



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS3580A

Superseding AMS 3580

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PLASTIC CASTINGS

Methyl Methacrylate, General Purpose

1. SCOPE:

1.1 Form: This specification covers one grade of cast methyl methacrylate plastic in the form of rods, tubes, and shapes.

1.2 Application: Primarily for fabricated parts, formed or otherwise, requiring dimensional stability, optical clarity, good electrical properties, and excellent outdoor weatherability.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

- ASTM D256 - Impact Resistance of Plastics and Electrical Insulating Materials
- ASTM D542 - Index of Refraction of Transparent Organic Plastics
- ASTM D570 - Water Absorption of Plastics
- ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
- ASTM D638 - Tensile Properties of Plastics
- ASTM D648 - Deflection Temperature of Plastics Under Flexural Load
- ASTM D1003 - Haze and Luminous Transmittance of Transparent Plastics
- ASTM E308 - Spectrophotometry and Description of Color in CIE 1931 System

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-784 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be made from pure methacrylate monomers.

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3.2 Color and Condition: Castings shall be colorless and transparent, unless otherwise specified. When so stipulated, castings shall be transparent, translucent, or opaque and in the color specified. Castings shall have a highly polished surface finish, unless otherwise specified.

3.3 Properties: Castings shall conform to the following requirements; tests shall be performed on the castings supplied and in accordance with specified ASTM methods, insofar as practicable:

- | | | | | | |
|-----------------|--|-------------------------------|-------------------------------------|--------------------|---|
| 3.3.1 | Index of Refraction
(Applicable to clear castings only) | $n_{23^{\circ}\text{C}}$
D | (n $_{73.4^{\circ}\text{F}}$)
D | 1.48
to
1.50 | ASTM D542 |
| 3.3.2 | Specific Gravity at 23°/23°C (73°/73°F) | | | 1.18
to
1.20 | ASTM D792,
Method A |
| 3.3.3 | Haze, max
(Applicable to clear sections 1/2 in. (12.7 mm) thick and under only) | | | 3.0% | ASTM D1003,
Procedure A |
| 3.3.4 | Water Absorption (gain) at 23° C ± 1 (73° F ± 2) | | | 0.65% | ASTM D570 |
| 3.3.5 | Luminous Transmittance, min
Ø Nominal Thickness
0.250 in. (6.35 mm) and under | | | 90% | ASTM E308 |
| 3.3.6 | Heat Distortion Temperature at
264 psi (1.82 MPa) fiber stress, min
Nominal Thickness
0.250 in. (6.35 mm) | | 64° C (147° F) | | ASTM D648;
Heating rate
2° C (4° F)
per min. |
| 3.3.7 | Tensile Strength, min | | 6800 psi (46.9 MPa) | | ASTM D638 |
| 3.3.8 | Elongation, min | | 2% | | ASTM D638 |
| 3.3.9 | Impact Resistance, per unit
of notch, min | | 0.3 ft-lb per in.
(16 J/m) | | ASTM D256,
Method C |
| Ø 3.3.10 | Flammability, burning rate, max | | 2.4 in. per min.
(1.02 mm/s) | | ASTM D635;
Use specimen
1/8 in. (3 mm)
in nominal thick-
ness |
| 3.3.11 | Corrosion: Castings shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable. | | | | |
| 3.3.12 | Weathering: When specified, castings shall have weather resistance acceptable to purchaser, determined by a procedure agreed upon by purchaser and vendor. | | | | |
| 3.4 | Quality: Castings shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from internal and external imperfections detrimental to fabrication, appearance, or performance of parts. | | | | |
| 3.5 | Tolerances: Unless otherwise specified, the following tolerances apply: | | | | |

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3.5.1 Rods:

TABLE I

<u>Nominal Diameter (See 3.5.1.1)</u>		<u>Tolerance, plus and minus</u>	
<u>Inches</u>	<u>(Millimetres)</u>	<u>Inch</u>	<u>(Millimetre)</u>
0.375 to 0.625, incl	(9.52 to 15.88, incl)	0.005	(0.12)
Over 0.625 to 1.250, incl	(Over 15.88 to 31.75, incl)	0.010	(0.25)
Over 1.250 to 2.000, incl	(Over 31.75 to 50.80, incl)	0.015	(0.38)
Over 2.000 to 3.000, incl	(Over 50.80 to 76.20, incl)	0.030	(0.76)

3.5.1.1 Rods 0.375 to 0.625 in. (9.52 to 15.88 mm) in nominal diameter are machined and may have a frosted finish.

3.5.2 Tubes:

3.5.2.1 Outside Diameter:

TABLE II

<u>Nominal OD</u>	<u>OD Tolerance, Inch</u>		<u>Ovality (See 3.5.2.1.1), max</u>
	<u>plus</u>	<u>minus</u>	
<u>Inches</u>			<u>Inch</u>
1.500 to 3.000, incl	0.010	0.020	0.025
Over 3.000 to 3.750, incl	0.015	0.030	0.040
Over 3.750 to 6.094, incl	0.015	0.045	0.060
Over 6.094 to 12.060, incl	0.015	0.065	0.080

TABLE II (SI)

<u>Nominal OD</u>	<u>OD Tolerance, Millimetres</u>		<u>Ovality (See 3.5.2.1.1), max</u>
	<u>plus</u>	<u>minus</u>	
<u>Millimetres</u>			<u>Millimetres</u>
38.10 to 76.20, incl	0.25	0.50	0.64
Over 76.20 to 95.25, incl	0.38	0.76	1.02
Over 95.25 to 154.79, incl	0.38	1.14	1.52
Over 154.79 to 306.32, incl	0.38	1.65	2.03

3.5.2.1.1 Ovality shall be the difference between the minor and major diameter measurements taken at the same transverse plane on the tube.

3.5.2.2 Wall Thickness:

TABLE III

<u>Nominal Wall Thickness</u>		<u>Tolerance plus and minus</u>	
<u>Inch</u>	<u>(Millimetres)</u>	<u>Inch</u>	<u>Millimetres</u>
Up to 0.125, incl	(Up to 3.18, incl)	0.015	(0.38)
Over 0.125 to 0.187, incl	(Over 3.18 to 4.75, incl)	0.019	(0.48)
Over 0.187 to 0.250, incl	(Over 4.75 to 6.35, incl)	0.025	(0.64)
Over 0.250 to 0.375, incl	(Over 6.35 to 9.52, incl)	0.035	(0.89)
Over 0.375 to 0.500, incl	(Over 9.52 to 12.70, incl)	0.045	(1.14)

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of castings shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the castings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for specific gravity (3.3.2), water absorption (3.3.4), heat distortion temperature (3.3.6), and impact resistance (3.3.9) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed on the initial shipment of a casting to a purchaser, when a change in material 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 material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with the following; a lot shall be all castings produced in a single production run from the same batch of raw materials under the same fixed conditions and presented for vendor's inspection at one time.

4.3.1 For Acceptance Tests: Sufficient castings shall be selected at random from each lot to perform all required tests. The number of specimens for each test shall be as specified in the applicable test procedure or, if not specified therein, not less than three. An inspection lot shall not exceed 200 lb (90 kg) of castings.

4.3.1.1 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.5.1 shall state that such plan was used.

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

4.4 Approval:

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

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

4.5 Reports: