International Standard 7630

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

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

Véhicules routiers — Joints toriques à section circulaire 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)

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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.

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

1 Scope

This International Standard specifies the performance test methods and requirements for elastomeric O-rings used in road vehicle drum brake wheel cylinders, for use with petroleum base brake fluid.

2 Field of application

This International Standard applies to solid O-ring seals mounted stationary in the cylinder bore or on the movable piston of drum brakes.

These elastomeric seals shall be 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 1817, *Vulcanized rubber — Determination of the effect of liquids.*

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

ISO 7631, *Road vehicles — Elastomeric cups and seals for cylinders for hydraulic braking systems using a petroleum base hydraulic brake fluid (service temperature* 120 °C *max.).*

4 Product requirement

4.1 Quality and finish

Seals 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 seal shall bear a green mark specifying that it refers to a category of seals 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 the green mark shall be the subject of an agreement between buyer and supplier.

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 seals into use.

5 Brake test fluid

The test fluid shall be the reference fluid as defined in ISO 7309.

6 Apparatus

6.1 Resistance to fluid at elevated temperature, physical stability and precipitation characteristics

6.1.1 Oven, uniformly heated, dry air type conforming to the requirements of ISO 188.

6.1.2 Test jar, screw-top, straight-sided, round glass type, having a capacity of 250 ± 10 ml and inner dimensions of approximately 125 mm height and 50 mm diameter, with a tinned steel lid (no insert or organic coating).

6.2 High temperature and pressure stroking test

Apparatus as illustrated in figure 1 with oven in accordance with 6.1.1.

6.3 Low temperature leakage test

Apparatus as illustrated in figure 1.

7 Test requirements

7.1 After the test for resistance to fluid at elevated temperature — physical stability (see clause 9), the seals shall conform to the following requirements.

7.1.1 Any change in volume shall be within 0 to + 15 %.

7.1.2 Any change in hardness shall be within −7 to 8 IRHD.

7.2 After the test for resistance to fluid at elevated temperature — precipitation characteristics (see clause 10), the parts shall conform to the following requirement : not more than 0,3 % sediment by volume shall be formed in the test fluid used.

7.3 After the test for resistance to elevated temperature in dry air (see clause 11), the parts shall conform to the following requirements.

7.3.1 Any change in hardness shall be within 0 to 20 IRHD.

7.3.2 Seal condition : test specimens shall show no evidence of blistering, cracking, or change in shape from original.

7.4 After the high temperature and pressure stroking test (see clause 12), the parts shall conform to the following requirements.

7.4.1 Leakage

Constant dampness past the seals or fluid discoloration of the filter paper on two or more inspections shall be cause for rejection.

7.4.2 Corrosion

Pistons and cylinder bore shall not show corrosion as evidenced by pitting to an extent discernible to the naked eye, but staining or discoloration shall be permitted.

7.4.3 Condition of test seals

The seals shall not show excessive deterioration such as scoring, scuffing, blistering, cracking.

7.5 After the low temperature performance test (see clause 13), the parts shall conform to the following requirement : no leakage of fluid shall occur.

7.6 After the test cycle of storage corrosion in the humidity cabinet (see clause 14), there shall be no evidence of corrosion adhering to or penetrating the wall of the cylinder bore which was in contact with the test seal.

Slight discoloration (staining) or any corrosion or spots away from the contact surface of the test seals shall not be cause for rejection.

8 Preparation of test specimens

All seals to be tested shall be cleaned prior to testing by rinsing in hexane and blown dry or wiped dry with a lint-free cloth. Seals shall not remain in the hexane for more than 10 s.

9 Resistance to fluid at elevated temperature — Physical stability

9.1 Test specimens

From three or more seals to be tested, obtain a sample of mass 3 to 5 g.

9.2 Procedure

9.2.1 Determine and record the initial volume of the sample in accordance with ISO 1817.

9.2.2 Determine and record the initial IRHD hardness of the sample. Measure hardness as described in ISO 48 using a microtester (or according to a procedure previously agreed upon between supplier and purchaser).

9.2.3 Place the sample in the test jar (6.1.2) and completely immerse in 75 ml of brake test fluid (see clause 5). Seal the test jar to prevent vapour loss and place in the oven (6.1.1) at 120 ± 2 °C for 70 h.

9.2.4 After 70 h, remove the test jar from the oven and allow the sample to cool in the test jar at 23 ± 5 °C for 60 to 90 min. At the end of the cooling period, remove the sample from the test jar, rinse in hexane and wipe dry with a clean, lint-free cloth.

Do not allow the sample to remain in the hexane for more than 10 s.

9.2.5 Determine and record within 60 min the final volume and IRHD hardness of each seal in accordance with 9.2.1 and 9.2.2.

