



SURFACE VEHICLE RECOMMENDED PRACTICE

J1802™

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Brake Block Effectiveness Rating

RATIONALE

The test data is set and should not be changed to keep the integrity and intent of the testing that was performed.

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FOREWORD

The brake block test methodologies in this SAE Recommended Practice provide the techniques and procedures required to determine brake effectiveness for the entire range of brake blocks, whether asbestos-based, nonasbestos organic, semimetallic, or full metallic in composition. Brake effectiveness is the nondimensional measurement of braking performance. This document is intended to supersede that of SAE J661 for brake blocks. An inertia dynamometer with one reference brake assembly is utilized to determine brake effectiveness under both normal temperature and high temperature conditions. This full-sized reference brake assembly is used to characterize the effectiveness performance of complete brake assemblies, thereby eliminating the shortcomings and uncertainties inherent in the use of small brake lining specimens.

1. SCOPE

This SAE Recommended Practice provides the test procedure and methods to calculate the effectiveness of brake blocks, using an inertia dynamometer. To minimize testing variability, and to optimize standardization and correlation, a single, high volume size of brake block is specified (FMSI No. 4515E) and evaluated in a reference S-cam brake assembly of 419 mm x 178 mm (16.5 in x 7.0 in) size, using a specified brake drum.

1.1 Purpose

The purpose of this document is to establish a uniform procedure for the determination and classification of brake effectiveness for commercial vehicle brake blocks. This document will permit comparison of basic frictional properties for brake blocks. Service usage classification ratings and applicable axle load ratings are not included in this document.

2. REFERENCES

2.1 Applicable Publications

The following publication forms a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

2.1.1 SAE Publication

Available from SAE International, 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 J1802-1 Test Component Specification

2.1.2 FMSI Publication

Available from Friction Materials Standards Institute, 23 Woodland Road, Suite B-3, Madison, CT 06443, Tel: 203-245-8425, www.fmsi.org.

FMSI No. 4515E Drawing of 16.5 Brake Block

3. TEST PROCEDURE

This test procedure applies to a reference air brake assembly of 419 mm x 178 mm (16.5 in x 7.0 in) size that utilizes S-cam actuation, with cam rotation same as brake drum rotation. Reference Appendix A and Figure A1.

Specifications for this brake assembly and the associated component parts, including installation/assembly requirements and maintenance procedures, are specified in Appendices B and C.

Dimensional, chemical, metallurgical, and surface finish specifications and requirements for the reference brake drums are included in Appendix D.

Brake lining block grinding requirements are shown in Appendix E.

Installation and mounting requirements for the brake assembly to the dynamometer stub axle fixture can be found in SAE J1802-1. SAE J1802-1 can be obtained from SAE.

A complete parts list, which includes all components of the reference brake assembly, can be found in SAE J1802-1. SAE J1802-1 can be obtained from SAE.

3.1 Dynamometer Test Conditions

3.1.1 The dynamometer inertia is to be 1134 kg-m² (837 slug-ft²).

3.1.1.1 Reference

Nominal wheel load - 4536 kg (10 000 lb)

Effective radius - 0.5 m (19.7 in)

3.1.2 Ambient temperature for the dynamometer cooling air is to be between 25 °C and 40 °C (77 °F and 104 °F).

3.1.3 Air at ambient temperature is to be directed uniformly and continuously over the brake drum during the test procedures at a velocity that when cooled from 250 °C (482 °F) and rotating at a uniform 60 rpm ± 5 rpm with no brake drag, the cooling time from 200 °C (392 °F) to 100 °C (212 °F) will be 10.0 min ± 1.0 min 30 s. If cooling characteristics are not achieved, abort test.

3.1.4 The brake drum temperature is to be measured with one thermocouple, installed at the center of the braking surface. The thermocouple hole is to be positioned within 3 to 4 mm (0.12 to 0.16 in) of the rubbing surface. Installation is per Appendix F.

