



Lithoprint for Aluminum Substrates

1 Scope

This specification covers the performance requirements of decorative lithoprints applied to aluminum substrates for interior hardware applications. Processes may include not only conventional lithography but also any aluminum decoration via inks, textures, etc., that are not classified as anodize (reference GMW14665) or paint (reference GMW14669). For 2nd surface lithoprinting on thermoplastic film, refer to GMW16717. Interior applications shall be defined as being readily visible and not directly exposed to outdoor weathering.

1.1 Material Description. Not applicable.

1.2 Symbols. Not applicable.

1.3 Applicability. Decorative metallic trim pieces for instrument panels, steering wheel, console, doors, sills, etc.

1.4 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

ISO 105-A02 ISO 20433

2.2 GM Standards/Specifications.

GMW3059	GMW14124	GMW14665	GMW14829
GMW3208	GMW14162	GMW14669	GMW14872
GMW3417	GMW14334	GMW14698	GMW15272
GMW6992	GMW14444	GMW14704	GMW16717
GMW14093	GMW14445	GMW14729	GMW16853

2.3 Additional References.

American Association of Textile Chemists and Colorists (AATCC) Evaluation Procedure 2
Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02

3 Requirements

3.1 Requirements on Delivery.

3.1.1 Chemical Requirements. Not applicable.

3.1.2 Mechanical Requirements. Not applicable.

3.1.3 Physical Requirements.

3.1.3.1 Test Samples. All samples for appearance or performance evaluations shall be prepared using production-intent materials and processes. Product process steps shall be documented and reported. Film thickness of any coating(s) also shall be documented and reported.

3.1.3.2 Finish. Appearance of the finished parts shall be equal to or better than the approved engineering sample when viewed under the conditions set forth in GMW6992.

3.2 Performance Requirements. Parts or test plaques prepared by normal production practices shall be subjected to tests listed in the following after a minimum aging period of 72 h following the baking or drying cycle.

Parts and/or plaques shall be tested under standard laboratory conditions of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $50\% \pm 5\%$ Relative Humidity (RH). All testing is detailed in the following subsections and in Appendix A, Tables A1 and A2.

3.2.1 Adhesion. There shall be no adverse appearance effects (e.g., blisters, cracking, film lifting, etc.) when the lithoprint is examined immediately after the following tests. The print shall not lift more than 1.5 mm from the intersection of the scribed test lines (GMW14829, Method B, for curved surfaces) or more than 5% of a standard test area (GMW14829, Method A, for flat surfaces). Brittleness of the print as evidenced by flaking or chipping while scribing shall be cause for rejection.

3.2.1.1 As-received tape adhesion per GMW14829, Method A or B (respectively, for flat or curved surfaces).

3.2.1.2 Twenty-Four Hour (24 h) Humidity Test (GMW14729), followed by Tape Adhesion Test (GMW14829, Method A or B (respectively, for flat or curved surfaces)).

3.2.1.3 Two hour (2 h) Water Immersion Test per GMW14704.

3.2.2 Colorfastness to Artificial Light (GMW14162). Samples shall show no loss of adhesion, objectionable gloss level change, objectionable color change or other visible surface deterioration after the following exposures: GMW14162, Method D, (1240.8 kJ/m^2). For sill plates, test to 300.8 kJ/m^2 (GMW14162, Method D). (For reference, interior paint requirements of GMW14669-B1 must be met.) After these exposures, samples shall be placed in humidity for 24 h per GMW14729, followed by a tape adhesion test per GMW14829, Method A, if flat surface, or Method B if curved surface. The samples shall meet the requirements as listed in 3.2.1 of this specification.

3.2.3 Natural Weathering. Test per GMW3417-L1-F2-G1-Tx. The requirements are to be met after the following exposures.

3.2.3.1 Horizontal Direct-sun Exposure. 110 000 Temperature Normalized Radiation (TNR) Langley's at $102\text{ }^{\circ}\text{C}$ (T5) for (example, top of instrument panel).