9.2.6 The change in volume is given, as a percentage of the original volume, 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.

10 Resistance to fluid at elevated temperature — Precipitation characteristics

10.1 Test specimens

From two or more seals to be tested, obtain a sample of 4 ± 0,5 g. Since whole seals are quite large, small pieces may be cut from the seal to reach the required mass. Use a minimum number of pieces to obtain a mass of 4 ± 0,5 g.

10.2 Procedure

10.2.1 Place the sample in a test jar (6.1.2) and cover with 75 ml of the test fluid (see clause 5). Seal the test jar to prevent vapour loss and place in the oven (6.1.1) at 120 ± 2 °C. (Optional : a blank test may be conducted on the brake fluid prior to the test, and any sediment resulting from this blank test may be deducted from the volume of sediment obtained after the test.)

10.2.2 After 70 h, remove the test jar from the oven. Allow the sample to remain in the fluid at room temperature for 24 h, then shake the test fluid and pour into a cone-shaped centrifuge tube.

10.2.3 Rotate the centrifuge tube for 30 min at 1 500 min^{-1}. Note the volume of sediment observed in the tube. Repeat the above rotation for an additional 30 min and record any difference in volume of sediment.

10.2.4 Record the percentage amount of sediment obtained after the second centrifuging.

11 Resistance to elevated temperature in dry air

11.1 Test specimens

Two or more seals shall be used.

11.2 Procedure

11.2.1 Measure and record the IRHD hardness of each seal in accordance with 9.2.2.

11.2.2 Place the test seals in a circulating air oven, as described in ISO 188, and maintain at 120 ± 2 °C for 70 h.

11.2.3 At the termination of the heating period, remove the seals from the oven and allow to cool for 16 to 96 h at room temperature.

11.2.4 After cooling, measure and record the IRHD hardness in accordance with 9.2.2 and note any visual change such as cracking, blistering, distortion, etc.

12 Heat pressure stroking tests

12.1 Apparatus

12.1.1 Oven, uniformly heated dry air type conforming to 6.1.1.

12.1.2 Actuating stroking fixture for wheel cylinder seals, designed to provide a 3,8 ± 1,7 mm movement of each piston. During the total movement of the piston the pressure shall increase 7 ± 0,3 MPa. The rate of operation shall be held to a uniform reciprocating motion of 1 000 ± 100 strokes/h. Figure 2 illustrates a recommended pressure (MPa) versus wheel cylinder piston movement curve for wheel cylinders having diameters of 12,7 to 60 mm.

NOTE — A new wheel cylinder assembly shall be used for each test.

12.2 Test specimens

Two cylinder seals shall be used as test specimens.

12.3 Procedure

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

Install the internal parts, which may include among other things seals, piston rings, expanders, etc., in a wheel cylinder of known diameter using the reference fluid given in ISO 7309 as a lubricant. (Boots shall not be used.) Mount the wheel cylinder assembly on the stroking fixture (12.1.2). Fill the system with the reference fluid given in ISO 7309. Bleed all air from the system. Place a sheet of filter paper under each end of the wheel cylinder to catch and determine leakage.

Place the stroking fixture assembly in the oven (12.1.1) and actuate at 120 ± 2 °C for 70 h. Shut off the actuating means and the oven heater at the termination of the 70 h stroking period with the master cylinder piston in the "off" position to relieve retained pressure in the system.

After a cooling period of 1 h with the oven door open and a ventilating fan on, disconnect the fluid line at the wheel cylinder inlet. Remove the entire stroking test fixture containing the test wheel cylinder from the oven and allow to cool for 22 ± 2 h at room temperature. Immediately after completion of the cooling period, make a careful inspection to check for fluid leaks past the seals and record the results.

Drain the fluid from the system, and remove the seals from the wheel cylinder. Rinse the seals in hexane and dry with compressed air. Do not allow the seals to remain in the hexane for more than 10 s.

Inspect seals for scoring, scuffing, blistering, cracking, and change in shape from original. Inspect cylinder parts, recording pitting on pistons and cylinder walls.

13 Low temperature test

13.1 Leakage

13.1.1 Apparatus

13.1.1.1 Cold chamber, large enough to permit arrangement of the test apparatus within and to permit the operator to check and operate the apparatus without removal from the chamber.

13.1.1.2 Master cylinder and wheel cylinder, so connected that their operation closely approximates to the brake system in actual service. The apparatus shown in figure 1 has been found to be satisfactory. The cylinder bore containing the test seals shall meet the dimensional limitations and bore finish requirements specified by the manufacturer.

13.1.1.3 Retractor spring, such as to require a line pressure of not more than 0,35 MPa to make a complete stroke at room temperature.

