



Filiform Corrosion Test Procedure for Painted Aluminum Wheels and Painted Aluminum Wheel Trim

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This standard defines a procedure that was developed for generating and evaluating filiform corrosion on painted aluminum wheels and painted aluminum wheel trim. This test has been used to evaluate the effectiveness of process and material changes with respect to filiform corrosion on aluminum wheels or trim. This procedure has also been used to evaluate filiform corrosion on painted aluminum body panels and parts. Unless otherwise noted, the procedure for testing these parts is identical to that used for testing wheels.

1.2 Applicability. Evaluation of the filiform corrosion resistance of painted aluminum components.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM B368 ASTM D1193 SAE J2634

2.2 GM Standards/Specifications.

GMW14458 GMW14885 GMW15282

2.3 Additional References.

Drawing DWO-4828

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Copper Accelerated Acetic Acid Salt Spray (CASS) cabinet per GMW14458 or ASTM B368.

3.2.2 Humidity cabinet per the requirements of 4.3.1.

3.2.3 Scribe Tool. A straight-shank tungsten carbide tip, lathe cutting tool or carbide-tipped pencil type tools with tip angle of 60 degrees $\pm$ 15 degrees or equivalent.

3.2.4 Continuity Tester. An electrical ohmmeter with needle tips should be used to ensure that based bare metal (electrically conductive) is exposed along each entire scribe line.

3.2.5 Millimeter Scale (Ruler). Any scale (or ruler) with 1 mm divisions may be used. A transparent scale is helpful for obtaining the measurements.

3.2.6 Camera. Any camera with the capability to take photographs as required in 5.3.3.

3.3 Test Vehicle/Test Piece.

3.3.1 Control Samples. Control samples must be included in every test to assure that the test conditions are normal. See 4.3.2 for selection and validation of the control samples. Consult GM North America (GMNA) Materials Engineering for further guidance.

3.4 Test Time.

Calendar time:	28 d
Test time:	678 h
Coordination time:	1 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Test technician familiar with test facilities and equipment.

4 Procedure

4.1 Preparation. Not applicable.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Filiform Test Procedure.

4.3.1.1 Check the humidity cabinet for the temperature, humidity, air flow and exhaust vent settings. Correct any discrepancies from predetermined levels.

- Temperature $60\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$.
- Humidity $85\text{ }^{\circ}\text{C} \pm 3\%$ Relative Humidity (RH).
- Air Flow 6 m/minute to 24 m/minute (20 ft/minute to 80 ft/minute) in the test area.

4.3.1.2 Control samples (reference 4.3.2) which have been evaluated over a period of time and have a known filiform growth rate must be tested with every batch of test samples to assure test consistency.

4.3.1.3 Mark the samples to be tested with the proper identification. Make sure that identification (ID) location will not affect test results. Preferably mark on back of sample.

4.3.1.4 Visually examine the painted surface and record any adverse conditions, such as sags, paint films porosity, scratches, etc., on the schematic drawing. Measure the paint film thickness over the area to be scribed and record this on the schematic drawing. The film thickness will vary depending on the particular paint system being measured.

4.3.1.5 Scribe the painted wheel to the base metal with carbide tip scribing tool per GMW15282 or SAE J2634. The scribe must be as close to perpendicular to the machine lines on the wheel as possible. A fixture is recommended (contact GMNA Materials Engineering for drawing DWO-4828, refer to Appendix A, Figure A1) in order to make a straight scribe line on the test sample. Check the scribe line, with multimeter, to assure electrical continuity from end to end. To do this, probes of the multimeter are first touched together to assure that the meter does read a completed electrical circuit. After the meter is checked, ground one of the probes to the sample, then run the other probe down the full length of the scribe. There must be electrical continuity down the full length of the scribe. If continuity is not continuous, a fresh scribe must be made. This may be done on the same sample if there is at least 15 mm of separation from the old scribe. Continuous continuity will assure that the scribe exposes the base metal. Particular care must be taken to scribe through multiple layers of paint.

4.3.1.6 Place the scribed parts in the CASS cabinet such that the wheel and scribe are at an angle of approximately 45 degrees to the horizontal on a suitable non-metallic rack.

4.3.1.7 Expose the parts for $6\text{ h} \pm 15\text{ minutes}$ in the CASS cabinet as described in GMW14458 or ASTM B368. The scribe must be fully exposed to the CASS fog settling on the part. The scribe should be at approximately 45 degrees to allow no puddles of the solution on the part.

4.3.1.8 Prepare a container, approximately 19 L (5 gal) in size, with a constant overflow of deionized water that meets the latest issue of ASTM D1193 (Type IV). The deionized (DI) water must enter the bottom of the container to promote flushing of any contamination out of the container with the overflowing water. Dip-rinse the parts in