



SURFACE VEHICLE RECOMMENDED PRACTICE

J1469™

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Superseding J1469 FEB2017

(R) Air Brake Actuator Test Procedure, Truck-Tractor, Bus, and Trailers

RATIONALE

This revision, after a request from a document user, adds clarification with regard to Section 13 and the stroke-identifying device called out in SAE J2899. The requirements of 13.1.2.2.d, 13.2.2.3, and 13.3.2.3.s will apply only if the subject actuator is equipped with such a stroke-identifying mark.

1. SCOPE

This SAE Recommended Practice provides procedures and methods for testing service, spring applied parking, and combination brake actuators with respect to durability, function, and environmental performance. A minimum of six test units designated A, B, C, D, E, and F are to be used to perform all tests per 1.1 and 1.2.

1.1 Test Procedures

- a. Leak Rate - Parking and Service Chambers (see Section 4)
- b. Maximum Release and Hold-Off Pressure - Parking Chamber (see Section 5)
- c. Minimum Pressure Response - Service Chambers (see Section 6)
- d. Force Output and Stroke - Parking and Service Chambers (see Section 7)
- e. Low-Temperature Leakage (Arctic Option Included) - Parking and Service Chambers (see Section 8)
- f. Low-Temperature Maximum Release and Hold-Off Pressure (see Section 9)
- g. Low-Temperature Force Output - Parking Chamber (see Section 10)
- h. Low-Temperature Operational Test - Service Chamber (see Section 11)
- i. Chamber Volume - Service Chambers (see Section 12)
- j. Corrosion Resistance - Parking and Service Chamber (see Section 13)
- k. Mechanical Back-Off Release Mechanism (see Section 14)

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Documents
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- l. Elevated Temperature Cycle Test - Parking and Service Chambers (see Section 15)
- m. Cycle Test - Parking and Service Chambers (see Section 16)
- n. Proof Pressure Test - Parking and Service Chambers (see Section 17)
- o. Vibration Test (see Section 18)

1.2 Test Sequence Chart

The test sequence as charted in the "Test Sequence Chart" shall be mandatory except where indicated as optional (see Figure 1).

TEST DESCRIPTION		Test Procedure Section NO.	TESTS FOR SERVICE CHAMBERS ONLY						TESTS FOR PARKING CHAMBERS ONLY						TESTS FOR COMBINATIONS					
			TEST UNIT DESIGNATION						TEST UNIT DESIGNATION						TEST UNIT DESIGNATION					
			A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
Leakage Rate	Park	4.1							X	X	X	X	X	X	X	X	X	X	X	X
	Service	4.2	X	X	X	X	X	X							X	X	X	X	X	X
Max Release & Hold-Off		5							X						X					
Min. Pressure Response		6	O												O					
Force Output and Stroke	Park	7.1							X	X	X	X	X	X	X	X	X	X	X	X
	Service	7.2	X	X	X	X	X	X							X	X	X	X	X	X
Low Temp. Leakage	Park	8.1							X						X					
	Service	8.2	X												X					
Low Temp. Max Release and Hold-Off		9							O						O					
Low Temp. Force Output	Park	10							O						O					
Low Temp. Operational		11	X												X					
Chamber Volume	Park	12.1							O						O					
	Service	12.2	X												X					
Corrosion		13						X						X						X
Mechanical Back-Off and Release		14							X					X	X					X
Elevated Temp. Test	Park	15.1										X						X		
	Service	15.2				X												X		
Cycle Test	Park	16.1								X	X		X			X	X		X	
	Service	16.2		X	X		X									X	X		X	
Proof Pressure	Park	17.1							X						X					
	Service	17.2	X												X					
Vibration		18				X						X						X		

1. Items marked with "X" are mandatory.
2. Items marked with "O" are optional.

Figure 1 - Test sequence chart

1.3 Purpose

This document provides uniform procedures and methods for laboratory testing of brake actuators used in air brake systems.

2. REFERENCES

2.1 Applicable Document

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 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org

ASTM B117 Method of Salt Spray (Fog) Testing

3. DEFINITIONS

3.1 HOLD-OFF PRESSURE

A decrease of parking chamber air pressure for parking brake application (extend power spring).

