



Impregnation, Heat Cured Material

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, Heat-Cured Resin Process.

1.2 Symbols. Not applicable.

1.3 Applicability.

1.3.1 Application Limit. Intended as a **single application** to components that do not 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 your selection. See Table 1, Class A. Do not confuse this with storage shelf-life, see 3.7.4.

Table 1: Temperature Classification

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

Note 1: Excursion time at temperature is determined by the resin manufacturer. Consult with the resin manufacturer regarding the specific application before selecting a product.

1.3.3 Process Use Limits.

1.3.3.1 The product is applied after all heat treatments and before final 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 is highly recommended to assist in defining long term sealing performance.

1.3.3.5 Expired Product. Even if properly stored (see 3.7.4) **do not** use this product past its expiration or use before date. Do not contact GM Materials Engineering and request permission to use expired product.

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 3.8.4.5), 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 D1298	ISO 3104	MIL-STD-276A
ASTM D287	ASTM E1252	ISO 3675	
ASTM D445	ISO 2592	MIL-I-17563C	

2.2 GM Standards/Specifications.

GMW3059	GMW3221	GMW14270	GMW17332
GMW3155	GMW3420	GMW16444	

2.3 Additional References.

- CANNON-Fenske equipment available at www.cannoninstrument.com/en/product/manual-glass-viscometers/cannon-fenske-routine-viscometer--CANNON%20CF-Routine%20GV
- Cleveland Open Cup Flash Point Tester available at koehlerinstrument.com/products/cleveland-open-cup-flash-point-tester/
- Component Technical Specifications (CTS)
- Metal Powder Products, 16855 Southpark Drive, Suite 100, Westfield, Indiana 46074-9373.
- Statement of Requirements (SOR)

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 of those batches will be at least 12 months old to evaluate compliance to 3.7.4 shelf life to the required tests in that paragraph.

3.2 Base Resin. Blend of Methacrylate monomers, see 3.6.1.

3.3 Visual Appearance. Clear, 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 3.8.4.7.

3.5 Oil Resistance. Test two (2) impregnated specimens. No air leakage is permitted, see 3.8.4.8.

3.6 Resin Quality Control Tests.

3.6.1 Viscosity. ASTM D445 or ISO 3104, (25 °C, CANNON-Fenske Routine Viscometer 100 tube), 5 mPa•s to 20 mPa•s (10 cP $\pm$ 5 cP).

3.6.2 Specific Gravity. ASTM D287 or ASTM D1298 hydrometer or ISO 3675, 0.92 to 0.98.

3.7 Process Control Tests.

3.7.1 Emulsification. The un-catalyzed excess material must be washable from the treated component. Visually disperses in water, see 3.8.2.