13.1.2 Test specimens

Two wheel cylinder seals shall be used for test seals.

13.1.3 Procedure

Rinse the test seals in hexane and wipe dry with a clean, lint-free cloth. Do not allow the seals to remain in the hexane for more than 10 s. Assemble the test seals in the test cylinder. During the assembly of the cylinder, coat the cylinder walls and other parts intended to be immersed in the fluid with reference petroleum base fluid in accordance with ISO 7309.

Install the wheel and master cylinder assembly containing the test seals (13.1.1.2) in the cold chamber (13.1.1.1). Fill the system with test fluid and bleed all air from the system. Do not use boots.

Enclose the complete actuating system in the cold chamber and subject it to a temperature of −40 to −43 °C for 120 h. Maintain the piston and seals in a static position during the first 72 h of the test and thereafter actuate the cylinders for six strokes at 0,7 MPa and six strokes at 3,5 MPa each 24 h (after 72, 96, 120 h). The strokes shall be approximately 1 min apart, and the piston shall return to the stop after each stroke. No leakage shall occur during the 120 h test period.

14 Storage corrosion test

14.1 Apparatus

14.1.1 Humidity cabinet, capable of maintaining temperatures of 21 ± 2 °C and 46 ± 2 °C at 95 ± 2 % humidity.

14.1.2 Three wheel cylinder assemblies of correct size for the seals being tested.

14.2 Test specimens

Six seals shall be used.

14.3 Procedure

Disassemble the three cylinder assemblies and using a clean, lint-free cloth, wipe all fluids from the cylinders, pistons, boots and springs.

Discard cylinders or parts showing light stains or corrosion.

Assemble the six test seals into the wheel cylinders (14.1.2) after completely coating the cylinder walls, seals, springs and pistons with a light film of the reference petroleum base fluid specified in ISO 7309. Install the clean boots on the cylinders to hold the pistons in position. Leave one inlet hole open and close the remaining holes with suitable rubber or metal plugs.

Adjust the humidity cabinet (14.1.1) to 46 °C and 95 % humidity. Place the cylinders in the cabinet with the unplugged inlet holes facing down. Maintain the specified temperature and humidity conditions for 16 h. Readjust the cabinet controls to 21 °C and 95 % humidity and maintain these new conditions for 8 h to complete the first cycle.

Repeat the above 24 h cycle for 12 days. When interrupted by one or more non-working days, keep the cylinder assemblies in the humidity cabinet with the cabinet controls set to maintain 21 °C at 95 % humidity until cycling can be resumed.

At the conclusion of 12 complete cycles, remove the cylinder assemblies from the humidity cabinet for inspection. In case of a non-working day make the inspection on the following working day.

Inspect the cylinder assemblies in accordance with the following procedure :

— During the removal from the humidity cabinet and subsequent disassembly, maintain the cylinders in the same position as they were on the cabinet to avoid fluid contamination of the inside of the cylinder.

— Remove the pistons and seals from the cylinders, after removal of the boots, by pulling them out from their respective ends. Slight air (dry) pressure may be applied internally in the cylinder, if necessary, to aid in the removal of seals and pistons.

— Wipe the cylinder bore free of fluid with a clean, lint-free cloth. Inspect the condition of the cylinder bore under or adjacent to the bearing area of the O-ring under a strong light for corrosion, discoloration, or spots, noting particularly the area of the ring left by the bearing area of the O-ring during its exposure in the humidity cabinet.

Disregard any corrosion or spots away from the contact surface of the seals.