3.2 RELEASE PRESSURE

An increase of parking chamber air pressure to release the parking brake (compress power spring).

3.3 PARKING CHAMBER APPLY

Extend power spring.

3.4 PARKING CHAMBER RELEASE

Compress power spring.

3.5 FULL STROKE

Maximum stroke of a unit.

3.6 RATED STROKE

Minimum design stroke of a unit.

3.7 SERVICE BRAKE ACTUATOR

Air-activated actuator for applying the foundation brake.

3.8 PARKING BRAKE ACTUATOR

Mechanically applied actuator for restraining the vehicle.

3.9 COMBINATION BRAKE ACTUATOR

Combined service and parking section actuator.

3.10 ZERO STROKE

Brake actuator push rod must be in retracted position (foundation brake full-off).

3.11 FULLY CAGED POWER SPRING

Power spring restrained in its most compressed position within the brake actuator.

NOTE: This may be accomplished either pneumatically or mechanically per the manufacturer's recommended procedure.

4. LEAK RATE - PARKING AND SERVICE CHAMBERS

4.1 Leakage - Parking Chamber

4.1.1 Conditions

4.1.1.1 27 °C ± 11 °C (80 °F ± 20 °F) ambient temperature.

4.1.1.2 Parking chamber is to be uncaged.

4.1.2 Test Procedure

4.1.2.1 Preconditioning Cycle

4.1.2.1.1 Pneumatically actuate the parking chamber from fully applied to fully released and back to fully applied three times using 620 to 830 kPa (90 to 120 lbf/in²) (gage) air pressure.

4.1.2.2 Pressurize the parking chamber with air to 860 to 900 kPa (125 to 130 lbf/in²) (gage).

4.1.2.3 Allow the air pressure in the unit to stabilize for a minimum of 5 minutes.

4.1.2.4 Establish air pressure at 860 kPa ± 7 kPa (125 lbf/in² ± 1 lbf/in²) (gage).

4.1.2.5 Measure leakage rate with a flow meter.

4.1.2.6 Record leakage rate.

4.1.3 Alternate Test Procedure

4.1.3.1 Preconditioning cycles per 4.1.2.1.1.

4.1.3.2 Connect the parking chamber to a 20485 cm³ ± 820 cm³ (1250 in³ ± 50 in³) air tank. U.S. 5 Gallon Tank acceptable as alternative.

4.1.3.3 Connect a pressure gage (or equivalent device) to measure pressure change.

4.1.3.4 Pressurize the parking chamber and air tank to 860 to 900 kPa (125 to 130 lbf/in²) (gage) air pressure.

4.1.3.5 Stabilize the air pressure for a minimum of 5 minutes.

4.1.3.6 Establish a pressure of 860 kPa ± 7 kPa (125 lbf/in² ± 1 lbf/in²) (gage) in the parking chamber and air tank and close shut-off valve at the air tank inlet.

4.1.3.7 Record the pressure change after 10 minutes ± 0.1 minute.

4.2 Leakage - Service Chamber

4.2.1 Conditions

4.2.1.1 27 °C ± 11 °C (80 °F ± 20 °F) ambient temperature.

4.2.1.2 Limit the stroke to 75% ± 5% of rated stroke.

4.2.1.3 Maintain the parking chamber at 860 to 900 kPa (125 to 130 lbf/in²) (gage), if applicable.

4.2.2 Test Procedure

4.2.2.1 Precondition Cycles

4.2.2.1.1 Cycle the service chamber three times pneumatically, by applying 620 to 830 kPa (90 to 120 lbf/in²) (gage) from full stroke to zero stroke and back to full stroke position.

4.2.2.2 Pressurize the service chamber with 860 to 900 kPa (125 to 130 lbf/in²) (gage) air pressure.

4.2.2.3 Allow the air pressure in the unit to stabilize for a minimum of 5 minutes.

4.2.2.4 Establish a pressure of 860 kPa ± 7 kPa (125 lbf/in² ± 1 lbf/in²) (gage) in the service chamber.

4.2.2.5 Measure leakage rate with a flow meter.

4.2.2.6 Record leakage rate.

4.2.3 Alternate Test Procedure

4.2.3.1 Preconditioning cycles per 4.2.2.1.1.

4.2.3.2 Connect the service chamber to a 20485 cm³ ± 820 cm³ (1250 in³ ± 50 in³) air tank. U.S. 5 Gallon Tank acceptable as alternative.

