GM	ENGINEERING STANDARDS	Material Specification	9986536

Resin, Impregnation, Anaerobic

1 Scope

1.1 Material Description. This specification describes requirements and tests for an anaerobic cure resin intended for the impregnation of porous metal castings and powdered metal components for transmission and engine applications. See 7.1.1.

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 (shaded, Table 1). Discuss with the resin supplier the nature and frequency of the excursions before making a selection. See Table 1. Do not confuse this with storage shelf life, see 3.9.5.

Table 1: Temperature Classification

Class	Maximum Continuous Temperature Limit (°C)	Maximum Excursion Note 1 Temperature Limit (°C)
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 manufacturer regarding the specific application before selecting the product.

1.3.3 Process Sequence.

1.3.3.1 The product is applied after all heat treatments and before or after 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. Suppliers are responsible for conducting fluid aging test of the impregnated articles (three (3) pieces) in Automatic Transmission Fluid (ATF) (transmission applications) per 3.10.5.9 or engine oil (engine applications) per 3.10.5.8 at 150 °C for 1008 h, or coolant per 3.10.5.7. The fluid aged parts should not exceed the GM specified maximum allowable leak rate.

1.3.3.5 Expired Product. Even if properly stored (see 3.9.5) **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.

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1.4.1 This material is introduced into a clean and dry part by a vacuum and/or pressure process. It reaches a cured state in the absence of oxygen.

1.4.2 Air leakage of the part or component determines before and after if the impregnation process is suitable. Consult the Statement of Requirements or Component Technical Specifications 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 (see 3.10.5.5) occurs on non-machined specimens, however, since machined parts are impregnated, the testing requires machined and etched surfaces.

1.4.5 For Aluminum Military (MIL) rings (see 3.10.5.1) order several thousand at a time. The alloy specified in the MIL specification is 99% aluminum, however 95% or higher is acceptable to manage cost.

1.4.6 For Iron MIL Type II rings order a small number as they are rarely used. The universal impregnation test ring produced by Oilite (Beemer) is acceptable. It is within the porosity limits defined by MIL (around 20%) and is suitable not just in a laboratory but also through an impregnation line.

1.4.7 GM releases 998xxxx specifications for impregnation sealants functioning as both specifications and part numbers instead of using MIL specifications because MIL specifications (listed in Section 2 of this document) are not maintained/updated. Just because an impregnant is on the MIL-I-17563C approval list does not mean it will pass the requirements in this document. MIL-I-17563C is a supply specification, so the approval is tied to the location of manufacture at the time of approval. Over time locations move and equipment changes, so old approvals may not be relevant. A number of the referenced material specifications in MIL-I-17563C have been superseded resulting in considerable time finding specified materials or identifying valid alternatives and requiring confirmation from the North American Vehicle Selective Enforcement Audit (NAVSEA) that the selected material is allowed. One or both of the materials needed for the environmental conditioning tests is not available and NAVSEA must supply the material. GM 998xxxx specifications ignore the MIL irrelevant parts, e.g., weight per gallon, etc., which are not in any way related to performance.

2 References

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

2.1 External Standards/Specifications.

ASTM D92	ASTM D1875	ISO 2592	MIL-STD-276A
ASTM D445	ASTM E1252	MIL-I-17563C	

2.2 GM Standards/Specifications.

9986153	GMW3221	GMW14270	GMW17205
GMW3059	GMW3420	GMW16444	GMW17332
GMW3155			

2.3 Additional References.

Component Technical Specification (CTS).

Statement of Requirements (SOR).

GM Specified Maximum Allowable Leak Rate.

2.3.1 Document References and Changes. Use the latest published version at the time of submission for approval. Change(s) in an existing test method or procedure referenced in a GM standard must be evaluated for compliance or non-compliant to the document limit(s) at the time of the change.

2.3.2 Applicability. To maintain approved source compliance as running changes occur. Typically a standard's content is reviewed and revised every five years (e.g., "refreshed"). See section 9 Release and Revisions.

2.3.3 Monitoring and Frequency. GM Global Propulsion Systems (GPS) expects the Tier one (1), Tier two (2) and Tier three (3) supplier to monitor external standards documents for changes and evaluate the impact of the change to determine if it affects required limits. GM is responsible for timely notification to suppliers of its own test standards referenced in this document. Check for changes every third month after initial production part approval. Less monitoring is required if the pending changes are communicated by a known committee or team release timing schedule.

2.3.4 Data and Timing for Change Compliance. Data is required only where the change level affects specified limits. Data must be submitted to GM GPS Engine/Transmission Material Engineering within 180 business days

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