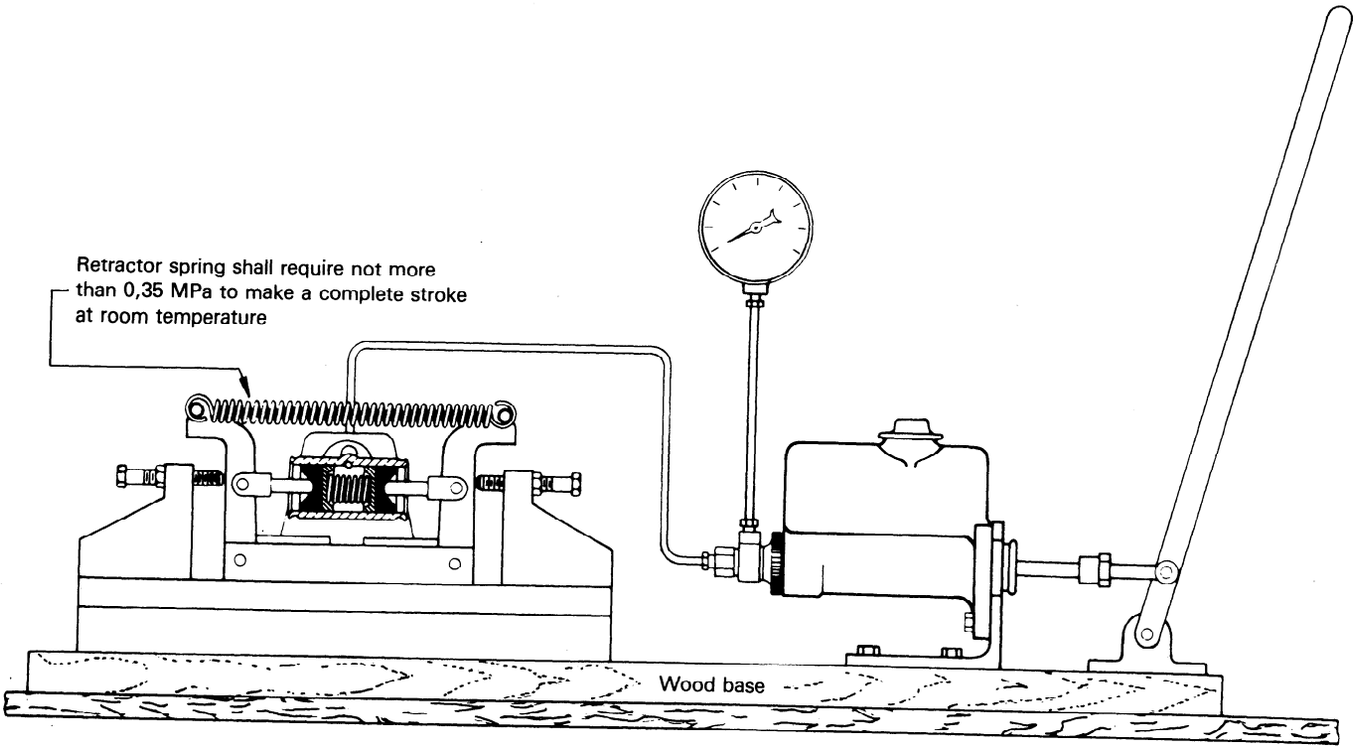

Figure 1 — Low temperature leakage test apparatus

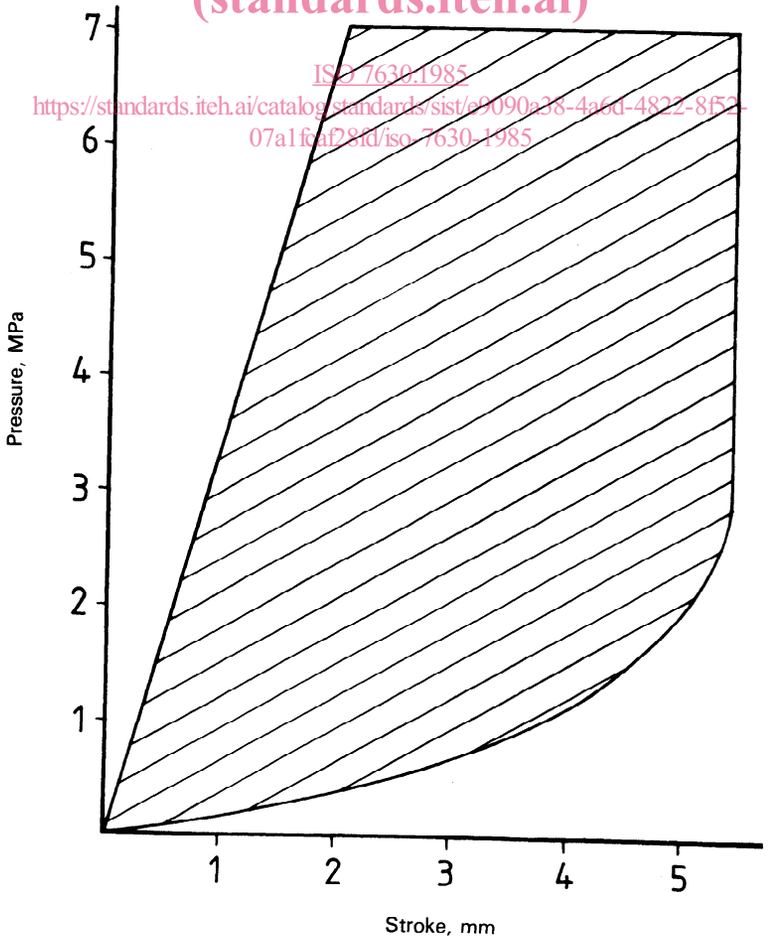

Figure 2 — Pressure versus wheel cylinder piston movement for wheel cylinders having diameters of 12,7 to 60 mm

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