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Brake Master Cylinder Reservoir Diaphragm Gasket - SAE J66

SOCIETY OF AUTOMOTIVE ENGINEERS, INC., TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

SAE STANDARD
APPROVED APRIL 1974



BRAKE MASTER CYLINDER
RESERVOIR DIAPHRAGM GASKET—SAE J66

SAE Standard

Report of Hydraulic Brake Systems Actuating Committee approved April 1974.

1. Scope—This standard covers performance requirements and methods of test for master cylinder reservoir diaphragm gaskets that will provide a functional seal and protection from outside dirt and water.

2. General Material Requirements

2.1 Composition—The materials used in the diaphragm gaskets shall be a rubber elastomer or combinations of elastomers and moisture barrier materials suitable for use with motor vehicle brake fluids of the nonpetroleum type conforming to SAE J1702 and J1703.

2.2 Workmanship and Finish—The diaphragm gaskets shall be free from blisters, pin holes, cracks, embedded foreign material, or other physical defects, and shall conform to the dimensions specified on the drawings.

2.3 Marking—The identification mark of the manufacturer, as designated by the Rubber Manufacturers Association, and other details as specified on the drawing shall be molded into each diaphragm gasket.

3. Inspection and Rejection

3.1 All tests and inspections shall be made at the place of manufacture prior to shipment, unless otherwise specified. The manufacturer shall afford the inspector all reasonable facilities for the tests and specimens.

3.2 The purchaser may make tests and inspections to govern the acceptance or rejection of the diaphragm gaskets at his laboratory or elsewhere. Such tests and inspections shall be made not later than 60 days after receipt of the material.

3.3 Any lot which fails to conform to one or more of the test requirements on the first sampling may be retested. For this purpose, two additional tests shall be made for the requirement in which failure occurred. Failure of either of the retests shall be cause for final rejection.

3.4 All rejected diaphragm gaskets shall be destroyed by the manufacturer to insure that no substandard diaphragms will be used.

4. Classification of Tests

4.1 Qualification Tests—The qualification tests shall include all tests specified herein.

4.2 Lot Acceptance Tests—Quality control tests for production lot acceptance shall include tests specified in paragraphs 5.1.2, 5.3, and 5.4.1.

4.3 Sampling and Test Frequency—The quantity of parts and the frequency of qualification tests and lot acceptance tests used to control production shall be agreed upon by the supplier and purchaser.

5. Physical Properties Requirements

5.1 Rubber Hardness

5.1.1 QUALIFICATION—When tested as specified in paragraph 6.1, the rubber hardness shall be within the limits of 45-67 points. Hardness determinations from any one lot shall not vary more than ± 5 points.

5.1.2 LOT ACCEPTANCE—When tested as specified in paragraph 6.1, the rubber hardness shall be equal to the qualifying value within ± 5 points providing it is within the limits of 45-67 points.

5.2 Rubber Tension and Tear

5.2.1 QUALIFICATION—ORIGINAL PROPERTIES—When tested per ASTM D 412 and ASTM D 624, the rubber materials shall meet the following requirements:

Tensile strength: 1000 psi (6.9 MPa) min

Ultimate elongation: 250% min

Tear, die C: 125 lb (21.9 kN/m) min

5.2.2 QUALIFICATION—ACCELERATED AGING AT 100°C (212°F)—The change from the original properties and compression set after dry heat aging per paragraph 6.2 shall conform to the following requirements:

Change in hardness (IRHD or durometer): 0 to +10 points

Change in tensile strength: -20% max

Change in ultimate elongation: -30% max

Compression set: 25% max

5.3 Low Temperature Bendability at -40°C (-40°F)—After the low temperature test as described in paragraph 6.3, the diaphragm shall not crack and shall return to its approximate original shape within 1 min.

NOTE: Residual kinking of some convolutions shall not be cause for rejection.

