



SURFACE VEHICLE RECOMMENDED PRACTICE

J225™

OCT2022

Issued 1971-01
Revised 2022-10

Superseding J225 APR2003

Brake Force Distribution Field Test Procedure for Truck and Bus

RATIONALE

This document has been revised to provide clarification in the scope, clarification of instrumentation and equipment, additional references, and grammatical corrections.

1. SCOPE

This SAE Recommended Practice provides a field test procedure and instructions for air braked single unit trucks, buses, and combination vehicles. Brake force distribution field testing with systems post-reduce stopping distance changes is still appropriate, however, vehicles with electronically controlled braking systems are not covered in this document and may need to be addressed in the future. It also provides recommendations for:

- a. Instrumentation and equipment.
- b. Vehicle preparation.
- c. Test of air-braked single and combination vehicles.
- d. Calculation of brake force distribution.
- e. This test procedure is intended to be used as a field procedure. If a more refined method, utilizing laboratory equipment, is required, refer to SAE J1505.

1.1 Purpose

This procedure provides a method to determine the brake force distribution (brake system effectiveness) for trucks and buses with a GVWR greater than 4536 kg (10000 pounds).

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 J1505 Brake Force Distribution Test Procedure - Trucks and Buses

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https://www.sae.org/standards/content/J225_202210/

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 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 J1626 Braking, Stability, and Control Performance Test Procedures for Air- and Hydraulic-Brake-Equipped Trucks, Truck-Tractors and Buses

SAE J1854 Brake Force Distribution Performance Guide - Truck and Bus

SAE J2115 Air Brake Performance and Wear Test Code Commercial Vehicle Inertia Dynamometer

3. INSTRUMENTATION AND EQUIPMENT

3.1 Each vehicle must be equipped with:

3.1.1 Decelerometer—0 to 9.8 m/s² (0 to 32.2 ft/s²), to measure vehicle deceleration during burnish or establish IBT (initial brake temperature).

3.1.2 Speedometer, accurate within ±1.6 km/h (±1 mph) in the range from 32 to 97 km/h (20 to 60 mph).

3.1.3 Pressure gauge capable of sustaining a full treadle pressure input range of 0 to 1034 kPa (0 to 150 psi) and accurate within 3.5 kPa (±0.5 psi) in the 69 to 552 kPa (10 to 80 psi) range. Install the gauge as follows:

3.1.3.1 For single-unit vehicles, pressure gauge in the foot valve circuit with the highest pressure, upstream of any other valve. This will be the reference gauge for the procedure in 5.6.

3.1.3.2 For combination vehicles, pressure gauge in control line coupling between tractor and first trailer. This will be the reference gauge for the procedure in 5.6.

3.1.4 Stopwatch, ±1 second accuracy.

3.1.5 Shutoff valves to be installed as follows:

3.1.5.1 For single-unit vehicles, the valve to be installed to permit cut-off of front or rear brakes.

3.1.5.2 Valve to be installed to permit each axle in the combination to be braked separately.

3.1.6 Adjustable pedal stop can be used (where conditions permit) to ensure constant application pressures.

3.1.7 (Optional) Infrared device to measure IBT (initial brake temperature) in the range from 38 to 260 °C (100 to 500 °F).

3.1.8 Vehicle axle lifting device and stands used during brake threshold pressure test.

3.2 Test should be run on a dry and flat roadway with no more than a 1% grade in all directions, including crown.

3.3 Measure and record ambient temperature and wind conditions, including speed and direction.

4. VEHICLE INFORMATION AND DATA

4.1 Vehicle Information Sheet

Test data sheet #1 (Figure 1) to be filled in prior to starting test.

- 4.2 Brake force distribution test data sheets #2 and #3 (Figures 2 and 3) to be filled in and used during the test and for calculating brake distribution.

