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SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1450

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Air Brake Actuator Diaphragm Test Procedure

1. ***Scope—***This SAE Recommended Practice is intended for, but not limited to, testing of reinforced air brake diaphragms as they are used in vehicle service or parking brake systems.

1.1 **Purpose—**This document establishes accelerated laboratory test procedures for evaluating air brake actuator diaphragms to determine performance in various functional modes and environmental conditions.

2. ***References—***There are no referenced publications specified herein.

3. ***Test Sample Inspection—***Test diaphragm should meet all dimensional, material, and other requirements specified on part drawings.

4. ***Leakage at Room Temperature—Parking and Service Chamber—***Assemble diaphragm test sample into a clean brake actuator in accordance with actuator manufacturer's recommendation. Connect actuator to air supply. Apply 862 kPa ± 34 kPa (125 lbf/in^2 ± 5 lbf/in^2) (gage) to the system. Limit the stroke to 75% ± 5% of the rated stroke and cycle 10 to 15 times. (Rated stroke is defined as the manufacturer's recommended stroke. Therefore, the rated stroke will vary according to manufacturer.) Room temperature to be 27 °C ± 11 °C (80 °F ± 20 °F).

Measurement of leakage may be in either of two ways:

4.1 **Pressure Drop—**Chamber to be connected to a 20 484 cm^3 ± 819 cm^3 (1250 in^3 ± 50 in^3) reservoir. Shut off air supply to the reservoir and allow the system (actuator and reservoir) to stabilize for 1 min. Measure total pressure drop over a 10 min period.

4.2 **Flow Rate—**Leave air supply connected to the actuator. An adequate flow meter must be connected to the air supply. Measure the flow rate after the actuator pressure has stabilized.

5. ***Low Temperature Evaluation—***Place actuator assembly, including specified return spring, into an environmental chamber with temperature maintained at −40 °C ± 1.1 °C (−40 °F ± 2 °F). Connect actuator to a 20 484 cm^3 ± 819 cm^3 (1250 in^3 ± 50 in^3) air reservoir pressurized to test pressure and located in the environmental chamber. Soak for 16 h minimum with actuator at zero pressure prior to performing any tests. If more than one test is to be performed on the same actuator, soak for an additional 1 h between tests.

Push rod angle must not be greater than 10 degrees from its true centerline.

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5.1 Low Temperature Flex Test—Service Chamber—Stroke actuator to 75% ± 5% rated stroke with 690 kPa ± 34 kPa (100 lbf/in^2 ± 5 lbf/in^2) (gage). Release air pressure to atmospheric pressure and measure time required to return to zero stroke. If actuator fails to return to zero stroke within 60 s, return manually. (Return force can be measured.) Repeat for a total of three strokes in rapid succession.

5.2 Low Temperature Leakage Test—Parking and Service Chamber—Apply 862 kPa ± 34 kPa (125 lbf/in^2 ± 5lbf/in^2) (gage) to the actuator. Limit stroke to 75% ± 5% of the rated stroke and cycle a maximum of three strokes in rapid succession. Measure leakage according to either 4.1 or 4.2.

5.3 Room Temperature Leakage Test—Parking and Service Chamber—Remove actuator from environmental chamber and allow to return to room temperature 27 °C ± 11 °C or (80 °F ± 20 °F). Repeat leakage test per Section 4.

6. Cycle Test

6.1 Service Actuator—Service actuator to be leak tested per Section 4 prior to cycle test. Install actuator on test stand. Cycle at the following conditions:

a. Stroke—0 to 75% ± 5% of rated stroke to be controlled by mechanical stop.
b. Pressure—0 kPa to 517 kPa ± 34 kPa (0 to 75 lbf/in^2 ± 5 lbf/in^2) (gage)
c. Resisting Force—Resisting actuator to be the same size as test unit. Set at 103 kPa ± 34 kPa (15 lbf/in^2 ± 5 lbf/in^2) (gage) at zero stroke with an increase to 310 kPa ± 34 kPa (45 lbf/in^2 ± 5 lbf/in^2) (gage) at 75% ± 5% rated stroke.
d. Cycle Rate—10 to 20 cycles/min
e. Room Temperature—27 °C ± 11 °C (80 °F ± 20 °F).

Repeat leakage test per Section 4 following cycle test. Disassemble actuator, inspect diaphragms, and record results.

6.2 Parking Actuator—Parking actuator to be leak tested per Section 4 prior to cycle test. Install actuator on test stand. Cycle at the following conditions:

a. Stroke—0 to 75% ± 5% of rated stroke to be controlled by mechanical stop.
b. Pressure—0 kPa to 690 kPa ± 34 kPa (0 to 100 lbf/in^2 ± 5 lbf/in^2) (gage).
c. Resisting Force—Resisting actuator to be same size as test unit. Set resisting force by starting with 103 kPa ± 34 kPa (15 lbf/in^2 ± 5 lbf/in^2) (gage) increasing until 75% ± 5% of rated stroke is reached.
d. Cycle Rate—10 to 20 cycles/min
e. Room Temperature—27 °C ± 11 °C (80 °F ± 20 °F).

Repeat leakage test per Section 4 following cycle test. Disassemble actuator, inspect diaphragms, and record results.

7. Arctic Diaphragm Test—Perform test per Section 5 except low temperature tests are to be run at –54 °C ± 1.1 °C (–65 °F ± 2 °F).

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