International Standard 7633

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Road vehicles — Elastomeric boots for drum type hydraulic brake wheel cylinders using a petroleum base hydraulic brake fluid (service temperature 120 °C max.)

Véhicules routiers — Capuchons en caoutchouc pour cylindres de roue de freins hydrauliques à tambour utilisant un liquide de frein à base pétrolière (température maximale d'utilisation 120 °C)

First edition — 1985-08-15

UDC 629.113-592.2 : 678.06 **Ref. No. ISO 7633-1985 (E)**

Descriptors : road vehicles, braking systems, hydraulic brakes, drum brakes, hydraulic cylinders, rubber products, tests, performance tests, marking.

Price based on 4 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7633 was prepared by Technical Committee ISO/TC 22, *Road vehicles.*

Printed in Switzerland

Road vehicles — Elastomeric boots for drum type hydraulic brake wheel cylinders using a petroleum base hydraulic brake fluid (service temperature 120 °C max.)

1 Scope

This International Standard specifies performance tests for moulded rubber boots used as end closures on drum type wheel brake cylinders used with a petroleum base hydraulic brake fluid; these boots prevent the entrance of dirt and moisture which could cause corrosion and otherwise impair brake operation.

2 Field of application

This International Standard applies to boots of both plain and reinforcement insert types, for fitting in wheel cylinders using a petroleum base hydraulic brake fluid in accordance with ISO 7309. It does not include requirements relating to chemical composition, tensile strength or elongation at break of the rubber compound; it does not cover the strength of the adhesion of rubber to the reinforcement in the insert type.

The rubber material used in these boots is classified as suitable for operation in a temperature range of − 40 to + 120 °C.

3 References

ISO 48, *Vulcanized rubbers — Determination of hardness (Hardness between* 30 *and* 85 IRHD*).*

ISO 188, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 1431/1, *Vulcanized rubber — Resistance to ozone cracking — Part 1 : Static strain test.*

ISO 4927, *Road vehicles — Elastomeric boots for drum type hydraulic brake wheel cylinders using a non-petroleum base hydraulic brake fluid (Service temperature* 120 °C *max.).*

ISO 4928, *Road vehicles — Elastomeric cups and seals for cylinders for hydraulic braking systems using a non-petroleum base hydraulic brake fluid (Service temperature* 120 °C *max.).*

ISO 7309, *Road vehicles — Hydraulic braking systems — ISO Reference petroleum base fluid.*

4 General requirements

4.1 Workmanship and finish

The moulded boots 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.

4.2 Marking

4.2.1 Each boot shall bear a green-coloured mark specifying that it refers to a category of boots for use with a petroleum base brake fluid.

4.2.2 The green identification mark can be ink or tinted elastomer.

4.2.3 The place and type of green mark shall be the subject of an agreement between buyer and seller.

4.2.4 The green mark shall entail neither extra thickness nor alteration of material characteristics; it shall remain during all handling, before bringing the boot into use.

4.2.5 The identification mark of the manufacturer and other details as specified on the drawing shall be moulded into each boot where design permits. Each boot in conformity with this International Standard may also have the following mark : "ISO 7633".

4.3 Packaging

Boots shall be packaged to meet requirements specified by the purchaser.

4.4 Sampling

The minimum lot on which complete specification tests shall be conducted for quality control testing, or the frequency of any specific type test used to check production, shall be agreed upon by the manufacturer and the purchaser.

5 Test requirements

5.1 Resistance to fluids at elevated temperature

After the boot has been subjected to the test for resistance to fluids at elevated temperatures as described in 6.4, the change in volume and the change in hardness shall be within the following limits:

Change in volume: − 10 to + 20 %

Change in hardness: − 10 to + 10 IRHD

5.2 Heat stroking test

After stroking as specified in 6.5, a boot shall be free of flexure cracks, which extend through the wall thickness, and shall fit tightly around the cylinder and push rod.

5.3 Low temperature stroking test

During stroking as specified in 6.6, a boot shall not crack or separate from its assembled position on the cylinder or become loose on the push rod.

5.4 Tension set test

After being subjected to the tension set test described in 6.7, boots shall show no more than 75 % tension set.