3.2.3.2 Vertical Direct-sun Exposure. 55 000 TNR Langley's at $93\text{ }^{\circ}\text{C}$ (T4) for (example; upper door trim, steering wheel), and all areas with lower exposure.

3.2.3.3 Concealed Surface. 10 000 TNR Langley's at $85\text{ }^{\circ}\text{C}$ (T3) for sill plates which are concealed by door.

3.2.3.4 After preceding exposures, samples shall be placed in humidity for 24 h per GMW14729, followed by a tape adhesion test per GMW14829, Method A, if flat surface, or method B if curved surface. The samples shall meet the requirements as listed in 3.2.1 of this specification.

3.2.4 Wear Resistance. There shall be no wear-through of the print or pattern after 750 cycles of the Taber abraser per GMW3208 (CS10 Wheel and 500 g load).

3.2.5 Effects of Cleaners.

3.2.5.1 For each of the following cleaners listed, apply ten (10) drops for 1 minute to paint at room temperature. Per ISO 20433, perform ten (10) double strokes of approximately 50 mm in length. Evaluate color transfer to the crock cloth and color change on the test plaque.

- Ammoniated Window Cleaner (North America)
- Fantastik or Formula 409 All Purpose Cleaner (North America)
- Armor All Cleaner (North America)
- Armor All Protectant (North America)

Note: For all other regions, if the cleaners listed are not available, use appropriate cleaners commonly used locally for automotive interiors.

3.2.5.1.1 There shall be no discoloration of paint film or transfer of paint or color coat to the cloth. The white cheesecloth shall have an AATCC rating of Class 4 or better on the chromatic transfer scale, see AATCC Evaluation Procedure 2 or ISO 105-A02.

3.2.6 Odor. See GMW16853 for procedure and requirement.

3.2.7 Fogging. See GMW16853 for procedure and requirement.

3.2.8 Emissions Testing of Interior Materials and Parts. For all Code E designated parts per GMW14444, reference GMW16853 for emissions testing of interior materials and parts.

3.2.9 Impact Resistance. Applicable to trim materials that are horizontal or within 30 degrees of horizontal. Test per GMW14093, Code 3, 1J. Use one (1) of three (3) test apparatuses, unless specifically specified on drawing. There shall be no observable deformation beyond 5 mm measured in any direction.

3.2.10 Dimensional Stability. Expose sample material to 2 cycles of GMW14124, Cycle M. There shall be no significant changes of surface appearance, including color, gloss, crazing, cracking, warping or other dimensions.

3.2.11 Resistance to Perspiration. Test per GMW14334, Code C, and 24 h immersion in both acidic and alkaline solutions at room temperature. Performance rating of 1 is required.

3.2.12 Sunscreen and Insect Repellent Resistance. Test per GMW14445. A performance rating of 1 or 2 is required. The exposed area of coating shall not show removal after a 1 mm hemispherical tip weighted with an 8 N load has been dragged across the surface per GMW14698.

3.2.13 Scratch Resistance. Coated surface shall not show penetration to metal substrate where the 1 mm hemispherical tip weighted with an 8 N load has been dragged across the surface per GMW14698.

3.2.14 Corrosion Resistance. Test to GMW14872 criteria according to location of material in vehicle. Performance criteria per GMW15272.

3.2.14.1 Secondary Surface (SS) Outside Weatherstrip (O/WS). Example: Sill plate step pad.

3.2.14.2 Secondary Surface (SS) Inside Weatherstrip (I/WS).

3.2.14.3 Interior (INT) Low. Contacts wet areas, such as carpet, lower 200 mm of door or cupholder.

3.2.14.4 Interior (INT) Mid-high. Typical instrument panel (IP), console or upper door trim.

3.3 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of bulk supplies.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.

5.4 Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS). For new product submissions, or when a change in chemical composition of an existing product has occurred, a complete copy of the Material Safety Data Sheet/Safety Data Sheet must be submitted in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific MSDS/SDS requirements. In addition, product MSDS/SDS submissions must be in compliance with specific country General Motors S&IH TS 3.4-160-02 where available.