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Superseding J1335 APR1990

Hydraulic Cylinder No-Load Friction Test

1. **Scope**—Applies to hydraulic cylinders, which are components of self-propelled work machines defined in SAE J1116.
 - 1.1 **Purpose**—To provide a laboratory method for determining the static and dynamic friction of a hydraulic cylinder at no-load conditions.
2. **References**
 - 2.1 **Applicable Publications**—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.
 - 2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1116—Categories of Off-Road Self-Propelled Work Machines
SAE J1276—Standardized Fluid for Hydraulic Component Tests
3. **Definitions**
 - 3.1 **Static Breakaway Pressure**—The minimum pressure that initiates movement of the piston under no external load.
 - 3.2 **Dynamic Drag Pressure**—The minimum pressure differential across the cylinder that is required to maintain constant velocity after breakaway at no load.
4. **Testing Conditions**
 - 4.1 **Accuracy of Measurement**—The accuracy of measurements unless otherwise stated shall be:
 - a. Temperature ± 3 °C (± 5 °F)
 - b. Pressure $\pm 2\%$
 - c. Flow $\pm 2\%$
 - d. Time $\pm 2\%$
 - e. Length $\pm 2\%$

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4.2 Test Temperature—The test temperature shall be 20 °C (68 °F) unless otherwise specified.

4.3 Test Fluid—The test fluid shall be SAE 1276 unless otherwise specified.

5. Test Equipment

5.1 Use a fluid power source capable of delivering a pressure necessary to overcome the static breakaway pressure of the cylinder.

5.2 Use a means of indicating pressure at the rod end and cap ports.

6. Test Procedure

6.1 Cycle the cylinder until the fluid and apparatus temperatures are stabilized.

6.2 Position the cylinder horizontally with the barrel restrained and the rod end free. Locate the piston at the stroke midpoint of the cylinder under test. Install pressure measuring instrumentation in the rod end and cap end port and install the flow meter at the cap end of the cylinder.

6.3 After allowing a minimum of 2 min to permit the rod and piston seals to settle in normal static positions, gradually apply increasing pressure to the rod end port of the cylinder. The flow rate during the dynamic drag test must be at a minimum to insure that pressure drops through the lines and that the connections do not influence the results.

6.4 Record on the data sheet the time elapsed between 6.1 and 6.3 as follows:

- a. The fluid temperature
- b. The static breakaway pressure
- c. The flow rate during the dynamic drag pressure test
- d. The inlet and outlet pressures to determine the dynamic drag pressure.

Repeat this test a minimum of two times.

6.5 Repeat the previous test for the reverse direction.

6.6 Record on the data sheet as follows:

- a. The fluid temperature
- b. The static breakaway pressure
- c. The flow rate during the dynamic drag test
- d. The inlet and outlet pressures to determine the dynamic drag pressure.

Repeat this test a minimum of two times.

PREPARED BY THE SAE OFF-ROAD MACHINERY TECHNICAL COMMITTEE—
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OF THE SAE OFF-ROAD MACHINERY TECHNICAL COMMITTEE

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