5.5 Heat resistance test (static)

After the heat resistance test as detailed in 6.8, a boot shall conform to the following requirements:

a) no cracking shall occur when the boot is flexed as if in service conditions;

b) the change in hardness shall be within the limits − 5 to + 10 IRHD;

c) no tackiness shall be evident after removal from the oven.

5.6 Ozone resistance test

At the end of the 70 h exposure period as detailed in 6.9, test specimens shall be removed from the ozone chamber and examined under 2 X magnification. The surfaces of the test specimens shall show no evidence of cracking, rupture or other deterioration.

6 Test procedures

6.1 Test specimens

Specimens prepared for all tests shall be cut from the same general area of the sample. In addition, hardness test specimens shall be prepared according to ISO 48.

6.2 Test fluid

The petroleum base hydraulic brake fluid used for the test shall be the reference fluid in accordance with ISO 7309.

6.3 Hardness

The referee method of determining rubber hardness shall be as specified in ISO 48. Another procedure, as agreed upon between manufacturer and purchaser, may be used.

Test each specimen submitted; record the range of IRHD.

6.4 Resistance to fluids at elevated temperature

6.4.1 Apparatus

6.4.1.1 Circulating air oven as specified in ISO 188 (subclause 3.2.2).

6.4.1.2 Test jar, screw-top, straight-sided, round glass type[1], having a capacity of approximately 250 ml and inner dimensions of approximately 125 mm height and 50 mm diameter, and a tinned steel lid (no insert or organic coating).

6.4.2 Test specimens

Cut a section of mass approximately 3 to 5 g from each of two boots.

6.4.3 Procedure

Rinse the specimens in ethanol or its equivalent and wipe dry with a clean, lint-free cloth to remove dirt and packing debris. Do not allow the specimens to remain in the ethanol for more than 10 s.

Determine and record the initial hardness of the test specimens (see 6.3). Determine the volume of each specimen in the following manner:

— Weigh each specimen in air (m_1) to the nearest 0,001 g and then weigh the specimen immersed in distilled water at room temperature (m_2).

1) Information on rubber test jars and tinned lids can be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa 15096, USA.

— Quickly dip each specimen in ethanol and then wipe dry with a clean, lint-free cloth.

— Immerse the two specimens completely in 75 ml of the test fluid in the glass jar (6.4.1.2) and tightly cap the jar.

— Place the jar containing the specimens in the oven (6.4.1.1) at 120 ± 2 °C for a period of 70 ± 2 h. At the end of the heating period, remove the jar containing the specimens from the oven and allow to cool to 23 ± 5 °C for 60 to 90 min. At the end of the cooling period, remove the specimens from the jar and rinse in hexane or its equivalent and wipe dry with a clean, lint-free cloth. Do not allow the specimens to remain in the hexane for more than 10 s.

After removal from the hexane and drying, place each specimen in a separate, tared, stoppered weighing bottle and weigh (m_3). Remove each specimen and weigh it immersed in distilled water (m_4) to determine water displacement after hot fluid immersion.

Determine the final volume and hardness of each specimen within 60 min after rinsing in hexane.

6.4.4 Expression of results

6.4.4.1 The change in volume, as a percentage of the original volume, is given by the formula

$$\frac{(m_3 - m_4) - (m_1 - m_2)}{(m_1 - m_2)} \times 100$$

where

m_1 is the initial mass, in grams, in air;

m_2 is the initial apparent mass, in grams, in water;

m_3 is the mass, in grams, in air after immersion in test fluid;

m_4 is the apparent mass, in grams, in water after immersion in test fluid.

6.4.4.2 Change in hardness shall be determined and recorded.

6.4.4.3 The specimens shall be examined for disintegration as evidenced by blisters or sloughing (carbon black).

6.5 High temperature stroking test

6.5.1 Apparatus

6.5.1.1 Circulating air oven, as specified in ISO 188 (subclause 3.2.2).

6.5.1.2 Stroking fixtures, as shown in figures 1 and 2 of ISO 4928.

6.5.2 Test specimens

Two boots shall be used as test specimens.

6.5.3 Procedure

Install two sample wheel cylinder boots on the cylinder for which they are designed or equivalent. Then mount the cylinder in the actuator assembly (6.5.1.2), set to operate at 1 000 strokes/h with a stroke length of 4,75 ± 0,25 mm.

