



Resin, Impregnation, Heat-Cured

1 Scope

1.1 Material Description. This specification describes requirements and tests for a heat-cured plastic resin intended for the impregnation of porous metal castings and powdered metal components. See 7.1.

1.2 Symbols. Not applicable.

1.3 Applicability.

1.3.1 Application Limit. Intended as a single application to components that don't initially pass final leak test due to porosity in the metal.

1.3.2 Usage and Temperature Limits. After impregnation, under no circumstances should the continuous or excursion product temperatures of the material manufacturer be exceeded. **This is a Class B product suitable for components operating in that continuous temperature range** (Table 1, shaded). Discuss with the resin supplier the nature and frequency of the excursions before making a selection. See Table 1, Class B. Do not confuse this with storage shelf-life, 3.7.3.

Table 1: Temperature Classification

Class	Maximum Continuous Temperature Limit (°C) ^{Note 1}	Maximum Excursion Temperature Limit (°C) ^{Note 2}
Class A	149	177
Class B	175	205
Class C	225	260
Class D	260	295

Note 1: The temperature classifications are consistent with MIL-I-17563C.

Note 2: Excursion time at temperature is determined by the resin manufacturer. Consult with them regarding your specific application before selecting your product.

1.3.3 Process Use Limits.

1.3.3.1 The product is applied after all heat treatments and before or after machining.

1.3.3.2 This product is only intended to seal porosity and no other process defect.

1.3.3.3 Use of impregnation product is strictly a temporary measure to resolve a porosity condition. The condition limits under which use is allowed are defined in the Component Technical Specifications (CTS) or the Statement of Requirements (SOR) for the part or component. If no provisions are stated, no impregnation is permitted.

1.3.3.4 Precautions. Resin use is recommended only as a temporary preventative measure to fill porosity contributing to air or fluid leak(s) until a metal forming process solution to eliminate porosity leakage is satisfactorily completed. The long term durability of this impregnation product is not known because it is rarely used. GMW3155 Testing of Impregnated Parts is highly recommended to assist in defining long term sealing performance.

1.3.3.5 Expired Product. Authorized use of this product past its expiration shall be determined from compliance to tests in this standard performed at the resin supplier and reviewed and approved by responsible GM personnel. Only product properly stored (see 3.7.3) in unopened original containers shall be tested.

1.4 Remarks.

1.4.1 This material is introduced into a cleaned part by a vacuum and/or pressure process. It reaches a cured state with the addition of heat.

1.4.2 Air leakage of the part or component determines before and after if the impregnation process is suitable. Consult the SOR or CTS for the part or component.

1.4.3 Resin discoloration may occur after impregnation. This is normal and shall not be cause for rejection of the component.

1.4.4 Normally pressure penetration testing occurs on non-machined specimens (see 3.8.3.5), however since machined parts are impregnated, the testing requires machined and etched surfaces.

2 References

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

2.1 External Standards/Specifications.

ASTM D92	ASTM D2196	ISO 2592	MIL-STD-276
ASTM D1475	ASTM E1252	MIL-I-17563	

2.2 GM Standards/Specifications.

GMW3059	GMW3221	GMW16076
GMW3155	GMW3420	GMW16444

2.3 Additional References.

- Component Technical Specifications (CTS)
- Metal Powder Products, 16855 Southpark Drive, Suite 100, Westfield, Indiana 46074-9373.

3 Requirements

3.1 Requirements on Test Specimens. Conditioning as specified in the referenced test. Reference GMW3221 Code A for unspecified conditioning.

3.1.1 Minimum Data Requirements. Compliance testing for initial approval will consist of data submitted from a minimum of three (3) production batches. One (1) of those batches will be at least 12 months old to evaluate compliance to 3.7.3 shelf life to the required tests in that paragraph.

3.2 Base Resin. Blend of Methacrylate monomers, see 3.8.1.

3.3 Visual Appearance. Clear, light amber liquid.

3.3.1 Fluorescence. The purchased product must fluoresce when examined (corrective vision) after illumination with a 365 nm black light. Use a black light intensity of 400 $\mu\text{W}/\text{cm}^2$ to 800 $\mu\text{W}/\text{cm}^2$.

3.4 Coolant Resistance. Test two (2) impregnated specimens. No air leakage is permitted, see 3.8.3.7.

3.5 Oil Resistance. Test two (2) impregnated specimens. No air leakage is permitted, see 3.8.3.8.

3.6 Resin Quality Control Tests.

3.6.1 Viscosity. ASTM D2196 Method A, (22.2 °C $\pm$ 0.5 °C, Brookfield LVT, ULA-EY UL adapter, 00 spindle, speed 6 rpm), 8 mPa·s to 16 mPa·s.

3.6.2 Density. ASTM D1475, 1.0269 g·cm⁻³ to 1.0341 g·cm⁻³ (8.60 lb·gal⁻¹ $\pm$ 0.03 lb·gal⁻¹).

3.7 Process Control Tests.

3.7.1 Resin Gel Time, Catalyzed. Three (3) minutes to 6 minutes, see 3.8.2 for the test conditions.

3.7.2 Flash Point. Ninety-three degrees Celsius (93 °C) minimum (Cleveland Open Cup per ASTM D92 or ISO 2592).

3.7.3 Shelf Life (Store Below 32 °C). One (1) year minimum. Product from an unopened container must meet all specification requirements (3.6 thru 3.7.3) after 1 year of storage. Store at or below 10 °C (follow label requirements).

3.7.4 Idle Pot Life (Open Time). Thirty days maximum at 23 °C $\pm$ 3 °C. If the product reservoir or storage container is not used for 30 consecutive days, then run 3.8.3 to confirm if draining and replacement of fresh product is necessary.