3.1.5 Brake temperatures are to be within ±5 °C (±9 °F) of those temperatures as specified.

3.1.6 Brake apply pressures are to be maintained within -0 to + 15 kPa (-0 to +2.0 psi) of those pressures as specified.

- 3.1.7 Chamber air pressure rise rate is to be $1.50 \text{ mPa/s} \pm 0.3 \text{ mPa/s}$ ($220 \text{ psi/s} \pm 45 \text{ psi/s}$).
- 3.1.8 The maximum air pressure in the chamber is not to exceed 700 kPa (100 psi). If a specified deceleration requires pressures above the pressure limit, continue at the limit pressure and resulting deceleration until the deceleration returns or the test section is completed.
- 3.1.9 The brake drum temperature is increased to a specified level by conducting one or more stops from 320 rpm at a deceleration of $3.0 \text{ m/s}^2 \pm 0.15 \text{ m/s}^2$ ($9.8 \text{ ft/s}^2 \pm 0.5 \text{ ft/s}^2$) and an interval of not less than 60 s, unless otherwise specified.
- 3.1.10 The brake drum temperature is decreased to a specified level by rotating the drum at a constant 240 rpm. Air flow rates are not to be varied during the test sequence, except during periods of measurement and inspection.

3.1.11 Adjustment

With brake fully released and the brake drum temperature less than 70 °C (158 °F), set clevis position such that the center of the pin to chamber mounting face is $69.85 \text{ mm} \pm 3.18 \text{ mm}$ ($2.75 \text{ in} \pm 0.125 \text{ in}$) with the brake drum temperature less than 70 °C (158 °F) adjust slack adjuster to 12.7 to 25.4 mm (0.50 to 1.0 in) of air chamber stroke at 70 kPa (10 psi), with peak brake drag less than 11.3 N·m (100 in-lb) with the brake released.

3.1.12 Brake Assembly Geometry Check

With brake, drum, and stub axle assembled, actuate brake with 35 kPa (5 psi) chamber pressure; using a 0.025 mm (0.001 in) feeler gage, confirm shoe to drum contact near shoe centers. This check is to be performed after the brake lining blocks have been ground per Appendix E.

- 3.1.13 All rotation speeds referenced are to be within $\pm 10 \text{ rpm}$.

3.2 Brake Burnish Procedure

3.2.1 Brakes are Burnished Before Testing as Follows

Place the reference brake assembly, with new test linings (ground per the requirements of Appendix E) and a new drum on the inertia dynamometer and set up the brake as specified in Appendix A and 3.1. Make 200 stops from 320 rpm at a deceleration rate of $3.0 \text{ m/s}^2 \pm 0.15 \text{ m/s}^2$ ($9.8 \text{ ft/s}^2 \pm 0.5 \text{ ft/s}^2$) with an initial brake drum temperature on each stop of 200 °C (392 °F).

3.2.2 Normal Temperature Test for Brake Effectiveness

- 3.2.2.1 With an initial brake drum temperature of 100 °C (212 °F), conduct a stop from 400 rpm maintaining brake chamber air pressure at a constant 70 kPa (10 psi). Record the brake output torque, and air pressure and stroke or chamber force exerted by the brake from the time the specified air pressure is reached until the brake stops. Perform this procedure at 70 kPa (10 psi), 103 kPa (15 psi), 138 kPa (20 psi), 172 kPa (25 psi), 207 kPa (30 psi), 241 kPa (35 psi), 276 kPa (40 psi), 310 kPa (45 psi), up to a maximum of 345 kPa (50 psi).

3.2.2.2 Normal Temperature Inspection

For the test to be acceptable, 90% minimum lining contact is required on all four lining blocks. If specified contact pattern is not achieved, the test is invalid.

- 3.2.3 Warm the brake by conducting stops from 320 rpm, at a deceleration of $3.0 \text{ m/s}^2 \pm 0.15 \text{ m/s}^2$ ($9.8 \text{ ft/s}^2 \pm 0.5 \text{ ft/s}^2$), at 45 s intervals until the drum reaches 315 °C (599 °F).

- 3.2.4 Make 200 additional stops from 320 rpm at a deceleration of $3.0 \text{ m/s}^2 \pm 0.15 \text{ m/s}^2$ ($9.8 \text{ ft/s}^2 \pm 0.5 \text{ ft/s}^2$) with an initial brake drum temperature on each stop of 300 °C (572 °F).