

**ELASTOMER, SYNTHETIC COMPOUNDS, HIGH AND LOW
TEMPERATURE, FUEL AND OIL RESISTANT**

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Revised

1. SCOPE:

- 1.1 This recommended practice covers synthetic elastomer compounds for use as insulating and sealing members in electrical components where both high and low temperatures and fuel and oil resistant characteristics are required.

2. CLASSIFICATION:

- 2.1 Compounds covered herein shall be identified by this specification number and the applicable durometer hardness number.

3. APPLICABLE DOCUMENTS:

- 3.1 The following documents of the issue in effect on the date of invitation for bids form a part of this recommended practice to the extent specified herein:

3.2 Military Specifications:

MIL-S-3136 - Standard Test Fluids, Hydrocarbon
MIL-C-5015 - Connectors, Electric, "AN" Type
MIL-H-5606 - Hydraulic Fluid, Petroleum Base, Aircraft and Ordnance
MIL-J-5624 - Jet Fuel, Grades JP-4, and JP-5
MIL-L-7808 - Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-L-9236 - Lubricating Oil, Aircraft Turbine Engine, 400 F.
MIL-I-17214 - Indicator, Permeability, Low-Mu (Go-No-Go)
MIL-P-27402 - Propellant Hydrazine-(Uns) Dimethylhydrazine
(50% N₂H₄ - 50% UDMH)
MIL-P-26539 - Propellant, Nitrogen Tetroxide

3.3 Military Standards:

MIL-STD-177 - Rubber Products, Terms for Visible Defects of

- 3.4 Other Publications - The following documents form a part of this specification. Unless otherwise indicated, the issue in effect on the date of invitation for bids shall apply.

CANCELLED

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Book of ASTM Standards, Part 9, Plastic, Electrical Insulation, Rubber, Carbon Black
(Application for copies should be addressed to American Society for Testing and
Materials, 1916 Race St., Philadelphia, Pennsylvania, 19103)

Monsanto Technical Bulletin AV-1 (Application for copies should be addressed to
Monsanto Chemical Company, Organic Chemicals Division, St. Louis 1, Missouri)

4. REQUIREMENTS:

- 4.1 Qualification - Any product furnished under this specification shall be of a compound which has been tested and has passed the qualification tests specified herein.
- 4.2 Compound or Method Change - Manufacture of a compound approved to this specification shall not change materials, processes, etc., which would cause the material to fail to meet the requirements specified herein. When a change is planned, the manufacturer shall submit a statement of his intention together with evidence that such a change will not cause the material to deviate from the requirements of this specification. Written approval shall be obtained from the qualifying agency prior to placing such change into effect.
- 4.2.1 Process Procedure Data - The manufacturer shall supply detailed, recommended process procedure data with each shipment.
- 4.3 Sulfur Content - Unless otherwise specified the material shall contain no free sulfur or any constituents which may cause tarnish or discoloration of silver.
- 4.4 Non-Magnetic Materials - The material shall have a relative permeability of less than 2.0 mu. The permeability shall be measured with an instrument conforming to Specification MIL-L-17214.
- 4.5 Performance
- 4.5.1 Examination of Product - Test specimens molded from compounds to this specification for test purposes shall be smooth and free from flash. Test specimens and material supplied to this specification shall be free of porous areas, bubbles, foreign matter and other applicable defects defined in MIL-STD-177 which would adversely affect the intended function. Workmanship shall conform to the highest grade commercial practice for this type of product.
- 4.5.2 Hardness - Hardness shall be within the limits specified in Table I, Column A, when tested in accordance with 5.5.2.
- 4.5.3 Tensile Strength and Ultimate Elongation - Tensile strength and ultimate elongation shall not be less than as specified in Table I, Column A, when tested in accordance with 5.5.3.

