The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
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SURFACE VEHICLE RECOMMENDED PRACTICE

An American National Standard

SAE J1334

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HYDRAULIC CYLINDER INTEGRITY TEST

***Foreword*—**This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

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 operational integrity of a hydraulic cylinder by a proof pressure and an operational test.

2. ***References***

2.1 **Applicable Publications—**The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the lastest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1116JUN86—Categories of Off-Road Self-Propelled Work Machines
SAE J1165MAR86—Reporting Cleanliness Levels of Hydraulic Fluids
SAE J1276MAR86—Standardized Fluid for Hydraulic Component Tests

3. ***Definitions***

3.1 **Average Cylinder Rod Velocity—**The sum of twice the stroke length divided by the sum of the movement time for the rod to extend and retract.

3.2 **Cycle—**One extension and retraction of the cylinder rod for a specified stroke length.

3.3 **Cycle Rate—**The number of cycles per unit of time.

3.4 **Proof Pressure—**The maximum pressure which can be applied that will not cause any permanent set or deformation.

3.5 **Rated Pressure—**The continuous duty operating pressure specified by the manufacturer.

3.6 **Rod Temperature—**The temperature of the rod surface during or immediately after cycling. Record location and method of sampling.

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3.7 **Side Load—**A continuous force which is in a direction, unless otherwise specified, perpendicular to the axial loading of the cylinder to simulate loading due to external forces on the cylinder as defined by the user.

3.8 **Specified Functional Life—**The number of cycles a cylinder can withstand and continue to function as specified.

3.9 **Stroke Length—**The total distance traveled by the piston in completing one-half cycle.

4. ***Testing Conditions***

4.1 **Accuracy of Measurement—**The accuracy of measurements unless otherwise stated shall be: Temperature ±3 °C (±5 °F), Pressure ±2%, Leakage ±2%, Time ±2% and Length ±2%.

4.2 **Fluid Test Temperature—**The fluid test temperature, measured in the supply line, shall be 50 °C (122 °F) and/or 110 °C (230 °F) or as agreed between user and supplier. If more than one temperature is used they shall be alternated at each leakage check point as specified in 6.9.

4.3 **Test Fluid—**The test fluid shall be per SAE J1276 unless otherwise specified.

4.4 **Test Pressure—**Operational test pressure shall be the manufacturer's rated pressure and measured at the cylinder work ports. A 10% transient overshoot is permissible unless another amount is agreed upon by the user.

4.5 **Pressure Rise Rate—**The pressure rise rate shall be a minimum of 150,000 kPa (21,755 psi) per second.

4.6 **Contamination Level—**Test system shall have a contamination level not to exceed SAE J1165 solid contaminant code 19/16.

4.7 **Stroke Length—**The length of stroke for the operational test shall be equal to at least 15% of the maximum stroke length of the hydraulic cylinder.

4.8 **Cycle Rate—**The cycle rate shall be as specified by the manufacturer.

4.9 **Specified Functional Life Rating—**The specified functional life rating as specified by the manufacturer.

4.10 **Proof Pressure—**The proof pressure shall be as specified by the manufacturer or 200% of rated pressure if none is specified.

5. ***Test Equipment***—Use a suitable test fixture, for example, an oscillating beam type, a conventional in-line beam type, or similar fixture, in which the test cylinder can be loaded and driven in either direction under both static and dynamic conditions with a side loading.

6. ***Test Procedure***

6.1 Connect test cylinder to a fluid power source and cycle maximum stroke a minimum of 20 cycles to displace the trapped air.

6.2 Install test cylinder in cycle test stand.

6.3 Fully extend the cylinder rod and pressurize the cap port to the specified proof pressure. Have cylinder fully extended unless restricted by the design. Hold one minute minimum.

6.4 Fully retract the cylinder rod and pressurize the rod end port to the specified proof pressure. Hold one minute minimum.

6.5 Position the cylinder rod to cycle within ±20% of the middle section of the stroke.

6.6 Cycle test cylinder for one hundred cycles at rated pressure to simulate a break-in period.

6.7 Conduct leakage tests per SAE J1336 on both internal and external seals.

6.8 Cycle the cylinder against the external load at the specified operational test pressure and cycle rate.

6.9 Continue the specified cycling until malfunction occurs or until specified functional life rating is reached. Measure drift rates or piston seal leakage every 50,000 cycles or at agreed upon intervals per SAE J1336, Section 6. Obtain accumulated rod seal leakage per SAE J1336, Section 7 and record during cycle test and calculate K_C.

6.10 No modifications or repairs shall be made during the operational test.

6.11 Pin joints shall be greased when necessary.

7. Presentation of Results

7.1 Record general data shown in Appendix A.

7.2 Record cycles, fluid temperature, and rod temperature.

7.3 Record drift rate per SAE J1336, Section 6.

7.4 Record external leakage during cycling portion of test per SAE J1336, Section 7.

7.5 Report any failures or external leakage.

PREPARED BY THE SAE ORMTC/SUBCOMMITTEE 4—HYDRAULIC FLUID POWER SYSTEMS & COMPONENTS OF THE SAE OFF-ROAD MACHINERY TECHNICAL COMMITTEE

APPENDIX A

HYDRAULIC CYLINDER INTEGRITY TEST

MANUFACTURE: _____

Model: _____ Size: _____

Test Fluid: _____

Fluid Viscosity: _____ At _____°___ Viscosity - Index: _____

Maximum Contamination Level: _____/_____

Type of Test Fixture Used: _____

Proof Pressure: _____

Test Pressure: _____ Pressure Rise Rate: _____

Side Load Used: _____

Cycle Rate: _____ Stroke Length: _____ Average Cylinder Rod Velocity: _____