

	SURFACE VEHICLE STANDARD	SAE J101 JUL2013
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Hydraulic Wheel Cylinders for Automotive Drum Brakes		

RATIONALE

It was agreed in the October 2012 committee meeting that this document was beneficial, but the document is "good as is." The committee supported the direction to stabilize this document.

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1. SCOPE

This document specifies minimum performance and durability requirements for satisfactory vehicle usage, and it is applicable to wheel cylinder assemblies from commercial production, after production shipment, shelf storage, and remanufacture (factory rebuild).

1.1 Purpose

This document applies to wheel cylinder assemblies used on hydraulically operated, drum-type brakes of highway vehicles. It covers such cylinders where they are employed in passenger car, light-duty truck, bus, that are up to and including 4500 kg (10 000 lb), and like brake systems utilizing motor vehicle brake fluids that conform to SAE J1703, SAE J1704 or other OEM specified brake fluids.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1603 Rubber Seals for Hydraulic Disc Brake Cylinders

SAE J1703 Motor Vehicle Brake Fluid

SAE J1704 Borate Ester Based Brake Fluids

2.1.2 ASTM Publication

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber (Flat Specimens)

3. TEST PROCEDURES AND REQUIREMENTS

Tests shall be conducted in the sequence shown and at room temperature $20\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ($70\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$) except where otherwise specified. Wheel cylinders shall not be disassembled until after all tests are completed or unless testing is discontinued.

A wheel cylinder assembly shall, when tested in accordance with the following procedures, meet the following requirements.

3.1 Unrestricted Apply and Release

3.1.1 Procedure

3.1.1.1 Remove the shipping plug from the wheel cylinder hydraulic inlet port(s).

3.1.1.2 Fully stroke the cylinder five times by hand and allow it to return under the piston return spring load. In the absence of a piston return spring, apply 50 kPa (7 psi) air pressure to the inlet port until the cylinder returns to its original position. Record time for return on fifth stroke.

NOTE: Avoid stroking the wheel cylinder cups into the bleed screw and/or hydraulic inlet openings during this test.

3.1.2 Requirement

3.1.2.1 The piston(s) must move smoothly throughout full stroke after starting, and must be completely returned to original position on the fifth stroke within 30 s by the force of the piston return spring, or, in the absence of a return spring, by 35 kPa (5 psi) maximum air pressure at inlet port.

3.2 Ozone Resistance

3.2.1 Procedure

3.2.1.1 Seal the hydraulic port(s) from the atmosphere, install connecting link(s) where required to seal the small diameter of the boot, and to an ozone concentration of $50\text{ pphm} \pm 5\text{ pphm}$ by volume at $40\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ($100\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$) for 70 h.

3.2.1.2 Remove the cylinder from the ozone chamber and visually inspect the boot(s) without disassembling.

3.2.2 Requirement

3.2.2.1 The boot(s) shall not be perforated or cracked through in any areas.

(This is a conditioning test of the wheel cylinder for other tests which follow, and the cylinder should be rejected if deterioration of the boot obviously precludes meeting subsequent test requirements.)

3.3 Pressure Test

3.3.1 Procedure

- 3.3.1.1 Install the wheel cylinder on its load fixture and tighten the mounting bolts by hand. (See Note of 4.3 for single-end wheel cylinders.) Making certain that the connecting link(s) has (have) $4 \text{ deg} \pm 0.5 \text{ deg}$ angularity with the wheel cylinder bore longitudinal axis, tighten the mounting bolts to the nominal torque specified by the vehicle manufacturer. Adjust the connecting link(s) so that the piston(s) is (are) in the brake release position.
- 3.3.1.2 Assemble the hydraulic connector of the test apparatus to the wheel cylinder and tighten to the nominal torque specified by the vehicle manufacturer. Fill the test setup with new hydraulic fluid and bleed at all points in the system as necessary to remove air. Tighten the bleed screw to the nominal torque specified by the vehicle manufacturer.
- 3.3.1.3 Drop the connecting link lock(s) in place per Figure 2 and open the valve to the low pressure gage. Apply the master cylinder to build up $200 \text{ kPa} \pm 10 \text{ kPa}$ ($30 \text{ psi} \pm 1.5 \text{ psi}$) pressure in the system, shut off the valve to the master cylinder, and release the master cylinder.
- 3.3.1.4 Allow the pressure to the wheel cylinder to stabilize for 15 to 20 s, and then record the pressure at the beginning and end of a $30 \text{ s} \pm 1 \text{ s}$ interval.
- 3.3.1.5 Open the valve to the master cylinder, close the valve to the low pressure gage, and open the valve to the high-pressure gage. Repeat 3.3.1.3 and 3.3.1.4 except apply the master cylinder to build up $12 \text{ MPa} \pm 1.2 \text{ MPa}$ ($1700 \text{ psi} \pm 170 \text{ psi}$) pressure in the system.

3.3.2 Requirement

- 3.3.2.1 Per 3.3.1.4 there shall be no drop in pressure in excess of 7 kPa (1 psi) in a $30 \text{ s} \pm 1 \text{ s}$ interval.
- 3.3.2.2 Per 3.3.1.5 there shall be no drop in pressure in excess of 350 kPa (50 psi) in a $30 \text{ s} \pm 1 \text{ s}$ interval.

3.4 Physical Strength

3.4.1 Procedure

- 3.4.1.1 Open the valve to the master cylinder and apply the master cylinder to build up $35 \text{ MPa} \pm 3.5 \text{ MPa}$ ($5000 \text{ psi} \pm 500 \text{ psi}$) for wheel cylinders up to 30.2 mm (1-3/16 in). For wheel cylinders larger than 30.2 mm (1-3/16 in) and up to 50.8 mm (2 in), apply master cylinder pressure to $20 \text{ MPa} \pm 2 \text{ MPa}$ ($3000 \text{ psi} \pm 300 \text{ psi}$). Hold the pressure for $15 \text{ s} \pm 1 \text{ s}$ and then release the master cylinder.
- 3.4.1.2 Observe the pressure gage during the test, and visually inspect the wheel cylinder and its mounting afterward for signs of leaks or structural failure.
- 3.4.1.3 Remove the connecting link lock(s).

3.4.2 Requirement

- 3.4.2.1 The gage shall show no abrupt pressure drop and the cylinder shall show no signs of mechanical failure.