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- 4.5.4 Tear Resistance - Tear resistance shall not be less than as specified in Table I, Column A, when tested in accordance with 5.5.4.
- 4.5.5 Insulation Resistance - Insulation resistance shall not be less than as specified in Table I, Column A, when tested in accordance with 5.5.5.
- 4.5.6 Dielectric Withstanding Voltage - Dielectric withstanding voltage shall not be less than as specified in Table I, Column A, when tested in accordance with 5.5.6.
- 4.5.7 Volume Resistivity, Dielectric Constant and Dissipation Factor
- 4.5.7.1 Volume Resistivity - Volume resistivity shall not be less than as specified in Table I, Column A, when tested in accordance with 5.5.7.1.
- 4.5.7.2 Dielectric Constant - The dielectric constant shall not be greater than as specified in Table I, Column A, when tested in accordance with 5.5.7.2.
- 4.5.7.3 Dissipation Factor - The dissipation factor shall not be greater than as specified in Table I, Column A, when tested in accordance with 5.5.7.3.
- 4.5.8 Dielectric Strength - Dielectric strength shall not be less than as specified in Table I, Column A, when tested in accordance with 5.5.8.
- 4.5.9 Arc Resistance - Arc resistance shall not be less than as specified in Table I, Column A, when tested in accordance with 5.5.9.
- 4.5.10 Low Temperature - The material shall be capable of meeting the following requirements when subjected to a temperature of -85 ± 5 F (-65 ± 3 C). Upon return to room temperature the samples shall show no evidence of cracking or other deleterious effects when examined in accordance with 5.5.10.1.
- 4.5.10.1 Hardness - Hardness shall be within the limits specified in Table I, Column B, when tested in accordance with 5.5.10.2.
- 4.5.10.2 Young's Modulus in Flexure - Young's Modulus in Flexure shall not be greater than as specified in Table I, Column B, when tested in accordance with 5.5.10.3.
- 4.5.11 High Temperature Aging - The material shall be capable of meeting the requirements outlined below when subjected to a temperature of 500 ± 5 F (260 ± 3 C). Upon return to room temperature the samples shall show no evidence of cracking or other deleterious effects when examined in accordance with 5.5.11.2.
- 4.5.11.1 Hardness - Hardness shall be within the limits specified in Table I, Column C, when tested in accordance with 4.5.11.3.

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- 4.5.11.2 Tensile Strength and Ultimate Elongation - Tensile strength and ultimate elongation shall not be less than specified in Table I, Column C, when tested in accordance with 5.5.11.4.
- 4.5.11.3 Tear Resistance - Tear resistance shall not be less than as specified in Table I, Column C, when tested in accordance with 5.5.11.5.
- 4.5.11.4 Insulation Resistance - Insulation resistance shall not be less than as specified in Table I, Column C, when tested in accordance with 5.5.11.6.
- 4.5.11.5 Dielectric Withstanding Voltage - Dielectric withstanding voltage shall not be less than as specified in Table I, Column C, when tested in accordance with 5.5.11.7.
- 4.5.11.6 Volume Resistivity, Dielectric Constant, and Dissipation Factor - Volume resistivity, dielectric constant and dissipation factor shall be as specified in Table I, Column C, when tested in accordance with 5.5.11.8.
- 4.5.11.7 Arc Resistance - Arc resistance shall not be less than as specified in Table I, Column C, when tested in accordance with 5.5.11.9.
- 4.5.11.8 Compression Set - Compression set shall not be greater than as specified in Table I, Column C, when tested in accordance with 5.5.11.10.
- 4.5.11.9 Fusion - There shall be no evidence of material transfer between material surfaces when tested in accordance with 5.5.11.11.
- 4.5.12 Fluid Immersion - The material shall be capable of meeting the requirements of this specification when subjected to immersion in the fluids listed below:
- MIL-S-3136, Type III Test Fluid
 - MIL-H-5606, Hydraulic Fluid
 - MIL-F-5624, JP-4 Fuel
 - MIL-L-7808, Lubricating Oil
 - Skydrol 500A, Hydraulic Fluid
 - MIL-L-9236, Lubricating Oil
- 4.5.12.1 Physical Properties
- 4.5.12.1.1 Hardness - Hardness shall be within the limits specified in Table I, Column D, when tested in accordance with 5.5.12.1.1.
- 4.5.12.1.2 Tensile Strength and Ultimate Elongation - Tensile strength and ultimate elongation shall not be less than as specified in Table I, Column D, when tested in accordance with 5.5.12.1.2.
- 4.5.12.1.3 Volume Change - Volume change shall not be greater than as specified in Table I, Column D, when tested in accordance with 5.5.12.1.3.

