SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS3201L

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Superseding AMS3201K

Butadiene Acrylonitrile (NBR) Rubber
Dry Heat Resistant
35 - 45

RATIONALE

AMS3201L results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a nitrile (NBR) rubber in the form of sheet, strip, tubing, extrusions, and molded shapes.

1.2 Application

These products have been typically used for parts, such as packings, bushings, grommets, and applications requiring resistance to dry heat, but usage is not limited to such applications. Each application should be considered individually.

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

2.1 The purchase order date shall stipulate the published document that shall be in effect. The supplier may work to a subsequent revision unless a particular revision is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published revision shall apply.

2.2 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS 2279	Tolerances, Rubber Products
AMS 2810	Identification and Packaging, Elastomeric Products

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2.3 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 D 297	Rubber Products - Chemical Analysis
ASTM D 395	Rubber Property - Compression Set
ASTM D 412	Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 471	Rubber Property - Effect of Liquids
ASTM D 518	Rubber Deterioration - Surface Cracking
ASTM D 792	Rubber Property - Specific Gravity
ASTM D 865	Rubber Property - Deterioration by Heating in Air (Test Tube Enclosure)
ASTM D 1149	Rubber Property Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimens)
ASTM D 2137	Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D 2240	Rubber Property - Durometer Hardness

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be a compound, based on an acrylonitrile-butadiene (NBR) elastomer, suitably cured to produce a product meeting the requirements of 3.2.

3.2 Properties

The product shall conform to the following requirements shown in Table 1; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable:

TABLE 1 - PROPERTIES

Property	Requirement	Test Method
3.2.1 Hardness, Durometer "A" or equivalent	40 ± 5	ASTM D 2240
3.2.2 Tensile Strength, min		ASTM D 412, Die B or C
3.2.2.1 For parts other than extrusions	1000 psi (6.90 Mpa)	
3.2.2.2 For extruded parts	800 psi (5.52 MPa)	
3.2.3 Elongation, min	300%	
3.2.4 Specific Gravity	Preproduction Value ±0.02	ASTM D 792 (Hydrostatic Method)
3.2.5 Oil Resistance		ASTM D 471 Medium: IRM 903 oil Temperature: 212 °F ± 2 (100 °C ± 1)
3.2.5.1 Hardness Change, Durometer "A" or equivalent	-15 to +10	Time: 70 hours ± 0.5
3.2.5.2 Tensile Strength Change, max	-50%	
3.2.5.3 Elongation Change, max	-40%	
3.2.5.4 Volume Change	-10 to +50%	
3.2.5.5 Decomposition	None	
3.2.5.6 Surface Tackiness	None	
3.2.6 Dry Heat Resistance		ASTM D 865 Temperature: 302 °F ± 5 (150 °C ± 3)
3.2.6.1 Hardness Change, Durometer "A" or equivalent	0 to +20	Time: 70 hours ± 0.5

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TABLE 1 – PROPERTIES (CONTINUED)

Property	Requirement	Test Method
3.2.6.2 Tensile Strength Change, max		
3.2.6.2.1 For parts other than extrusions	-60%	
3.2.6.2.2 For extruded parts	-70%	
3.2.6.3 Elongation Change, max		
3.2.6.3.1 For parts other than extrusions	70%	
3.2.6.3.2 For extruded parts	-85%	
3.2.6.3.3 Bend (flat)	No cracking or checking	
3.2.7 Compression Set		ASTM D 395, Method B Temperature: 212 °F ± 2 (100 °C ± 1) Time: 70 hours ± 0.5
Percent of Original Deflection, max	75	
3.2.8 Low-Temperature Resistance		
3.2.8.1 Brittleness	Pass	ASTM D 2137, Method A Temperature: -40 °F ± 1 (-40 °C ± 2)

3.3 Dimensions and Tolerances

Dimensions and tolerances shall be as specified in the parts standard, drawing or purchase document. If not specified, shall conform to all applicable requirements of AMS2279 .

3.4 Toxicological Formulations

The material shall have no adverse effects on the health of personnel when used for its intended purpose in accordance with manufacturer's instructions and with appropriate handling procedures.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the product shall be responsible for performance of all required tests. Purchaser reserves the right to sample and perform any testing deemed necessary to ensure that the product conforms to the AMS requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Requirements shown in Table 2 are acceptance tests and shall be performed on each lot:

TABLE 2 - ACCEPTANCE TEST REQUIREMENTS

Requirement	Paragraph
Hardness, as received	3.2.1
Tensile Strength, as received	3.2.2
Elongation, as received	3.2.3
Specific Gravity	3.2.4
Volume Change in oil	3.2.5.4
Compression Set	3.2.7

4.2.1.1 Lot: A quantity of one size of product processed as one production entity from a batch

4.2.1.2 Batch: The quantity of compound run through a mill or mixer at one time.

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4.2.1.3 Random Sampling

The method shall be as specified in the parts standard, drawing or purchase document. If not specified, product shall be taken at random from each lot to perform all the required acceptance tests. The number of test iterations for each requirement shall be specified in the applicable test procedure.

4.2.2 Preproduction Tests

All technical requirements are preproduction tests and shall be performed prior to the initial shipment of the product 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.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 For Acceptance Tests

Sufficient product 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, except as specified in 4.3.1.1.

4.3.1.1 If specimens cannot be prepared from the product, ASTM test specimens prepared from the same batch and state of cure shall be used. When the product supplied is an extrusion of such shape that suitable test specimens cannot be cut from the product, a separate flat strip test sample from the same production lot shall be supplied upon request. This strip shall be prepared from tubing 1.000 inch ± 0.063 (25.40 mm ± 1.60) in OD by 0.075 inch ± 0.008 (1.90 mm ± 0.20) in wall thickness, mechanically slit and flattened into a strip while being extruded, and cured in the same manner as production product. When the product is a molded shape from which test specimens cannot be cut, a slab 6 inches (152 mm) square by 0.075 inch ± 0.008 (1.90 mm ± 0.20) thick molded from the same batch of compound shall be supplied upon request.

4.3.1.2 A statistical sampling plan acceptable to the purchaser may be used in lieu of sampling as in 4.3.1. Sample size for visual and dimensional requirements shall be as shown in Table 3; sample unit shall be one molded part and acceptable based on zero defects.

4.3.2 For Preproduction Tests

Acceptable to purchaser or as stated in the contract.

4.4 Approval

4.4.1 Sample product shall be approved by the purchaser before product for production use is supplied, unless such approval is waived by the purchaser. Results of the tests on production product shall be essentially equivalent to those on the approved sample. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval. If necessary to make any change in parameters for the process control factors, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and when requested, sample product.

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.

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