GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17237

Polyester Sheet Molding Compound - Low Density 35% Glass Fiber Reinforced

1 Scope

1.1 Material Description. This specification covers the properties of an unsaturated polyester low density Sheet Molding Compound (SMC), reinforced with 35% chopped glass fibers that are 25 mm long and randomly oriented. The cured material shall have a density of 1.12 g/cm^3 to 1.34 g/cm^3 maximum.

1.2 Symbols. The material abbreviation according to ISO 11469 is >UP-GF35<.

1.3 Applicability. Typical applications include the following: the surround, hoods, doors, deck lids, quarter panels, roofs, front fenders.

2 References

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

2.1 External Standards/Specifications.

ISO 62	ISO 527	ISO 1183	ISO 6603-2
ISO 178	ISO 527-1/2	ISO 2577	ISO 11359-2
ISO 180/U	ISO 1172	ISO 11469	

2.2 GM Standards/Specifications.

GMW3059	GMW14444	GMW16172	GMW16853
GMW3221	GMW15921		

2.3 Additional References.

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

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221, Code A.

3.2 Emissions Testing of Interior Materials and Parts. For all Code E designated parts per GMW14444, reference GMW16853 for emissions testing of interior materials and parts.

3.3 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.

3.3.1 Properties shall be determined using test specimens router cut from SMC test plaques. Plaques shall be molded as shown in Appendix A, Figure A1. Plaques shall be molded using the mold temperatures, mold pressure and cure cycle that will be used to mold production parts. Each material vendor shall define these molding conditions in this certifiable data package. The length and width of the test mold, as well as the gate configuration, shall be included in the certification package. Plaques shall be 2.5 mm ± 0.1 mm thick. Weight variation between plaques shall not exceed ±3.0%.

3.3.2 Raw materials used for compounding shall be within their vendor defined shelf life. Plaques shall be molded seven days maximum after compounding. Plaques shall be uniform in appearance and free from blisters, pregels, knit lines, cracks, and surface contamination. Porosity shall be one pit maximum per 625 mm^2. Surfaces shall also be free of external mold release. (Mold and scrap a minimum of three plaques after using external mold release.)

3.3.3 An equal number of specimens shall be cut from both the longitudinal and transverse plaque directions for each mechanical property. The specimens shall be tested and the results averaged. The average value is the material property value. This value is compared to the required value shown in Table 1.

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3.3.4 Tests shall be conducted 40 h minimum after molding and immediately following a conditioning period of 24 h minimum at 22 °C ± 3 °C and 50% ± 5% relative humidity (RH) unless otherwise specified. All testing shall be done on unannealed samples.

3.4 Compound Properties.

3.4.1 Compound Properties (Natural, Gray and Black). See Table 1.

Table 1: Compound Properties

Properties	Test Values	Test Methods
Glass Fiber Reinforcement	34% to 41%	ISO 1172
Moisture Absorption	0.75% maximum	ISO 62, Method 1
Density	1.12 g/cm^3 to 1.34 g/cm^3 maximum	ISO 1183, Method A
Flexural Modulus At +22 °C 0.5 mm deflection 2.5 mm deflection At 150 °C 0.5 mm deflection 2.5 mm deflection	 5400 MPa minimum 4400 MPa minimum 2500 MPa minimum 1200 MPa minimum	ISO 178, Method 1. Three point loading. 1.3 mm/minute, 70 mm length 10 mm wide, thickness 2.5 mm to 3.0 mm, 60 mm span, secant calculations at 0.5 mm and 2.5 mm deflection.
Flexural Strength	110 MPa minimum	ISO 178, Method 1
Tensile Strength at Break	50 MPa minimum	ISO 527
Tensile Modulus	7000 MPa minimum	ISO 527
Multi Axial Instrumented Impact Maximum Load Deflection to Maximum Load Energy to Maximum Load Total Energy	 1800 N minimum 6.5 mm maximum 3.5 J minimum 11.5 J minimum	ISO 6603-2 speed of testing, 2.2 m/s
Poison's Ratio	Report	ISO 527-1/2
Coefficient of Linear Thermal Expansion (CLTE)	Report values for flow and cross flow directions	ISO 11359-2, mean secant value over the temperature range -30 °C to +150 °C
Unnotched Izod Impact	Report	ISO 180/U
Mold Shrinkage [Note 1]	Report	ISO 2577

Note 1: This property assures reproducible mold shrinkage but does not indicate the shrinkage to use cut tools for production parts.

3.4.2 Constituent Materials. Individual specifications for the materials which constitute the SMC molding compound shall be established by the molder. Incoming materials shall be approved to those specifications by the molders laboratory before release for production. Test results shall be maintained by the molder and be available for GM review.

3.5 Suggested Compound Verification. Inherent compound properties and test procedures that may be used to identify this material are as follows. The test value and test procedure requirements are identical to those listed in 3.3.

- Glass Fiber Content
- Infrared Characterization Scan
- Density

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