5.4 Resistance to Fluids at Elevated Temperature 120°C (248°F)—

After being subjected to the test for resistance to fluids at elevated temperature per paragraph 6.4, the diaphragm materials shall conform to the following requirements:

5.4.1 LOT ACCEPTANCE

Change in hardness (IRHD or durometer): -10 to +5 points

Change in volume: -10 to +20%

Precipitation: Not more than light

5.4.2 QUALIFICATION

Change in tensile strength: -30% max

Change in ultimate elongation: -55% max

5.5 Ozone Resistance—After being tested per paragraph 6.5, the surface of the diaphragm shall evidence no cracking, rupture, or other deterioration when examined under 2X magnification.

5.6 Heat Pressure Stroking—After being subjected to the heat pressure stroking test prescribed in paragraph 6.6, there shall be no fluid dampness on the top surface of the diaphragm except where there is contact with metal.

5.7 Functional Design Test—After being subjected to the functional design test prescribed in paragraph 6.7, the convolutions of the diaphragm shall be fully extended, or the brake fluid level in the master cylinder reservoir shall not be greater than $\frac{1}{8}$ in (3.2 mm) above the master cylinder porting.

6. Test Procedures

6.1 Rubber Hardness—The referee method of determining rubber hardness shall be as described in ASTM D 1415, International Hardness of Vulcanized Natural and Synthetic Rubbers (micro tester). An alternate procedure, as agreed upon between vendor and purchaser, may be used.

Test each specimen submitted for test; record the range of IRHD (degrees).

Sample diaphragms, segments thereof, or specimens mutually acceptable to supplier and purchaser shall be plied together as necessary to provide the test thickness. The same operator shall make all hardness determinations for any one test.

6.2 Accelerated Aging at 100°C (212°F)

6.2.1 TEST METHOD—RUBBER HARDNESS, TENSILE STRENGTH, AND ELONGATION CHANGE

6.2.1.1 Apparatus—Circulating air oven as specified by ASTM D 573.

6.2.1.2 Procedure—Sample diaphragms, specimen sections thereof, or accepted specimens shall be rinsed in isopropyl alcohol or equivalent and wiped dry with a lint-free cloth to remove dirt and packing debris. The specimen shall not remain in the alcohol for more than 30 s.

The rubber hardness of unaged test specimens shall be determined as specified in paragraph 6.1 and recorded. The unaged tensile strength and ultimate elongation shall be determined and recorded in accordance with ASTM D 412.

New test specimens shall be placed in a circulating air oven as described in ASTM D 573, Procedure for Accelerated Aging, and held for 70 h at $100 \pm 2^\circ\text{C}$ ($212 \pm 3.6^\circ\text{F}$). The specimen shall then be removed from the oven, placed on a clean dry table top and allowed to cool for 16-96 h. The specimens shall then be retested for hardness as specified in paragraph 6.1 and tensile strength and ultimate elongation as specified in ASTM D 412. The tensile strength and ultimate elongation change shall be calculated per ASTM D 573.

6.2.2 TEST METHOD—COMPRESSION SET—Sample diaphragms, plied sections thereof, or accepted specimens, mutually agreed upon between supplier and purchaser, shall be rinsed in isopropyl alcohol or equivalent and wiped dry with a lint-free cloth to remove dirt and packing debris. The specimens shall not remain in the alcohol for more than 30 s.

The compression set of the specimens shall then be determined as specified in ASTM D 395, Method B with a heat treatment period of 22 h at $100 \pm 2^\circ\text{C}$ ($212 \pm 3.6^\circ\text{F}$).

6.3 Low Temperature Bendability—Sample diaphragms or accepted specimens shall be rinsed in isopropyl alcohol or its equivalent and wiped dry with a lint-free cloth. The specimen shall not remain in the alcohol for more than 30 s. The specimen shall then be placed in a suitable cold chamber and exposed for 22 h at -40 to -43°C (-40 to -45°F). It shall then be bent 180 deg around a $\frac{1}{4}$ in (12.7 mm) mandrel, conditioned at the test temperature, and released im-