5. VEHICLE PREPARATION

- 5.1 Inspect the brake lining and mating surface. Replace if abnormal conditions exist or worn beyond manufacturers recommended limits.
- 5.2 Brakes to be adjusted to manufacturer's specifications.
- 5.3 Inspect tires and replace if worn beyond manufacturer's recommended limits or abnormal tire condition. Adjust tire pressure per vehicle manufacturer's load recommendations.
- 5.4 Load vehicle to its normal operating capacity, but sufficient load at each axle to prevent brake lock-up below 345 kPa (50 psi). Do not exceed the GAWR (gross axle weight rating) or GVWR (gross vehicle weight rating). Record axle weights on vehicle information sheet (Figure 1).
- 5.5 Brakes should be fully seated and free from oil or other contaminants.
- 5.6 Determine the reference pressure level at which braking starts to occur at each brake by raising the vehicle and rotating the wheel by hand while gradually increasing the input to the brake system. Record the reference pressure level at which brake torque is first evident on the brake force distribution test data sheet (Figure 3). Continue to increase pressure to approximately 276 kPa (40 psi) and then slowly release it until the point at which no brake drag is detected. Record the reference pressure level at the no-drag point on the brake force distribution test data sheet (Figure 3). The average of these two recorded values is defined as the brake threshold pressure. Calculate the threshold pressure for each brake and average these values for each axle or tandem set. Threshold pressure should be as close to the same value as possible at each axle.

NOTE: If each axle of the tandem set is supplied from different circuits of the foot valve, an average threshold pressure should not be used. This could mask a problem on one axle.

Test No.: _____ Test Date(s) – From: _____ To: _____
 Test Organization: _____ Test Location: _____
 Vehicle Year, Make, and Model: _____ Vehicle VIN: _____
 Trailer Year, Make, and Model: _____ Trailer VIN: _____
 GAWR Vehicle: Front _____ Rear _____ Total _____
 Weight Distribution: _____
 Vehicle Front _____ Rear _____ Total _____
 Trailer Axle(s) _____
 Gross Total _____

BRAKES:

		Type ¹	Make	Size mm (in)	Lining Make	Lining Edge Code
Vehicle:	Front	_____	_____	_____	_____	_____
	Rear	_____	_____	_____	_____	_____
Trailer:		_____	_____	_____	_____	_____

BRAKE DRUM/ROTOR:

		Type ²	Make	Weight (optional)	Dust Shields (Y/N)
Vehicle:	Front	_____	_____	_____	_____
	Rear	_____	_____	_____	_____
Trailer:		_____	_____	_____	_____

ACTUATION DETAILS:

		Air Chamber Size	Slack Adjuster Length or Wedge Angle	Type ³	Adjustment		Cam Rotation ⁴
					Stroke @ 552 kPa (80 psi)		
					Left	Right	
Vehicle:	Front	_____	_____	_____	_____	_____	_____
	Rear-fwd	_____	_____	_____	_____	_____	_____
	Rear-rear	_____	_____	_____	_____	_____	_____
Trailer:	Front	_____	_____	_____	_____	_____	_____
	Rear	_____	_____	_____	_____	_____	_____

TIRES:

		PSI	Size	Make	Model	Data book SLR mm (in)
Vehicle:	Front	_____	_____	_____	_____	_____
	Rear-fwd	_____	_____	_____	_____	_____
	Rear-rear	_____	_____	_____	_____	_____
Trailer:	Front	_____	_____	_____	_____	_____
	Rear	_____	_____	_____	_____	_____

SPECIAL CONDITIONS:

Special conditions or equipment, which might affect brake performance: _____

¹ Cam, disc, wedge, etc.

² Cast or composite drum, vented or nonvented rotor, etc.

³ Automatic, manual, etc.

⁴ With or opposite drum, etc.

