SAE International

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1499

REV. JAN2005

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SAE Band Friction Test Machine Guidelines

1. Scope

This SAE Recommended Practice is intended as a guide toward implementation of a standard practice but may be subject to frequent change to keep pace with experience and technical advances. This should be kept in mind when considering its use.

The SAE band friction test machine is used to evaluate the frictional characteristics of automatic transmission band friction materials with automatic transmission fluids. It can also be used to conduct durability tests on wet friction systems.

1.1 Rationale

This procedure is being revised to comply with SAE requirements to periodically review standards. Revisions include typographical corrections, clarifications and minor editorial changes.

2. References

2.1 Related Publications

The following publications are for information purposes only and are not a required part of this specification.

2.1.1 SAE PUBLICATIONS

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

SAE J286—SAE No. 2 Clutch Friction Test Machine Guidelines
SAE J1646—Glossary of Terms—Lubricated Friction Systems
SAE Paper 670051—New Fixture for Testing Friction Materials for Automatic Transmission Clutch

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2.1.2 GENERAL MOTORS PUBLICATION

Available from General Motors Corporation, Technology Licensing, Mail Code 483-720-220, 777 Joslyn Road, Pontiac, MI 48340-2925.

2.1.3 FORD MOTOR COMPANY PUBLICATION

Available from Ford Motor Company, 35500 Plymouth Road, Livonia, MI 48150.

3. Test Equipment

3.1 SAE Band Friction Test Machine with breakaway accessory.

3.2 Flywheels to deliver desired kinetic energy.

3.3 Data Acquisition, at not less than 1000 data samples per second, to record the following:

a. Torque channel, bandwidth 500 Hz—Accuracy shall be within ±0.5% full range.
b. Pressure channel, bandwidth 500 Hz—Accuracy shall be within ±0.5% full range.
c. Speed channel, bandwidth 500 Hz—Accuracy shall be within ±0l.1% full range.
d. Full Temperature channel, bandwidth 3 Hz—Accuracy shall be within ±1% full range.

3.4 Jacket Heater and/or Cooler for Test Fluid Temperature Control

3.5 Adapters

Drum, apply strut, and anchor

4. Typical Operating Conditions And Test Parameters

4.1 Piston Area (A_p)

7 000 mm^2 to 14 000 mm^2.

4.2 Piston Available Travel

11.0 mm.

4.3 Apply Pressure (P_p)

Up to 900 kPa ± 0.5%.

4.4 Apply Pressure Rise Rate

2 to 3 MPa/s.

4.5 Piston Release Pressure

30 to 40 kPa, if applicable, or spring return may be used.

4.6 Total Inertia Range

0.1 to 0.7 kg·m^2.

4.7 Dynamic Engagement Speeds

1000 to 10 000 r/min.

4.8 Kinetic Energy (E)

30-50 kJ.

4.9 Breakway Motor Drive Speed

0 to 4.5 r/min.

4.10 Fill Volume (V)

0.6 to 2.0 L.

4.11 Fluid Control Temperature

80 to 150 °C ± 3°C.

4.12 Band Interface Clearance (c_i)

0.20 to 0.45 mm.

4.13 Cycle Time

A series of events repeated during friction-system testing. Periods in a cycle may include a fluid temperature stablization period, a coast period to the desired engagement speed, apply period, and cooling period. When breakaway friction measurements are made, a cycle may include dwell, soak, and breakaway periods (see Figure 1).

4.14 Test Duration

10 to 50 000 cycles, as required depending on test objectives as well as the cycles required to stabilize the frictional coefficient.

4.15 Test Cavity Pressure

15 kPa maximum.

5. General Test Preparation

5.1 Prior to each test, the fixture must be cleaned thoroughly and fixture parts washed with mineral spirits.

5.2 Inspect rotating shaft seal for deterioration and replace, if necessary. Seal failure or loss of flexibility is indicated by the escape of air past the seals. If this seal is replaced, also replace nonrotating lip seals.

5.3 Soak friction elements in the test fluid for at least 10 min minimum.

5.4 Measure and record the thickness at the same locations around the band of the friction element before the test and again after test.

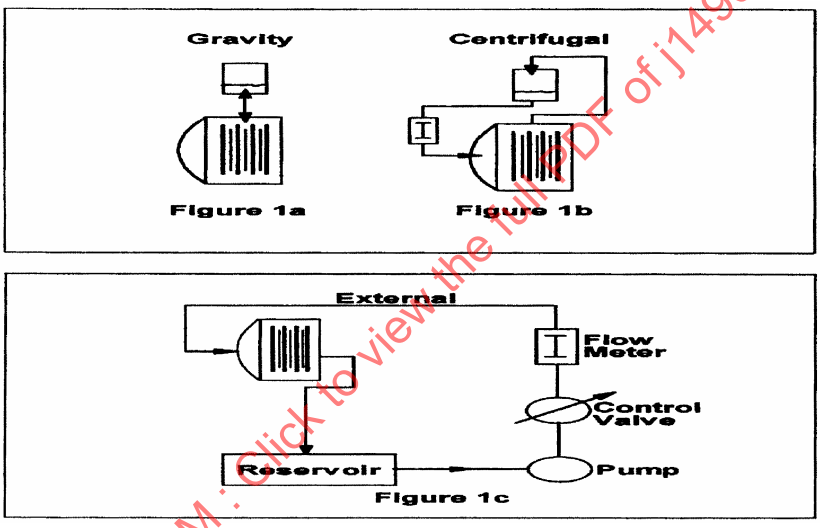

FIGURE 1—EXAMPLE CYCLE

5.5 Install the band and drum, adjust the band to the specified torque on the drum, and relax the band to the desired band interface clearance (c_i).

5.6 Install cover on test cavity.

5.7 Fill test cavity with specified amount of fluid. Vent the cavity while filling.

6. Testing

Conduct testing in accordance with specified procedure.