Then place the cylinder assembly in the oven (6.5.1.1) and actuate for 22 ± 1 h at 120 ± 2 °C. After the actuation of the assembly, remove it from the oven, allow to cool to room temperature, and examine the boots for flexure cracks and general appearance.

6.6 Low temperature stroking test

6.6.1 Apparatus

6.6.1.1 Cold chamber, in which the test specimens are exposed to the low temperature, of sufficient size to contain the apparatus assembled with test specimens and so arranged as to permit the operator to check and operate it without removal from the chamber.

It shall be capable of maintaining a uniform atmosphere of cold dry air within the specified temperature range of − 40 to − 43 °C.

6.6.1.2 Stroking fixture, as shown in figure 4 of ISO 4928.

6.6.2 Test specimens

Two boots shall be used as test specimens.

6.6.3 Procedure

Install the sample wheel cylinder boots on the cylinder for which they are designed, or equivalent. Place the test boots and test apparatus in the cold chamber (6.6.1.1) and expose them to a temperature of − 40 to − 43 °C for 70 ± 2 h. After 70 ± 2 h of low temperature exposure, stroke the boots with the stroking apparatus for six strokes, at intervals of 30 s, without removal from the cold chamber.

6.7 Tension set test

6.7.1 Apparatus

6.7.1.1 Circular stretching mandrels, having a diameter which will expand by 15 % one or the other of the sealing ends attached to the wheel cylinder or to the actuating rod.

The mandrel diameter (d_3) is calculated as 115 % of the moulded diameter of the chosen boot end. The moulded diameter shall be calculated from the average of two measurements made at right angles to one another on a contour projector. The mandrel shall be provided with a smooth lead in chamfer to prevent cutting of the rubber and shall itself have a polished machine finish (16 CLA maximum).

6.7.1.2 Circulating air oven, as specified in ISO 188 (sub-clause 3.2.2).

6.7.2 Procedure

6.7.2.1 Measure accurately and record the inside diameters (d_1) of the ends of three specimen boots. Assemble on the stretching mandrels (6.7.1.1). Place the assemblies in the oven (6.7.1.2) and age for 70 ± 2 h at 120 ± 2 °C. Remove the assemblies and cool at room temperature for 1 h. Remove the boots. Allow to recover for between 30 min and 1 h. Again measure and record the diameter (d_2).

6.7.2.2 The tension set is given, as a percentage of the original stretch deflection, by the formula

$$\frac{d_2 - d_1}{d_3 - d_1} \times 100$$

where

d_1 is the unaged inside diameter, in millimetres, of the boot;

d_2 is the aged inside diameter, in millimetres, of the boot;

d_3 is the diameter, in millimetres, of the stretching mandrel.

6.7.3 Not less than three specimens shall be tested as in 6.7.2.1 and the average of the three results shall be reported.

6.8 Heat resistance test (static)

6.8.1 Apparatus

Circulating air oven, as specified in ISO 188 (sub-clause 3.2.2).

6.8.2 Procedure

Select two sample boots for the heat resistance test. Determine the initial hardness of the boots as detailed in 6.3. Suspend the test specimens in the oven (6.8.1) for 22 ± 1 h at 120 ± 2 °C. Remove them from the oven, allow to cool for 16 to 96 h at room temperature, then check for hardness, flexibility and tackiness.

6.9 Ozone resistance test

6.9.1 Apparatus

6.9.1.1 Ozone chamber, as described in ISO 1431, capable of maintaining an ozone concentration of 50 pphm.

6.9.1.2 Stretching mandrel (see 6.7.1.1).

6.9.2 Test specimens

The test specimens shall be two boots.

6.9.3 Procedure

Assemble the boots on the stretching mandrels (6.9.1.2) (which will provide $15^{\ 0}_{-3}$ % stretch in the boot bead section) and allow to rest for 22 ± 1 h at room temperature, then subject the boots installed on the mandrels to an ozone concentration of 50 ± 5 pphm by volume at 40 ± 2 °C for 70 ± 2 h in the ozone chamber (6.9.1.1).

This page intentionally left blank

This page intentionally left blank