4.2.3.3 Connect a pressure gage (or equivalent device) to measure pressure change.

4.2.3.4 Pressurize the service chamber and air tank to 860 to 900 kPa (125 to 130 lbf/in²) (gage).

4.2.3.5 Stabilize the air pressure in the service chamber and air tank for a minimum of 5 minutes.

4.2.3.6 Establish a pressure of 860 kPa ± 7 kPa (125 lbf/in² ± 1 lbf/in²) (gage) in the service chamber and air tank and close shut-off valve at the air tank inlet.

4.2.3.7 Record the pressure change after 10 minutes ± 0.1 minute. Use a stroke limiting device to restrain the pushrod to the required test stroke.

5. MAXIMUM RELEASE AND HOLD-OFF PRESSURE - PARKING CHAMBER

5.1 Conditions

5.1.1 27 °C ± 11 °C (80 °F ± 20 °F) ambient temperature.

5.2 Test Procedure

5.2.1 Power Spring Preset - Parking Brake

- 5.2.1.1 Fully cage the power spring in the parking chamber either pneumatically or mechanically as specified by the manufacturer.
- 5.2.1.2 Maintain the power spring in the caged position for 24-hour minimum.
- 5.2.1.3 Release the power spring to a full stroke position after the required preset period.
- 5.2.2 Preconditioning Cycles
 - 5.2.2.1 Apply preconditioning cycles per 4.1.2.1.
- 5.2.3 On the third cycle, measure and record stroke versus air pressure in the apply and release direction for the full stroke of the brake actuator. It is recommended measurements be taken in 5.0 mm (0.20 inch) increments or as otherwise specified.

6. MINIMUM PRESSURE RESPONSE - SERVICE CHAMBERS

NOTE: This test is optional and shall be performed only if required by the vehicle manufacturer or customer.

6.1 Conditions

- 6.1.1 $27^{\circ}\text{C} \pm 11^{\circ}\text{C}$ ($80^{\circ}\text{F} \pm 20^{\circ}\text{F}$) ambient temperature.
- 6.1.2 Maintain the parking chamber at 860 to 900 kPa (125 to 130 lbf/in²) (gage), if applicable.

6.2 Test Procedure

- 6.2.1 Slowly apply air pressure to the service chamber port. Measure and record air pressure value at which the pushrod extends to $5\text{ mm} \pm 0.5\text{ mm}$ ($0.20\text{ inch} \pm 0.02\text{ inch}$). This is the chamber response pressure.
- 6.2.2 Alternate Test Procedure
 - 6.2.2.1 Record plot of chamber pressure versus stroke from fully released to fully applied position. Pressurize chamber slowly such that the test time is 30 seconds, push rod travel speed should be approximately 152 mm (6 inches) per minute.

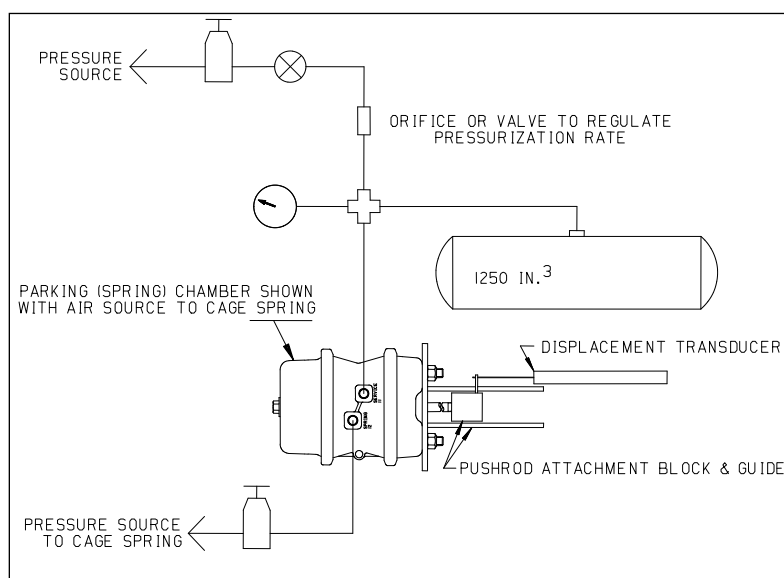


Figure 2 - Minimum pressure response test schematic

7. FORCE OUTPUT AND STROKE - PARKING CHAMBER

7.1 Conditions

7.1.1 27 °C ± 11 °C (80 °F ± 20 °F) ambient temperature.

