



Material and Performance Requirements for Spark Plug Boots and Distributor Boots

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This specification covers the requirements for elastomeric protective boots used on spark plugs and distributors.

1.1.1 Type A. Vinyl Methyl Silicone Elastomer (VMQ) for +175 °C permanent and +200 °C peak temperatures.

1.1.2 Type B. Chlorosulfonated Polyethylene (CSM) optionally chlorinated polyethylene (CM) compound for +100 °C permanent and +125 °C peak temperatures.

1.2 Applicability. Elastomeric protective boots used on spark plugs and distributors in vehicle applications.

1.3 Remarks. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

DIN VDE 0303-3	ISO 37	ISO 48	ISO 188
ISO 1431-1	ISO 1817	ISO 2285	ISO 7619-1

2.2 GM Standards/Specifications.

GMW3059	GMW16955
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3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Facilities.

3.1.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.1.2 Equipment. Conforming to the relevant test procedures.

3.1.2.1 Two mandrels with semicircular cross section. The radius of each mandrel shall be equal to the nominal internal radius of the appropriate boot.

3.1.2.2 Cylindrical mandrel with a diameter of 130 % of the nominal diameter of the appropriate boot.

3.1.2.3 High - voltage testing equipment with ball electrodes of 10 mm diameter and an alternating current voltage output, variable up to 25 kV RMS.

3.1.2.4 Measuring equipment for determination of dielectric constant; measuring frequency 800 Hz.

3.1.2.5 Apparatus for testing sealing against moisture.

3.1.2.5.1 Drying oven capable of maintaining the specified temperatures (+90 °C and +120 °C) to within ± 2 °C.

3.1.2.5.2 Container of suitable size consisting of insulating material.

3.1.2.5.3 Vibrator with an amplitude of 6 mm and a frequency of 25 Hz.

3.1.2.5.4 Ignition system with drive motor capable of producing a voltage of 20 kV peak at an impulse frequency of 20 Hz or equivalent high voltage source.

3.1.2.5.5 Sodium chloride solution prepared by dissolving 10 % by weight sodium chloride (NaCl) in 90 % by weight distilled or deionized water.

3.1.2.5.6 Ignition cable, spark plug insulator assemblies and distributor caps.

3.1.2.5.7 60 Hz high voltage supply (e.g. HiPot tester).

3.1.3 Test Vehicle/Test Piece. Unless otherwise specified (exemptions see 3.1.3.1), the shape, size, and number of test pieces shall be in accordance with the relevant test procedure. Unless otherwise specified, samples are finished parts or to be taken from finished parts. If not otherwise stated, mechanical properties in delivery state and after heat or fluid immersion shall be tested at + 23 °C and with the same test methods.

3.1.3.1 For the testing elongation at break, cold resistance, change in stress at 30 % strain and tear strength, a test piece in the form of a ring shall be cut from the larger diameter of the boot or the test piece shall be taken from the area shown on the relevant component drawing. The width of the ring shall be (10 /+0.1) mm, and it shall include any rim.

3.1.3.2 For testing performance properties, (surface resistance, breakdown voltage and test for sealing moisture, Open Circuit (Tower Seal Durability) complete components shall be used.

3.1.3.3 For testing Dielectric Constant sheet material of 100 mm diameter and a thickness of (4 ± 1) mm shall be used.

3.1.4 Test Time. Not applicable.

3.1.5 Test Required Information. Not applicable.

3.1.6 Personnel/Skills. Not applicable.

3.2 Preparation. Not applicable.

3.3 Conditions.

3.3.1 Environmental Conditions. Conditioning shall be as specified in the relevant test procedure.

3.3.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

3.4 Instructions. Not applicable.

3.5 Data. Not applicable.

3.6 Safety. This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM Department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

3.7.1 Test Results. Conforming to the relevant test procedures.

4 Requirements and Procedure

4.1 Design Validation Testing. Material properties (material approval) are summarized in Table 1, performance requirements (construction approval) in Table 2. For full approval of a spark plug or distributor boot, compliance to the requirements of Table 1 and Table 2 is needed.

4.2 Product Validation Testing. If not defined otherwise, the following testing should be done for production audit testing.

4.2.1 All tests per Table 1, except Age Resistance, Ozone Resistance. Oil Resistance, Cold Flexibility, and Tension Set.

4.2.2 Surface Resistance per Table 2.

4.3 Audit/Inspection Testing. If not defined otherwise, the following testing should be done for production audit testing:

4.2.1 All tests per Table 1, except Age Resistance, Ozone Resistance. Oil Resistance, Cold Flexibility, and Tension Set.

Table 1: Material Properties

Property	Test Procedure	Unit	Value
Hardness			
Types A	ISO 7619-1	Shore A	60 ± 5
Type B	ISO 7619-1	Shore A	50 ± 5
All Types	ISO 48 Method M	IRHD	To be reported
Elongation at Break			
All Types	ISO 37, Ring test piece to 3.1.3.1 is placed over the mandrels to 3.1.2.1 and strained to break at a constant velocity of 100 ± 10 mm/minute	%	500 Minimum
Age Resistance (Heat Aging)			
Type A	ISO 188 Method B, (168 /-2) h at (+200 ± 3) °C Change in Hardness	Shore A / IRHD	+7 maximum
Type B	ISO 188 Method B, (168 /-2) h at (+100 ± 3) °C Change in Hardness	Shore A / IRHD	+15 maximum
Ozone Resistance			
All Types	ISO 1431-1, 50 pphm, 20 % strain on mandrel, (+40 ± 2) °C, (72 /-2) h Visual examination (no magnification)		No cracks
Oil Resistance			
Type A	ISO 1817 in GMW16955 Fluid F (72 /-2) h; at (+150 ± 3) °C Change in Volume Change in Hardness	% Shore A / IRHD	0 to +15 ^{Note 1} 0 to -10
Type B	ISO 1817 in GMW16955 Fluid F (72 /-2) h; at (+125 ± 3) °C Change in Volume Change in Hardness	% Shore A / IRHD	-12 to +5 ^{Note 1} ±5
Cold Flexibility			
All Types	Ring test pieces to 3.1.3.1 shall be subjected to a temperature of (-40 ± 2) °C for (5 /- 0.5) h. After conditioning and without removal from the cold box, the ring test piece shall be compressed until diametrically opposite points are in contact within 4 s.		Ring must not show any cracks, breaks or checks