SAE INTERNATIONAL

AEROSPACE MATERIAL SPECIFICATION

AMS3670™ REV. C

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Superseding AMS3670B

(R) Molded or Extruded Bar, Rod, and Shapes Made from Polyamide-Imide (PAI) Plastic Material Both Filled and Unfilled Grades for High-Impact Strength and Mechanical Strength Applications in High Temperature Environments

RATIONALE

This standard has been updated to include technical and editorial changes.

1. SCOPE

1.1 Form

This specification and its supplementary detail specifications cover molded or extruded bar, rod, and shapes made from filled and unfilled polyamide-imide (PAI) polymer.

1.2 Application

These products have been used to produce mechanical parts used in engines, hydraulic systems, and other applications where a high strength, high temperature resistant, low friction, and light weight product is required. Service temperature ranges up to 482 °F (250 °C). Usage is not limited to these applications. Each application should be considered individually.

1.3 Classification

The requirements specified herein and in the applicable detail specification define each product on the basis of the filler used with the same base polyamide-imide polymer. The presence of filler and the material used as filler are specified in the title of each detail specification. The tabulated properties presented within each applicable detail specification shall be performed on test specimens molded from the polyamide-imide material referenced and, if possible, on test specimens taken from the final bar, rod, or shape molded or extruded from the polyamide-imide material.

1.4 Type

The type shall designate the process used to produce bar, rod, or shapes.

Type I Bar, rod, or shapes produced via the injection molded process or the raw material used to produce the shapes.

Type II Bar, rod, or shapes produced via the extrusion process.

Type III Bar, rod, or shapes produced via the compression molding process.

When no type is specified, Type I shall be supplied.

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https://www.sae.org/standards/content/AMS3670C

1.5 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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D149	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D150	A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D570	Water Absorption of Plastics
ASTM D648	Deflection Temperature of Plastics Under Flexural Load
ASTM D695	Compressive Properties of Rigid Plastics
ASTM D695M	Compressive Properties of Rigid Plastics (Metric)
ASTM D790	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D790M	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials (Metric)
ASTM D792	Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D1708	Tensile Properties of Plastics by Use of Microtensile Specimens

2.2 U.S. Government Publications

Copies of these documents are available online at https://quicksearch.dla.mil.

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

3. TECHNICAL REQUIREMENTS

3.1 Detail Specifications

The requirements for a specific product shall consist of all requirements specified herein in addition to requirements specified in the applicable detail specification. In case of conflict between requirements of this specification and an applicable detail specification, requirements of the detail specification shall govern.

3.2 Material

All bar, rod, and shapes shall be manufactured from virgin, unplasticized polymer polyamide-imide, unfilled or filled as specified in the applicable detail specification, ready for machining and use, and post cured to meet requirements of 3.4. The grades of PAI rods, tubes, and molded shapes shall be as shown in Table 1.

Table 1 - Material grades

Grade	Description	Detail Specification
1	Virgin PAI, all types	AMS3670/1
2	PAI filled with 20% graphite and 3% PTFE	AMS3670/2
3	PAI filled with 12% graphite and 3% PTFE	AMS3670/3
4	PAI filled with 30% glass fiber	AMS3670/4
5	PAI filled with 30% carbon fiber	AMS3670/5

3.2.1 Virgin PAI shall mean resin that has no filler added and the resin has not experienced any previous pressure or heat history.

3.2.2 Filled material shall mean that at least one filler has been uniformily blended with the virgin PAI resin prior to any pressure or heat process. The percentage of fillers added shall be measured by weight.

3.2.3 Grade 1 material offers excellent compressive strength and the highest elongation of all grades. It also provides electrical insulation and exceptional mechanical strength. It is commonly used for back up rings, electrical connectors, and insulators.

3.2.4 Grade 2 and 3 materials are typically used for wear and friction parts. They offer very low thermal expansion rates and low friction, and exhibit little or no slip-stick in use. They are used in severe service wear applications such as non-lubricated bearings, seals, and bearing cages with Grade 2 having the lower coefficient of friction.

3.2.5 Grade 4 material is typically used for sockets, gears, valve plates, terminal strips, and insulators.

3.2.6 Grade 5 material has higher stiffness than Grade 4. It has the best retention of stiffness at high temperature and excellent fatigue resistance, and is electrically conductive. This material is used for metal replacement, housings, mechanical linkages, gears, fasteners, spline liners, cargo rollers, brackets, valves, labyrinth seals, fairings, tube clamps, standoffs, impellers, shrouds.

3.2.7 Unless a specific type and grade is ordered, Type 2, Grade 1 shall be supplied.

3.3 Color

Shall be natural and may vary as specified in the applicable detail specification depending on the filler material used.

3.4 Properties

The bar, rod, and shapes shall conform to the requirements of this specification and the applicable detail specification; tests shall be performed on test specimens as described below and in accordance with test methods specified in Table 1 of the applicable detail specification.

Type I Injection molded or machined test specimens and post cured.

Type II Machined test specimens and post cured.

Type III Machined test specimens (post curing not needed for compression molding compounds).

3.4.1 Dimensional Stability

Dimensions of raw stock or parts fabricated from stock shall not change more than 0.001 in/in (0.001 mm/mm), measured at 68 to 86 °F (20 to 30 °C) before and after being held for 24 hours ± 0.5 hour at 482 °F ± 9 °F (250 °C ± 5 °C) in air. Before initial measurement, test specimens shall be conditioned at 302 °F ± 9 °F (150 °C ± 5 °C) for 70 hours ± 0.5 hour.

3.5 Quality

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

3.6 Tolerances - Stock Shape Bar Stock

Shall be as shown in Table 1, determined at 68 to 86 °F (20 to 30 °C) except that closer temperature control may be required for large dimensions.

Table 1A - Tolerances, inch/pound units

Nominal Diameter Inches	Diameter Tolerance, Inches Plus Only
0.250 to 1.000, incl	0.025
Over 1.000 to 2.000, incl	0.050
Over 2.000 to 3.500, incl	0.070
Over 3.500	As specified by purchaser

Table 1B - Tolerances, SI units

Nominal Diameter Millimeters	Diameter Tolerance Millimeters Plus Only
6.35 to 25.40, incl	0.64
Over 25.40 to 50.80, incl	1.27
Over 50.80 to 88.90, incl	1.78
Over 88.90	As specified by purchaser

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the product 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 product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Sufficient test samples shall be taken at random by the manufacturer of the bar, rod, or shape in order to perform the required tests. If a quantity is not specified, the sample quantity shall not be less than three.

4.2.2 Preproduction Tests

The manufacturer of the bar, rod, and shapes shall certify each lot to the acceptance tests identified in 4.2.1. When a purchaser deems additional conformity testing be required per Table 1 of AMS3670/XX, then details of such testing shall be agreed upon between the purchaser and the manufacturer and shall be defined in the purchase agreement. All technical requirements of the bar, rod, and shapes are preproduction tests and shall be performed prior to or on the initial shipment of the bar, rod, and shapes produced by the manufacturer of the bar, rod, and shapes or when a change in ingredients and/or processing requires reapproval as in 4.4.2.

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, contracting officer, or request for procurement.

4.3 Sampling and Testing

Shall be acceptable to purchaser.