

# **SURFACE VEHICLE RECOMMENDED PRACTICE**

Submitted for recognition as an American National Standard

**SAE J1610**

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## **TEST METHOD FOR EVALUATING THE SEALING CAPABILITY OF HOSE CONNECTIONS WITH A PVT TEST FACILITY**

**1. Scope**—This test method provides a standardized procedure for evaluating the sealing capability of a hose connection or any of the individual components of the connection with a pressure, vibration, and temperature (PVT) test facility. This test method consists of a test procedure which includes vibration and coolant flow (#1) and a similar test procedure specified without vibration or coolant flow (#2). Any test parameters, other than those specified in this SAE Recommended Practice, are to be agreed to by the tester and the requestor.

### **2. References**

**2.1 Applicable Documents**—The following publications form a part of this recommended practice to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J962—Formed Tube Ends for Hose Connections

SAE J1508—Hose Clamps Specification

**3. Materials and Equipment Required**—Unless otherwise specified, the components for evaluating a hose connection should include:

**3.1** Hose molded to consistent ID and OD and cut to a minimum length of 400 mm (16 in).

**3.2** Hose connectors per SAE J962.

**3.3** Series Type F hose clamps per SAE J1508.

**3.4** PVT test facility

**3.5** An ethylene glycol/water (50/50 volume) mixture with appropriate inhibitors.

### **4. Preparation of Test Components**

**4.1** All pertinent information of the components (ID, OD, type of materials, etc.) should be documented before assembly.

**4.2** The sealing surfaces should be cleaned of all foreign materials for the test.

**4.3** An ethylene glycol/water (50/50 volume) mixture should be used as an assembly aid for the hose and connector unless another lubricant or no lubricant is specified for the test.

**4.4** The Type F clamps should be torqued to 3.4 Nm (30 in-lb) unless otherwise specified in the requestor's test requirements.

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4.5 After assembly, each hose connection should be evaluated by pressure testing to 345 kPa (50 psi) for a minimum of 60 s unless otherwise specified in the requestor's test requirements.

**5. Test Procedure #1—With Vibration and Coolant Flow**

5.1 Raise the temperature of the chamber from ambient to 121 °C (250 °F) at an approximate rate of 2 to 4 °C (3 to 7 °F) per minute.

5.1.1 Heat the coolant to 113 °C ± 8 °C (235 °F ± 15 °F).

5.1.2 Flow coolant through hose assembly at an approximate rate of 20 L/min (5 gal/min).

5.1.3 Vibrate one end of the hose assembly at an amplitude of 12.5 mm (0.5 in) and a total displacement of 25 mm (1 in) at 0.5 Hz.

5.1.4 Pressure cycle the hose assembly from 69 kPa ± 14 to 193 kPa ± 14 (10 psi ± 2 to 28 psi ± 2) at a rate of 2 to 4 cycles per minute.

5.1.5 Estimated time - 1 h.

5.2 Maintain the temperature of the assembly at 104 °C (220 °F) and continue the following test conditions for 1 h.

NOTE: The temperature of the hose assembly must be at a minimum of 104 °C (220 °F) for this 1 h period.

5.2.1 Continue flowing coolant through the hose assembly.

5.2.2 Continue vibrating the hose assembly.

5.2.3 Continue pressure cycling the hose assembly.

5.3 Reduce the chamber temperature to -40 °C (-40 °F) at an approximate rate of 2 to 4 °C (3 to 7 °F) per minute.

5.3.1 Coolant heaters should be off.

5.3.2 Flow of coolant should be off.

5.3.3 Vibration system should be off.

5.3.4 Pressure cycling should be off.

5.3.5 Estimated time - 4.5 h.

5.4 Soak the hose assembly at -40 °C (-40 °F) for 0.5 h.

NOTE: The temperature (surface) of the hose assembly must be 32 °C (-25 °F) or lower for this 0.5 h period. The thermocouple should be placed between the hose and the tube before the clamp.

5.4.1 Coolant heaters should be off.

5.4.2 Flow of coolant should be off.

5.4.3 Vibration System should be off.

5.4.4 Pressure cycling should be off.

5.5 At -40 °C (-40 °F), after the 0.5 h soak, start the following test sequence:

5.5.1 Heat the coolant to 24 °C (75 °F).

5.5.2 Flow coolant through the hose assembly at an approximate rate of 20 L/min max (5 gal/min).

- 5.5.3 Vibrate the hose assembly at an amplitude of 12.5 mm (0.5 in) and a displacement of 25 mm (1.0 in) at a frequency of 0.5 Hz.
- 5.5.4 Pressure cycle the hose assembly from 69 kPa  $\pm$  14 to 193 kPa  $\pm$  14 (10 psi  $\pm$  2 to 28 psi  $\pm$  2) at a rate of 2 to 4 cycles per minute.
- 5.5.5 Estimated time - 0.5 h.
- 5.6 Raise the chamber temperature from -40 °C (-40 °F) to ambient and repeat the test cycle.
- 5.6.1 Estimated time to return to ambient - 0.5 h.
- 5.6.2 One test cycle is approximately 8 h.
- 5.6.3 The end of the testing is 15 complete test cycles, approximately 120 h.
6. **Test Procedure #2**—Without Vibration or Coolant Flow—The test procedure for this requirement does not include vibration or coolant flow. This procedure is similar to Test Procedure #1 except for the steps specified for flow and vibration.
7. **Report**—The test report should document the pertinent details of the entire test including the actual test conditions at the time of a failure, if experienced. The waveform used in the pressure cycle is optional and should be stated in the test report. The criteria for a failure should be any visible coolant leakage from the assembly unless otherwise specified in the requestor's test requirements. The reported data should include the date, time, number of hours, number of PVT test cycles, chamber temperature, coolant temperature, coolant pressure, and any related comments.

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