



SURFACE VEHICLE RECOMMENDED PRACTICE

J1729™

OCT2019

Issued 1995-08
Revised 2019-10

Superseding J1729 FEB2008

Parking Brake Drawbar Pull Test Procedure - Truck and Bus

RATIONALE

Added requirement for recording tire static loaded radius (SLR) and to report drawbar peak force as a moving average.

1. SCOPE

This SAE Recommended Practice provides a test method and instructions for measuring performance of parking brakes on air- or hydraulic-braked vehicles equipped with in-wheel or drive-line parking brakes. This procedure applies to truck-tractors, trailers, trucks, and buses.

1.1 Purpose

This document establishes a uniform procedure for determining retardation force capability of the parking brakes of new truck-tractors, trailers, trucks, and buses.

2. REFERENCES

2.1 Applicable Documents

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

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J360	Truck and Bus Grade Parking Performance Test Procedure
SAE J1452	Trailer Grade Parking Performance Test Procedure
SAE J1626	Braking, Stability, and Control Performance Test Procedures for Air- and Hydraulic-Brake-Equipped Trucks, Truck-Tractors and Buses
SAE J2503	Drawbar Pull Performance Criteria
SAE J2115	Air Brake Performance and Wear Test Code Commercial Vehicle Inertia Dynamometer

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2019 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: [SAE J1729_201910](http://www.sae.org/J1729_201910)

SAE values your input. To provide feedback on this Technical Report, please visit http://standards.sae.org/J1729_201910

Documents

Document Sharing Hub

2.1.2 Federal Publications

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

49 CFR 571.105 (Code of Federal Regulations) Brake Performance - Hydraulic Brake Systems

49 CFR 571.121 Brake Performance - Air Brake Systems

3. INSTRUMENTATION AND EQUIPMENT

3.1 Instrumentation Required

3.1.1 Temperature Measuring Device

0 to 540 °C (0 to 1000 °F), to measure parking brake lining pad or shoe as per figure described in SAE J2115 and display monitor/recording brake lining temperature accurate to ± 5.6 °C (± 10 °F).

3.1.2 Load Cell

0 to 89 kN (0 to 20000 lbf) capacity accurate to ± 445 N (± 100 lbf) to measure drawbar force.

3.1.3 Pressure Gauge

0 to 900 kPa (0 to 130 lbf/in²) $\pm 1.0\%$ accuracy of the indicated value, for air brake application pressure measurements.

3.1.4 Decelerometer

0 to 9.8 m/s² (0 to 32.2 ft/s²), $\pm 1.5\%$ accuracy at 1 G, $\pm 1.5\%$ maximum non-linearity over the range and visual output resolution of 0.15 m/s² (0.5 ft/s²) to measure vehicle deceleration during burnish or establishing initial brake temperature (IBT).

3.1.5 Force Measuring Device

0 to 890 N (0 to 200 lbf), $\pm 1.0\%$ accuracy of the indicated value, to measure park brake hand or foot application force.

3.1.6 Axle Weight Measuring Device

$\pm 1.0\%$ of indicated weight.

3.1.7 Device or method of measuring wheel rotation, $\pm 5\%$ of indicated value once the parking brake has been applied.

3.1.8 Tire Pressure Gauge

$\pm 1.0\%$ accuracy of the indicated value.

3.2 Equipment Required

3.2.1 A device capable of providing a steady-state pull to the vehicle with park brake applied, at the required rate of 1.2 m/min (4 ft/min) or less.

4. VEHICLE INFORMATION AND DATA

- 4.1 Test data sheet 1 (Figures 1A and 1B) to be used as a work sheet during testing.
- 4.2 Vehicle information shall be documented as described in SAE J1626 data sheet - vehicle information.
- 4.3 Vehicle Conditions

To ensure the accuracy and validity of results, the following conditions should be met:

- 4.3.1 On the brakes applied by the parking brake system, use new thermocouple lining and drums or discs of original equipment material and install in accordance with the vehicle manufacturer's specifications.
- 4.3.2 Parking brake assemblies and actuation systems are to be installed, lubricated, adjusted, and inspected in accordance with the vehicle manufacturer's specifications.
- 4.3.3 Tires must not be more than 20% worn, largest diameter specified for the vehicle at the test GVWR and inflated to the pressure specified by the vehicle manufacturer for the GVWR, measured cold (at the beginning of each test day).
- 4.3.4 For driveline type parking brakes, the rear axle ratio should be at the specified manufacturer value to generate the highest torque in combination with 4.3.3 tire size during drawbar pull.
- 4.3.5 The vehicle is to be tested in the fully loaded condition. For the purposes of this test procedure, fully loaded shall be the manufacturer's gross vehicle weight rating (GVWR) distributed proportionately to individual axle weight ratings (GAWR's) per SAE J1626 definitions.

