength (3.6) are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of yarn by the manufacturer, when a change in ingredients and/or processing 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 yarn shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient yarn 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 yarn from a single production run made from the same batch of raw filaments under the same fixed conditions and presented for manufacturer's inspection at one time.

4.3.1.2 When a statistical sampling plan has been agreed upon by purchaser, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1.

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

4.4 Approval:

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

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

4.5 Test Methods:

Shall be as follows:

4.5.1 Ash Content: Shall be determined on triplicate samples from each spool of yarn. Approximately 5 grams of yarn shall be dried for not less than 1 hour in a circulating air oven at 110 °C ± 3 (230 °F ± 5) and cooled in a desiccator. Accurately weigh to 0.001 gram approximately 2 grams of the cooled sample into a previously dried, tared crucible, place in a muffle furnace, gradually heat to 760 °C ± 15 (1400 °F ± 27), hold in an oxidizing atmosphere for not less than 3 hours, then raise temperature to 870 °C ± 15 (1598 °F ± 27) and hold at heat for not less than 1 hour until ignition is complete. Remove the crucible from furnace, cool in desiccator, and weigh. Calculate ash content as shown in Equation 1.

$$\text{Ash Content,\%} = \frac{\text{Final sample weight x 100}}{\text{Dry sample weight}} \qquad \text{(Eq.1)}$$

4.6 Reports:

The supplier of yarn shall furnish with each shipment a report from the manufacturer showing the results of tests to determine conformance to the acceptance test requirements and stating that the yarn conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3890A, manufacturer's identification, quantity, and date of manufacture.

4.7 Resampling and Retesting:

Shall be in accordance with SRM 12.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Yarn shall be furnished on spools of a size acceptable to purchaser. Spools of yarn shall be wound uniformly and shall be free of telescoping.

5.1.2 Spools:

5.1.2.1 Identification: Each spool shall be legibly marked with a label on the inside surface of the core, or with a tag suitably attached to the spool:

YARN, GRAPHITE _____
AMS 3890A _____
MANUFACTURER'S IDENTIFICATION _____
QUANTITY _____
LOT NUMBER _____
PURCHASE ORDER NUMBER _____
DATE OF MANUFACTURE _____