



Qualification of Blackout Coating (Frit) for Automotive Glazing

1 Scope

This specification describes the performance requirements for a glass blackout system (frit) on automotive glass. Materials qualified to this specification are suitable for bonding and sealing with GM approved glass bonding adhesive sealing compounds and compatible glass primers. Additionally, this requirement will be used to document existing glass blackout (frit) materials that are and have been used for GM automotive glass. Only materials approved to this requirement may be used for blackout on automotive glazing on GM vehicle programs. This specification is only applicable for free edge glazing.

1.1 Material Description. The material is typically, but not restricted to, a ceramic enamel blackout paint that is screen printed on and baked in the automotive glass manufacturing process. Glass blackout systems approved to this specification have met the performance requirements of GMW3136, Automotive Safety Glazings, and GMW3041, Performance Requirements for Bonding and Sealing of Stationary Automotive Glass.

1.2 Symbols. Not applicable.

1.3 Applicability. Typical applications include windshields, backlights, fixed liftgates, fixed side and encapsulated glass.

1.4 Remarks. The test procedures and performance requirements contained in this specification are to serve as a template for glass and adhesive manufacturers to assist them in the determination of the acceptability of their products in the applications per 1.3.

2 References

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

2.1 External Standards/Specifications.

ASTM D523 ISO 7724-1 SAE J1545 VDA 2021

2.2 GM Standards/Specifications.

GMW3041 GMW3059 GMW3136

2.3 Additional References.

TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

3 Requirements

3.1 Requirements on Delivery. Materials considered for use under this specification must meet all performance requirements as described in the Approval and Compatibility Section of GMW3041 and the Printing Flaws Section of GMW3136.

3.2 Material Selection by Region. Specific regional build requirements must be considered for qualification of these materials. Unique material properties may have an effect upon performance. Adhesive and glass primer system selection for use in qualifying a new glass blackout must be agreed to by the responsible GM Engineering group. Glass bonding materials will be defined in MATSPC (GM Materials File) upon approval of the blackout material candidate.

3.3 Sulfuric Acid (H₂SO₄) Resistance. Reference Verband Der Automobilindustrie E.V. (German Automobile Industry Association) VDA 2021.

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3.3.1 Test Samples. A minimum of three (3) test samples, 100 mm × 100 mm, shall be used. Production representative glass test plaques may be used when production-made samples are not available. These shall be stress free tempered at 450 °C and cooling down for a minimum of 10 h prior to test. Approval of test samples will be at the discretion of GM Engineering.

3.3.2 Test Solution. A 0.1 normal sulfuric acid (H₂SO₄) solution in a solution resistant container capable of holding 500 mL without degradation during oven exposure.

3.3.3 Test Sample Exposure. Immerse test samples in the test solution to 20 mm and expose to 80 °C ± 2 °C in an air circulating oven 24 h for parts to consider the different firing process and burn in temperature of the black inks for tempered and laminated parts. The samples shall be placed such that unexposed printed area is left for end of test examination.

3.3.3.1 If sample parts do not meet the 24 h exposure, then samples parts will be run at 4 h, 8 h, 12 h, and 16 h exposure to define part capability. Report results to the responsible GM Engineering group.

3.3.4 Measurement. At the completion of exposure, remove the samples and rinse with distilled water and allow to air dry. Do not wipe or rub samples.

3.3.4.1 Color. Measure the test sample from the outside, and test the location, before and after acid exposure. Measure the sample per ISO 7724-1 or SAE J1545 (CIELAB color space, 10° to observer, metering orifice ≤ 10 mm, illuminant D65, 45°/0° measurement geometry).

3.3.4.2 Gloss. To be measured per ASTM D523.

3.3.4.3 Visual Color and Gloss Evaluation. Light intensity for visual evaluation shall be 1000 lux to 1600 lux.

3.3.5 Requirement. The color change shall not exceed three (3) units. Delta E (ΔE) of ≤ 3.0.

Note: Visual color or gloss change, that is considered objectionable, shall override the ΔE and/or gloss measurements.

4 Manufacturing Process

Firing times and temperatures to be defined at time of approval.

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 TMC003 Material Safety Data Sheet/Safety Data Sheet guidance documents where available.

5.5 All materials supplied to this standard must comply with the requirements of GMW3059, Restricted and Reportable Substances for Parts.

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