

**RESISTANCE TO EXHAUST GAS CONDENSATE FOR RUBBER AND PLASTIC****Application**

This procedure is used to determine the resistance of parts and materials to continuous exposure of automotive exhaust. This method is to test the integrity and robustness of plastic and elastomeric body plugs located near the tail pipe of a vehicle, which may be continuously or intermittently exposed to exhaust gases.

Apparatus and Materials Required**Mechanical Convection Oven**

Capable of maintaining 120 +/- 2 °C

Pressure Vessel

Parr Instrument Company
Moline, IL USA
<https://www.parrinst.com/>

1L Blank Head Pressure Vessel
Product Code: 4600-1L-T-RD-2000

- Max Operating Pressure 1900 psi
- Max Operating Temperature 350 °C
- Vessel Size (Volume) 1 L
- Material T316 Stainless Steel

A vessel from another manufacturer may be used for testing - it must have the same properties as those listed above. Max pressure and temperature properties greater than those listed are permitted.

Synthetic Exhaust Condensate

Prepare the condensate by dissolving the following chemicals into deionized water:

- Anhydrous Sodium Sulfate (Na_2SO_4) – 7.391 +/- 0.001 g
 - Sodium Chloride (NaCl) – 0.165 +/- 0.001 g
 - Sodium Nitrate (NaNO_3) – 0.137 +/- 0.001 g
 - Concentrated Formic Acid (HCOOH) – 0.100 +/- 0.001 g
1. Weigh each salt into a weighing boat or weighing paper using an analytical balance, and then transfer to a 1 L volumetric flask.
 2. Weigh the formic acid using a small glass vial or beaker, and then rinse to the volumetric flask using deionized water.
 3. Add deionized water to the flask to allow the salts to dissolve. Once the salts have completely dissolved, dilute to 1 L volume.
 4. Measure pH of fresh synthetic exhaust condensate solution and report pH value. The value shall be in the 3.3 – 3.5 range.

Chemicals, materials, parts, and equipment referenced in this document must be used and handled properly. Each party is responsible for determining proper use and handling in its facilities.

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**Documents**

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Procedure

1. Place 200 mL of synthetic exhaust condensate solution within the pressure vessel (Safety Precaution: Never fill vessel with more than 300 mL of fluid).
2. If the part or material to be tested does not fit within the pressure vessel, it is acceptable to trim it down to fit inside. See Figure 1. Samples do not need to be fully submerged in synthetic exhaust condensate solution.
3. Seal pressure vessel and place in oven at 120 °C for 72 h or as specified in engineering document.
4. Remove pressure vessel from oven and allow to cool to room temperature. Evaluate the samples per evaluation criteria below.
5. If part/material is unchanged, place it back into the oven at 120 °C for 72 h or as specified in engineering document.
6. Remove pressure vessel from oven and allow to cool to room temperature. Evaluate samples a second time per the evaluation criteria.

Evaluation

Gently flex the samples by hand and visually inspect them for evidence of embrittlement, softening, staining, blistering, flaking, chipping, checking, chalking, cracks, splits, sinks, bulges, tackiness, peeling or delamination. Report any changes from the original condition.



Figure 1: Body plug in pressure vessel with synthetic exhaust condensate.