Figure 1 - Vehicle information sheet (test data sheet #1)

Date: _____ Test Number: _____
 Vehicle Unit Number: _____ Trailer Unit Number: _____
 Road Surface Level: _____ Road Surface Dry: _____
 Ambient Temperature: _____ Wind Speed: _____ Wind Direction: _____

Glad Hand Pressure		1. All Brakes		2. Vehicle Brakes (Truck Front Axle)		3. Trailer Brakes (Truck Rear Axle)	
kPa	(psi)	Decel m/s ² (ft/s ²)	IBT ⁵ °F (°C)	Decel m/s ² (ft/s ²)	IBT ⁵ °F (°C)	Decel m/s ² (ft/s ²)	IBT ⁵ °F (°C)
69	(10)	_____	_____	_____	_____	_____	_____
69	(10)	_____	_____	_____	_____	_____	_____
69	(10)	_____	_____	_____	_____	_____	_____
	Avg.	_____	_____	_____	_____	_____	_____
1-	Coastdown	_____	_____	_____	_____	_____	_____
	Decel	_____	_____	_____	_____	_____	_____
137.9	(20)	_____	_____	_____	_____	_____	_____
137.9	(20)	_____	_____	_____	_____	_____	_____
137.9	(20)	_____	_____	_____	_____	_____	_____
	Avg.	_____	_____	_____	_____	_____	_____
2-	Coastdown	_____	_____	_____	_____	_____	_____
	Decel	_____	_____	_____	_____	_____	_____
206.8	(30)	_____	_____	_____	_____	_____	_____
206.8	(30)	_____	_____	_____	_____	_____	_____
206.8	(30)	_____	_____	_____	_____	_____	_____
	Avg.	_____	_____	_____	_____	_____	_____
3-	Coastdown	_____	_____	_____	_____	_____	_____
	Decel	_____	_____	_____	_____	_____	_____
275.8	(40)	_____	_____	_____	_____	_____	_____
275.8	(40)	_____	_____	_____	_____	_____	_____
275.8	(40)	_____	_____	_____	_____	_____	_____
	Avg.	_____	_____	_____	_____	_____	_____
4-	Coastdown	_____	_____	_____	_____	_____	_____
	Decel	_____	_____	_____	_____	_____	_____

⁵ Initial Brake Temperature (IBT) – The average temperature of the service brakes on the hottest axle of the vehicle 0.30 km (0.2 mile) before any brake application.

Figure 2 - SAE J225 brake force distribution (test data sheet #2)

Date: _____ Test Number: _____
 Vehicle Unit Number: _____ Trailer Unit Number: _____
 Road Surface Level: _____ Road Surface Dry: _____
 Ambient Temperature: _____ Wind Speed: _____ Wind Direction: _____

COASTDOWN DECELERATION TIMES (t)

1 - _____ 3 - _____

2 - _____ 4 - _____

COASTDOWN EQUATION

$$d = \frac{2.234}{t} \text{ Metric}$$

$$d = \frac{7.33}{t} \text{ English}$$

RUN # Decel

1 _____

2 _____

RUN # Decel

3 _____

4 _____

Formula for braking percentages at 69, 137.9, 206.8, or 275.8 kPa (10, 20, 30, or 40 psi). Use average minus coastdown or just decel from Brake Force Distribution Test Data Sheet #2

Vehicle Front
 (#2 – Coastdown) + (#3 – Coastdown) x 100 = %

Vehicle Rear or Trailer
 (#2 – Coastdown) + (#3 – Coastdown) x 100 = %

Braking Performance

Vehicle Front	KPa (psi)	Vehicle Rear or Trailer
_____	69 (10)	_____
_____	137.9 (20)	_____
_____	206.8 (30)	_____
_____	275.8 (40)	_____

THRESHOLD PRESSURES

	Axle No.															
	1L	1R	2L	2R	3L	3R	4L	4R	5L	5R	6L	6R	7L	7R	8L	8R
Increasing Pressure																
Decreasing Pressure																
Threshold Pressure																
Average Threshold Pressure																

Figure 3 - SAE J225 brake force distribution for calculation (test data sheet #3)