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| GM | WORLDWIDE ENGINEERING STANDARDS | Material Specification | GMW16929 |

# Organic Clearcoats for Aluminum Trim Parts

## 1 Scope

**1.1 Material Description.** This specification covers requirements for organic coatings (paints) used to provide environmental protection for exterior aluminum applied parts. Coatings may be liquid or powder and may be applied over aluminum surfaces that are anodized (incompletely sealed) or chemically conversion coated.

**1.2 Symbols.** Not applicable.

**1.3 Applicability.** This coating is used to improve the chemical resistance of formed aluminum trim parts (window moldings, roof rack rails, etc.)

**1.4 Remarks.** This coating may be used to meet the requirements of GMW14665-DET-Class A.

## 2 References

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

**2.1 External Standards/Specifications.**

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|---|---|---|
| ASTM D7869 | ISO 2808 | SAE J2527 |

**2.2 GM Standards/Specifications.**

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|---|---|---|---|
| GMW3005 | GMW14334 | GMW14729 | GMW15777 |
| GMW3059 | GMW14458 | GMW14829 | GMW15891 |
| GMW3221 | GMW14665 | GMW14865 | |
| GMW14124 | GMW14698 | GMW14873 | |
| GMW14270 | GMW14701 | GMW15287 | |

## 3 Requirements

**3.1 Requirements on Test Specimens.** Reference GMW3221 Code B for sample conditioning before tests.

**3.2 Appearance.** Painted parts shall conform to GMW15777 Zone A requirements. There shall be no visible orange peel, and at least minimum visual appearance master standard(s) must be met.

**3.3 Coating Materials.** A summary of testing requirements is given in Table A1 and Table A2 in Appendix A for new approvals, Production Part Approval Process (PPAP), and for regular quality checks.

**3.3.1 Chemical Fingerprint.** The supplier must provide infrared data to document the fingerprint of the recommended formula. All materials subsequently supplied under this specification must correspond to the reference spectrum when compared under the same conditions. GM may conduct infrared spectrophotometry analysis of the material supplied to this specification. Analysis may also be performed on coating removed from representative samples that have film thickness and bake at target levels. The infrared spectra established for initial approval shall constitute a reference standard and shall be part of the submission package.

**3.3.2 Film Thickness.** The supplier shall report the thickness of anodizing and clearcoat layers individually. For each clearcoat technology, GM Materials Engineering and the supplier shall establish minimum and maximum values for each attribute which ensure all coating performance requirements are met.

**3.3.3. Cure.** Test per GMW15891. An appropriate solvent shall be specified by the paint manufacturer. Samples shall show no more than slight, barely observable change to the paint surface (maximum rating 1).

**3.4 Coating Performance.**

**3.4.1. Initial adhesion.** Test per GMW14829 method A. Coating shall exhibit a rating of 0 or 1.

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**3.4.2. Humidity + Tape Adhesion.** Expose samples to 240 h of humidity per GMW14729. Samples shall exhibit a rating of 1 maximum after the environmental exposure. No cracks, blisters, delamination, or crazing are permitted after the exposure.

**3.4.3 Filiform Corrosion.** Expose samples according to GMW15287. Samples shall exhibit 4 mm maximum creepback from scribe line at the end of the test. No cracks, blisters, delamination, or crazing are permitted after the exposure. Also, there shall be no filament growth on the non-scribed test surfaces at the end of the test, excluding sample prepared cut edges.

**3.4.4. Acidified salt spray (CASS).** Expose samples according to GMW14458 for a minimum of 8 h. No base metal corrosion shall be permitted at the end of the test.

**3.4.5 Scratch Resistance.** Perform scratch resistance according to GMW14698, using Test Tip 1 (hemispheric), in the as-received condition and after 144 h of humidity per GMW14729. The spring tension at which the tip of the test rod just fails to penetrate the coating shall be recorded. A minimum spring tension of 4.00 N with no penetration is required.

**3.4.6 Automotive Environmental Cycling (GMW14124).** There shall be no coating cracking or adhesion loss after 15 cycles of Cycle A plus 96 h of humidity (GMW14729). Adhesion (GMW14829) must be run after humidity. A maximum rating of 1 is allowed.

**3.4.7 Simulation of Car Wash Installations (GMW14865).** This test must be run on flat panels. After 200 test strokes, there shall be no more than a 20% change in gloss value (examples: an initial gloss reading of 80 shall not be reduced to lower than 64, and an initial gloss reading of 20 shall not be reduced to lower than 16). In order to effectively measure this gloss change, it may be helpful (or necessary) to evaluate the clearcoat as applied to a black E-coated (electrocoated) standard panel. Coating tested may also compare favorably to a control sample consisting either of bare, sealed, anodized aluminum or of an approved body basecoat/clearcoat (BC/CC) system. Final acceptability judgment is to be made by GM Engineering.

**3.4.8 Resistance of Coatings to Chemical Etching and Distortion. For initial approval, samples must achieve the following minimum ratings for materials listed in GMW14701:**

- Rating 8: Egg Albumin, Acid Rain pH 3 and pH 4, Sulfuric Acid pH 4.
- Rating 6: Sulfuric Acid pH 0 and pH 2.
- Not required: Brake Fluid.
- Rating 10: All other materials listed in GMW14701.

Any temporary/reversible changes in the coating due to exposure to any material must be reported to Materials Engineering.

**3.4.9 Resistance to Cleaning Agents.** Test per GMW14334, using agents appropriate for exterior paints. A rating of 2 is required at the end of the test.

**Note:** Cleaning compounds appropriate for and available in vehicle operating areas shall be used.

**3.4.10 Weathering.** Accelerated weathering tests (Xenon) are used as an aid in predicting long-term durability performance (outdoor weathering). All tests must be conducted with control samples painted with an approved body BC/CC system. Outdoor exposure performance takes precedence over accelerated exposure performance in the event of disagreement.

**3.4.10.1 Accelerated Weathering (Xenon Exposure).** Exposure is according to SAE J2527 or ASTM D7869 plus 96 h humidity per GMW14729 and tape adhesion per GMW14829. Total test exposure is to be 3500 kJ, with a minimum of 70% gloss retention (unpolished) (or 80% polished) and no cracking. Samples shall have a maximum adhesion rating of 1 after xenon exposure + 96 h humidity + tape adhesion. Inspect test materials per GM Engineering agreement, throughout the test. Rate panels for gloss and Distinctness of Image (DOI) retention, cracking, color change, and yellowing. Evaluate polish back (hand polish only), if gloss retention is below minimum specification, using a non-abrasive polishing compound.

**3.4.10.2 Outdoor Weathering of Automotive Exterior Materials (GMW14873).** Requirements for these aluminum clearcoats parallel the requirements for GMW3005 Class 2, Type B. Coatings must have a minimum of 24 months exposure on the exact system and five years on the prototype system prior to production release. Five south black box exposure is to be followed. A minimum of two samples per exposure duration must be tested (one for appearance and one for further testing). Total five-year test duration and yearly sample performance criteria are given in GMW3005 (Class 2).

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