7.2 Power Spring Preset - Parking Brake

7.2.1.1 Fully cage the power spring in the parking chamber either pneumatically or mechanically as specified by the manufacturer.

7.2.1.2 Maintain the power spring in the caged position for 24-hour minimum.

7.2.1.3 Release the power spring to a full stroke position after the required preset period.

7.2.2 Test Procedure

7.2.2.1 Mount unit to test fixture.

7.2.2.2 Mount the test actuator to a holding fixture using mounting hardware specified by the manufacturer and tightened to the manufacturer's recommended torque. The holding fixture shall be constructed with sufficient strength and rigidity to minimize fixture deflection under loading (see Figure 3).

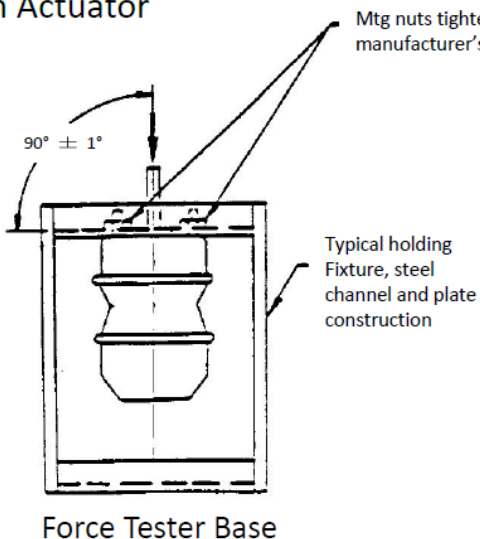
7.2.2.3 Cycle the parking chamber three times pneumatically from full stroke to zero stroke and back to full stroke using 620 to 830 kPa (90 to 120 lbf/in²) (gage).

7.2.2.4 Install the test unit and holding fixture in a suitable force versus stroke measuring equipment.

NOTE: The test fixturing must provide guiding of the test unit's pushrod, which will assure a pushrod angularity with the mounting surface of the chamber of 90 degrees ± 1 degree during force output testing.

7.2.2.5 Apply 690 to 830 kPa (100 to 120 lbf/in²) (gage) air pressure to the parking chamber to fully compress the power spring (if applicable).

S-Cam Actuator



Wedge Actuator

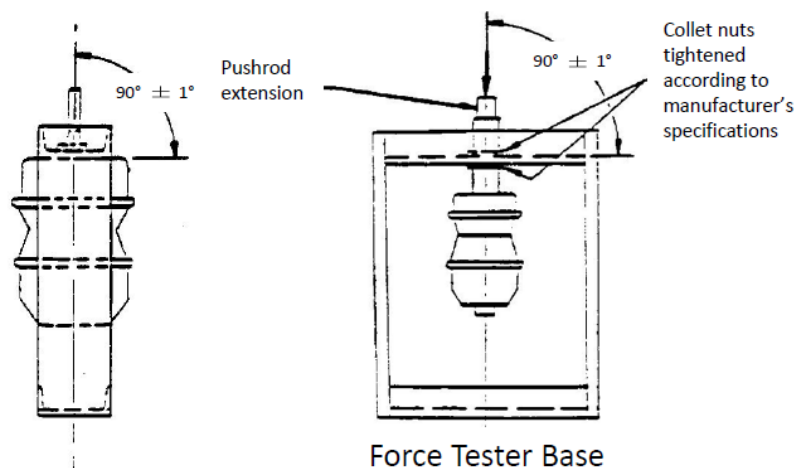


Figure 3 - Force output test fixture schematic