NOTE: FMVSS 121 (Federal Motor Vehicle Safety Standard) allows the option of performing the grade holding test at LLVW and GVWR or the static retardation force parking brake test at GVWR.

- 4.3.5.1 Load vehicles to GVWR per SAE J1626.

- 4.3.5.2 Trailer

Hook up trailer to tractor. Add ballast to trailer until weight of trailer and tractor equal trailer GAWR(s). Position ballast over trailer axle(s) to prevent wheel slide. If a wheel slides during test, load trailer axle to GAWR. Conduct burnish as described in Appendix A.

5. TEST CONDITIONS AND FACILITIES

- 5.1 Ambient air temperature must be between 0 °C and 38 °C (32 °F and 100 °F).
- 5.2 Wind velocity should not exceed 24 km/h (15 mph).
- 5.3 Unless otherwise specified, the transmission shall be in the highest gear appropriate for a speed of 40 mph during burnish snubs per SAE J1626.
- 5.4 All vehicle openings (doors, windows, hood, etc.) must be closed except as required for instrumentation purposes.
- 5.5 The road surface used for vehicle parking brake conditioning shall be dry with a peak friction coefficient (PFC) less than 0.9 per SAE J1626, flat with no more than a 1% grade in all directions, including crown for burnish snubs and initial brake temperature (IBT) conditioning.
- 5.6 Automatic adjusters must remain activated for the duration of the test.
- 5.7 Unless otherwise specified, parking brakes can be adjusted per the vehicle manufacturer's procedure.

- 5.8 Individual parking brake lining temperatures should be less than 65 °C (150 °F) when being adjusted or checked.
- 5.9 All park brake tests should be conducted on a dry, level, smooth Portland cement concrete surface or equivalent.
- 5.10 Initial Brake Temperature (IBT)

For vehicles with a parking brake system that utilizes friction elements of the service brake system, the lining temperature just prior to any parking brake test must be between 65 °C and 95 °C (150 °F and 200 °F). Temperature condition the lining material by conducting brake snubs from 64 to 32 km/h (40 to 20 mph) speed at 3 m/s² (10 ft/s²) deceleration at 1.6 km (1 mile) intervals (If speed or deceleration is not attainable, run at maximum speed or deceleration).

For hydraulic vehicles with a parking brake system that does not utilize the service brakes, the lining material temperature just prior to any parking brake test shall not be more than 65 °C (150 °F) (when the temperature of components on both ends of an axle are averaged or the temperature of the driveline type parking brake material). Temperature condition the lining material per the vehicle manufacturers recommendation but not to exceed the 65 °C (150 °F) requirement per FMVSS 105.

- 5.11 With variable input systems, conduct the test to establish the applied manual effort or pressure required to lock the braked wheels and observe whether the braked wheels lock or roll.
- 5.12 With fixed input systems, determine the manual effort required to actuate the system control and observe whether the braked wheels lock or roll.
- 5.13 For vehicles having any equipment (such as driver-controlled interaxle differentials or multi-speed axles), which can be placed in or out of engagement by the driver so as to vary either the number of axles braked or the amount of torque imposed on the parking brake or brakes, conduct the test to determine parking performance under the condition that requires highest parking brake torque and under the condition that requires highest tire-to-road tractive force. It is suggested that all conditions be tested.
- 5.14 Parking brake systems employing service brakes or those employing non-service brakes for which the manufacturer provides the purchaser with a published burnish procedure need not be tested before burnishing because of the difficulty in obtaining reliable and repeatable pre-burnish data.
- 5.15 Vehicles equipped with parking brake systems employing cable or rod actuation of service brakes shall be allowed to roll between each pull and data reading. This will improve repeatability of results by allowing realignment between axle and actuation parts and by removing system hysteresis.
- 5.16 Air braked trucks with more than two axles shall disable parking brake chambers on those axles other than the test axle per FMVSS 121.

5.17 Method of Conducting Parking Brake Retardation Force Test

NOTE: For air brake vehicles, the following procedures apply only to vehicles equipped with conventional spring-applied, air-release parking brake systems from which air is exhausted after actuation of the parking brake control.

5.17.1 Test Preparation

- 5.17.1.1 Install instrumentation and equipment based on the type of parking brake system as described in Section 3.
- 5.17.1.2 Install new thermocouple lining and drums/discs. Lining grind and surface finish of drums/discs, including all other brake components must be within vehicle manufacturer's specifications.
- 5.17.1.3 Adjust brakes to vehicle manufacturer's specifications. Where applicable, measure and record pushrod travel with only service brakes applied at 620 kPa (90 psi +0,-5 psi) at chamber.
- 5.17.1.4 Adjust vehicle weight to appropriate load condition as per test sequence, if required.
- 5.17.1.5 For vehicles with a parking brake system that does not utilize the service brakes, burnish brakes as described in 6.1.1.