

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 Federal Motor Vehicle Safety Standard (FMVSS) Publication

Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402

49CFR571 Code of Federal Regulations Sec. 571.121 Standard No. 121 (Revised as of October 1, 2009) - Air Brake Systems - Trucks, Buses and Trailers

3. INERTIA-DYNAMOMETER

The dynamometer must have provisions for the following:

Electronic console capable of controlling the test sequence and recording data automatically through the entire test.

Inertia capabilities with minimum increments to obtain any required inertia within $\pm 2\%$.

Constant pressure within ± 13.8 kPa (± 2 psi) from 138 kPa to 827 kPa (20 to 120 psi).

Constant torque control within ± 136 N·m (± 100 ft·lb).

Temperature control within $\pm 6^\circ\text{C}$ ($\pm 10^\circ\text{F}$).

Time control within ± 1 second for repetitive cycles.

Speed control within 1.61 km/h (1 mph).

Permanent recording of pressure, torque, temperature, shaft speed, and time.

Simultaneous direction of air uniformly and continuously over the brake drum at a velocity of (11 ± 1) m/s; $(2,200 \pm 200)$ ft/min at $(15-38)^\circ\text{C}$; $(60-100)^\circ\text{F}$.

4. DEFINITIONS

4.1 BRAKE RETARDATION FORCE

Brake torque / SLR

4.2 BRAKE TORQUE

Test weight · SLR · deceleration rate / Acceleration due to gravity

4.3 CAM TORQUE

Air chamber size · air pressure · slack adjuster moment arm

4.4 CYCLE TIME

Time interval from the beginning of one brake application to the beginning of the next

4.5 GAWR

Gross Axle Weight Rating

4.6 IBLT

Initial brake lining temperature

4.7 IBDT

Initial brake drum temperature

4.8 SLR

Static loaded radius of the tire

4.9 Test Material

Provide three new brake drums representative of production or sample lot and two brake assemblies for each test as follows:

- 4.9.1 Use one brake drum and one set of brake lining(s) for the initial burnish and durability and speed maintenance test (Part A, paragraph 5.4).
- 4.9.2 Use the second brake drum with unburnished brake lining(s) for the "Heat Check Drag Sequence" (Part B, paragraph 5.5). The brake lining(s) used for Part B can be the same as that used for Part A or can be different.
- 4.9.3 Use the third brake drum to burnish additional brake lining(s) if needed for part A only.

4.10 Thermocouples

Install two thermocouples in the lead shoe as close to the center of the rubbing area as possible, embed the primary thermocouple (IBLT) 1.0 mm (0.040 in) below the friction surface, install the secondary thermocouple for backup embedded 3.0 mm (0.12 in) below the friction surface, located as shown in SAE J2115 Figures 2 and 3.

Install two thermocouples in the durability drum (Part A), 120 degrees apart; embed the primary (IBDT) and secondary thermocouples 1.0 mm (0.04 in) from the inside diameter in the center of the rubbing area (drill through from outside diameter) as shown in SAE J2115 Figures 3 and 4.

5. PROCEDURE

5.1 Brake Drum Test Procedure description

The test consists of two different types of evaluations:

5.1.1 Part A

- 5.1.1.1 Durability section in which the brake drum is subjected to deceleration loads from various speeds.
- 5.1.1.2 Grade simulation section to evaluate the durability of drum when subjected to speed maintenance brake applications encountered on descents of various grades.
- 5.1.2 Part B - Drag simulation section to evaluate resistance to heat check formation and propagation.

5.2 Burnish

5.2.1 Burnish the brake lining(s) for Part A as described in SAE J2115 paragraph 6.1.

5.3 Brake Performance

5.3.1 Adjust brakes per manufacturer's specifications if required.

5.3.2 Conduct the TP 121D brake performance as described in SAE J2115 paragraph 6.2.

5.4 Part A - Durability and Speed Maintenance Test

5.4.1 Test Loop

Each test loop shall consist of a Durability Sequence per item 5.4.2, a Speed Maintenance Sequence per item 5.4.3, and a Cool-Down Sequence per item 5.4.4.

If faults occur, warm the brake drum by performing the next brake cycle until IBDT is achieved and then resume the test.

If mechanical or structural failure occurs apart from the brake drum, replace the component(s), reburnish if needed and resume the test.

5.4.2 Durability Sequence

Cycles	Initial speed	Final speed	Retardation level	Pressure	IBDT (Drum)	Cycle time
1	48.3 km/h (30 mph)	0.8 km/h (0.5 mph)	0.745 g	827 kPa (120 psi) maximum	93°C (200°F)	-
1	80.5 km/h (50 mph)	0.8 km/h (0.5 mph)	0.621 g	827 kPa (120 psi) maximum	93°C (200°F)	-
2	96.6 km/h (60 mph)	0.8 km/h (0.5 mph)	0.528 g	827 kPa (120 psi) maximum	93°C (200°F)	-
1	113 km/h (70 mph)	0.8 km/h (0.5 mph)	0.373 g	827 kPa (120 psi) maximum	93°C (200°F)	-

5.4.3 Grade Speed Maintenance Sequence

Perform all brake applications at a constant deceleration level with a brake pressure limit of 586 kPa (85 psi). Cool-down the drum to the IBDT by rotating at 8 km/h (5 mph).

Cycles	Initial speed	Final speed	Retardation level	Drag-on time	IBDT (Drum)	Cycle time
1	88.5 km/h (55 mph)	88.5 km/h (55 mph)	0.028 g	35 sec	66°C (150°F)	70 sec
2	88.5 km/h (55 mph)	88.5 km/h (55 mph)	0.028 g	35 sec	-	70 sec
5	88.5 km/h (55 mph)	88.5 km/h (55 mph)	0.037 g	35 sec	-	75 sec
2	88.5 km/h (55 mph)	88.5 km/h (55 mph)	0.019 g	35 sec	-	70 sec
1	88.5 km/h (55 mph)	88.5 km/h (55 mph)	0.030 g	40 sec	-	-

5.4.4 Cool Down the brake drum to IBDT by rotating the brake drum at 8 km/h (5 mph).

5.4.5 Run a maximum of 50 test loops or until test suspension occurs per paragraph 6.