



Cycle - Immersion Corrosion Test for Stainless Steel Molding Materials

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 describes a test procedure intended to simulate the corrosive environment encountered by the exterior stainless steel moldings on automobiles operating where highly corrosive agents are used for winter road deicing and/or where high corrosion load near coastal regions does exist.

1.2 Applicability. This is a corrosion test used for validation testing (cosmetic and/or functional/general durability), development testing, and quality control testing of stainless steel exterior moldings.

1.3 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

ASTM D1193

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- Alconox detergent available at: alconox.com/product-catalog/
- Component Technical Specification (CTS)
- Subsystem Technical Specification (SSTS)
- Whatman filter paper available at: thomassci.com/scientific-supplies/Whatman-Filter-Paper

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.

3.1.3 An automatic cycle timer and elevating mechanism to raise and lower test samples to specified requirements of section performance of test.

3.1.4 Heat Source. Air-circulating oven capable of maintaining $41^{\circ} \pm 2^{\circ} \text{C}$ and $< 30\%$ relative humidity (RH). Airflow across samples should reach 0.25 m/s (50 ft/minute) or less.

3.2 Equipment.

3.2.1 Electrometric meter to be used for checking pH of solution.

3.2.2 Analytical balance with ± 0.1 mg sensitivity.

3.2.3 Glass beaker; 300 mL with a height of 115 mm minimum.

3.2.4 Glass beakers; 1 L and 3 L.

3.2.5 Type J or K thermocouple.

3.2.6 Clear plastic grid 50 mm × 50 mm with 3 mm squares as outlined by 0.25 mm thick lines.

3.2.7 Test Solution.

- 0.5 g ± 0.002 g anhydrous, reagent grade Sodium Sulfate (Na₂SO₄).
- 0.25 g ± 0.002 g anhydrous, reagent grade Sodium Sulfite (Na₂SO₃).
- 0.1 g ± 0.002 g anhydrous, reagent grade Sodium Thiosulfate (Na₂S₂O₃).
- 52.5 g ± 0.1 g reagent grade Sodium Chloride (NaCl).
- 52.5 g ± 0.1 g reagent grade Calcium chloride dihydrate (CaCl₂ · 2H₂O).
- Deionized water (per ASTM D1193, Type IV).

Note: These reagents should be stored in a desiccator container (over calcium sulfate).

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time.

Calendar time:	1 d
Test time:	1 h
Coordination time:	2 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.

4.1.1 Solution Preparation.

4.1.1.1 Weigh out all reagents to the designated accuracy.

4.1.1.2 Add (25 ± 5) mL of deionized water to a clean 3 L beaker and slowly add the first four (4) reagents in the order listed (i.e., Sodium Sulfate, Sodium Sulfite, Sodium Thiosulfate, Sodium Chloride); each reagent must be dissolved and thoroughly mixed before the next reagent is added. Label resultant mixture as Solution A.

4.1.1.3 Add (525 ± 5) mL of deionized water to a clean 1 L beaker and slowly add the calcium chloride reagent. Dissolve and thoroughly mix solution until clear. Label resultant mixture as Solution B.

4.1.1.4 Add Solution B to Solution A with continuous stirring of the composite solution; too rapid an addition of Solution B may cause the precipitation of calcium sulfate. If a precipitate forms, gravity filter through No. 42 Whatman filter paper (or equivalent) and discard precipitate.

4.1.1.5 Adjust the pH of the solution to 9.3 ± 0.1 at room temperature (25 ± 5) °C immediately after preparation (using dilute Sodium Hydroxide (NaOH) and/or dilute Hydrochloric Acid (HCL) reagent grades).

Note: Shelf life of the test solution: Store the solution in stoppered brown glass bottles. The solution shall be used within 8 d following initial preparation with proper adjustments of pH at room temperature (25 ± 5) °C being made just prior to use in testing program.

4.1.2 Sample Preparation.

4.1.2.1 Cut samples to approximately 50 mm × 50 mm in a shear; punch a 5.5 mm diameter hole in the top edge and polish all the edges.

4.1.2.2 Wash samples in Alconox detergent solution (or equivalent) to achieve as near a water break-free surface as possible (i.e., scrub samples with nylon brush; soak samples (20 to 30) minutes; rescrub samples; re-soak samples 5 additional minutes using an (Alconox or equivalent) solution 8 g/L, at (43 ± 2) °C). Rinse cleaned samples, each with fresh room temperature (25 ± 5) °C water.

4.1.2.3 Immediately examine the samples visually for any pits, scratches, roughness, or other surface defects and record. Then begin test within 1 minute of cleaning.

4.2 Conditions.