



Epoxide, Continuous Unidirectional Glass Fiber Reinforced, 45 GPa Nominal Tensile Modulus, Leaf Spring Composite

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose/Material Description. This material specification covers the properties of an epoxide matrix reinforced with continuous unidirectional glass fibers. The material is characterized by having a nominal tensile modulus of 45 GPa.

1.2 Symbols. The material abbreviation per ISO 11469 is >EP-GFXX< (see Section 8 for details).

1.3 Applicability. For applications requiring bonding, the material must meet the requirements of GMW15921.

1.4 Remarks. All parts must meet the component technical specification (CTS) for chassis composite leaf springs.

2 References

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

2.1 External Standards/Specifications.

ASTM D5379	ASTM D3518	ISO 62	ISO 11359-2
ASTM D790	ASTM D4065	ISO 527-5	ISO 11469
ASTM D3039	ASTM D4255	ISO 1172	ISO 14125
ASTM D3171	ASTM D5229	ISO 1183	ISO 14126
ASTM D3410	ASTM D6641	ISO 11357	ISO 14129

2.2 GM Standards/Specifications.

GMW3059	GMW3221	GMW14270	GMW15921
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2.3 Additional References. Not applicable.

3 Requirements

3.1 Requirements on Test Specimens.

Reference GMW3221, Code A.

3.2 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.

3.3 Sample Variation. The testing shall be completed using a minimum of three (3) unique lots of material.

3.3.1 The test specimens shall be router cut from test plaques that were molded using temperatures, pressure, and cure cycles that will be used to mold production parts. The mold conditions shall be stated in the certifiable data package. The length, width, and gate configuration of the test plaque mold shall be indicated in the certifiable data package. The test plaque thickness shall be 2.5 mm $\pm$ 0.1 mm. Variation in weight between plaques shall not exceed $\pm$ 3.0%.

3.3.2. The test plaques shall be molded within the recommended time range for production parts. The raw materials shall be within their vendor defined shelf life. The molded plaques shall be uniform in appearance, free from any surface defects, and free of external mold release. If mold release is used, mold and scrap a minimum of three (3) plaques after using the external mold release.

3.4 Test Procedures. Tests shall be conducted using the latest issue of the test methods indicated. Suitable precautions should be taken to ensure that applicable safe limits are not exceeded when conducting test procedures, processes, and/or handling the materials required by this specification.

3.5 Data Reporting. The material shall be tested for all properties shown in Table 1: Composite Properties, and the results averaged. The average value is compared to the required value shown in Table 1.

3.6. Composite Properties. See Table 1 for Classification and the material property requirements.

Table 1: Classification and Material Property Requirements

Properties	Requirement	Test Methods
Glass Fiber Reinforcement	Minimum 50%	ISO 1172 or ASTM D3171, Method I
Moisture Absorption	Maximum 1.5%	ISO 62, Method 1 or ASTM D5229, Procedure A
Specific Gravity	Maximum 2.1	ISO 1183, Method A
Coefficient of Linear Thermal Expansion (CLTE) • 0° for -30 to 30 °C • 90° for -30 to 30 °C	Report Report	ISO 11359-2, mean secant value over the temperature range -30 °C to +30 °C
Poison's ratio	Report	ISO 527-5 or ASTM D3039
Tensile Strength • 0° at 23 °C • 90° at 23 °C	Minimum 775 MPa Minimum 15 MPa	
Tensile Modulus • 0° at 23 °C • 90° at 23 °C	Minimum 38 GPa Minimum 9 GPa	
Flexural Strength	Minimum 1200 MPa	ISO 14125 or ASTM D790. 0° at 23 °C. Mean secant value.
Flexural Modulus	Minimum 30 GPa	
Compression Strength • 0° at 23 °C • 90° at 23 °C	Minimum 700 MPa Minimum 110 MPa	ISO 14126, ASTM D6641, ASTM D3410
Compression Modulus • 0° at 23 °C • 90° at 23 °C	Minimum 38 GPa Minimum 9 GPa	
Shear Strength	Report	ISO 14129, ASTM D5379, ASTM D4255, or ASTM D3518
Shear Modulus	Minimum 3.5 GPa	
Glass Transition Temperature (T _g)	Minimum 115 °C	ISO 11357 or ASTM D4065 (5 °C/minute)

4 Manufacturing Process

4.1 The manufacturing process must be defined in the certified test package. A process control plan must also be stated for the manufacturing method.