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4.5.12.2 Electrical Properties

4.5.12.2.1 Insulation Resistance - Insulation resistance shall not be less than specified in Table I, Column D, when tested in accordance with 5.5.12.2.1.

4.5.12.2.2 Dielectric Withstanding Voltage - Dielectric withstanding voltage shall not be less than specified in Table I, Column D, when tested in accordance with 5.5.12.2.2.

4.5.13 Ozone Resistance - There shall be no evidence of cracking of the material when tested in accordance with 5.5.13.

4.5.14 Propellant Compatibility - The material shall be capable of meeting the requirements of 4.5.12 when exposed to the following fluids and gases in accordance with 5.5.14:

- a. Liquid Fuel - 50% hydrazine and 50% unsymmetrical dimethyl hydrazine (UDMH) per MIL-P-27402.
- b. Liquid Oxidizer - nitrogen Tetroxide (N_2O_4) per MIL-P-26539.
- c. Gaseous Oxidizer - same composition as for liquid oxidizer.

5. QUALITY ASSURANCE PROVISIONS:

5.1 Manufacturer Responsibility - Unless otherwise specified, the manufacturer is responsible for the performance of all quality assurance requirements prior to submission for the qualifying activity's inspection and acceptance. Except as otherwise specified, the manufacturer may utilize his own facilities or any commercial laboratory acceptable to the qualifying activity. Inspection records of the examinations and tests shall be available to the qualifying activity as specified in the contract or order.

5.1.1 Classification of Tests - The inspection and testing of the specified material shall be classified as follows:

- a. Qualification Tests
- b. Acceptance Tests - Group A
Group B

5.2 Qualification Tests

5.2.1 Qualification Required - Prior to actual procurement, the material which this specification covers shall pass the qualification test specified herein.

5.2.2 Qualification Test Samples - The specimens for each material listed in Table I shall be submitted in accordance with Table II, and test samples shall be prepared from these specimens in accordance with Table III.

TABLE I
PHYSICAL AND ELECTRICAL REQUIREMENTS

T E S T				
	VALUE REQUIRED			
	INITIAL	LOW TEMPERATURE	TEMPERATURE AGING	FLUID IMMERSION
Durometer Shore Hardness "A", Points	A 40 $\pm$ 5	B 40 $\pm$ 15 5	C 40 $\pm$ 15 5	D 40 $\pm$ 15 5
Ultimate Elongation, Percent (Minimum)	600	--	400	400
Tensile Strength, PSI (Minimum)	2000	--	1300	1400
Tear Resistance, Lbs/In. (Minimum)	300	--	150	--
Compression Set, Percent (Maximum)	--	--	70	--
Fusion	--	--	none	--
Volume Change, Percent Swell (Maximum)	--	--	--	10
Young's Modulus in Flexure "E", PSI (Maximum)	--	1500	--	--
Durometer Shore Hardness	75 $\pm$ 5	75 $\pm$ 15 5	75 $\pm$ 15 5	75 $\pm$ 15 5
Ultimate Elongation, Percent (Minimum)	400	--	280	280
Tensile Strength, PSI (Minimum)	1200	--	780	780
Tear Resistance, Lbs/In. (Minimum)	200	--	100	--
Compression Set, Percent (Maximum)	--	--	70	--
Fusion	--	--	none	--
Volume Change, Percent Swell (Maximum)	--	--	--	10
Young's Modulus in Flexure "E", PSI (Maximum)	--	2000	--	--
Insulation Resistance, Megohms at 500 VDC (Min)	500,000		5000	5000
Volume Resistivity, Ohm-Centimeters (Minimum)	1 X 10 ¹⁴	--	1 X 10 ¹²	--
Dielectric Constant "K" (Maximum) @ 1 KC/Second	4.0	--	4.0	--
Dissipation Factor "D" (Maximum) @ 1 KC/Second	0.002	--	0.002	--
Dielectric Strength, Volts/Mil (Minimum)	300	--	130	--
Arc Resistance, Seconds (Minimum)	130	--		
Dielectric Withstanding Voltage, Volts AC rms (Min)	3000		3000	3000

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