GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17549

Polyethersulfone – Glass Fiber Reinforced

1 Scope

1.1 Material Description. This specification covers the properties of an engineering thermoplastic, natural or black, glass fiber reinforced, injection molding grade, pellet form, amorphous Polyethersulfone.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PESU-GFXX<, where XX is the percentage of glass fibers.

1.3 Applicability. Typical applications include bulb sockets.

1.4 Remarks. This specification is separated into grades based on percentage of glass fiber (GF) reinforcement.

- **GF20** - 20% glass fiber reinforcement
- **GF30** - 30% glass fiber reinforcement

2 References

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

2.1 External Standards/Specifications.

ASTM E228	ISO 179/1eA	ISO 527-2	ISO 11469
ASTM E831	ISO 294-3	ISO 1183/A	ISO 11359-2
ISO 75-1	ISO 294-4	ISO 3167	UL 94
ISO 75-2	ISO 527-1	ISO 3451	

2.2 GM Standards/Specifications.

GMW3013	GMW14270	GMW14650
GMW3059	GMW14444	

3 Requirements

Materials approved to this specification shall meet the requirements of GMW3013, General Requirements for Handling of Technical Terms of Delivery for Plastics.

3.1 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding per the resin manufacturer.

All tests shall be performed on unannealed specimens in a controlled atmosphere of 22 °C ± 3 °C and 50% relative humidity (RH) ± 5% RH unless otherwise specified. In addition, tests specified at temperatures below or above 22 °C ± 3 °C shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum. The minimum values specified in the property tables must be met by test specimens in natural, black, or in a standard sampled color, if natural or black are not available.

3.1.1 Chemical Requirements. All parts manufactured from molding compounds shall be resistant to the media they contact at their place of use.

3.2 Requirements on Delivery. Important physical, mechanical, and thermal properties that characterize the material are summarized in Table 1. The color shall be specified on drawings, in material specifications, and otherwise.

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3.3 Requirements on Materials. See Table 1.

3.4 Performance Requirements. Performance requirements, e.g., flammability, fogging or resistance to odor, shall be specified on part drawings or in component specifications. All finished parts for Interior applications shall meet the requirements according to GMW14444. All finished parts for Exterior applications shall meet the requirements according to GMW14650.

3.5 Compound Properties (Natural, Black and Integrally Colored). The following are also required for full standard approval. The minimum number of lots per test required is one (1) in natural:

- Poisson's Ratio
- Coefficient of Linear Thermal Expansion (CLTE)
- Mold Shrinkage
- Stress Strain Curve at multiple temperatures. For example: -30 °C, 23 °C, 85 °C, 125 °C, 150 °C and 200 °C
- Shear Modulus Curve
- Differential Scanning Calorimetry (DSC) Curve
- Infrared Spectroscopy Curve

See GMW3013 for the test procedures.

3.6 All materials supplied to this standard must comply with GMW3059, Restricted and Reportable Substances, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

Table 1: Compound Properties (Natural and Black)

Property	Standard	Units	Range	
Grade			**GF20**	**GF30**
Glass Fiber Content	ISO 3451	% by mass	17 to 23	27.5 to 32.5
Density	ISO 1183/A	g/cm^3	1.2 to1.8	1.3 to1.9
Tensile Modulus	ISO 527-1, ISO 527-2, 1 mm/minute, between 0.05% to 0.25% strain, ISO 3167, 4 mm thick Type A bar	MPa	6600 to 8400	9100 to 10900
Tensile Stress at Yield/Break	ISO 527-1, ISO 527-2, 50 mm/minute, ISO 3167, 4 mm thick Type A bar	MPa	≥ 115	≥ 119
Elongation at Break	ISO 527-1, ISO 527-2, 50 mm/minute, ISO 3167, 4 mm thick Type A bar	%	≥ 1.8	≥ 0.7
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eA, 80 mm × 10 mm × 4 mm	kJ/m^2	≥ 40 ≥ 40	≥ 24 ≥ 24
Heat Deflection Temperature under Load 1.8 MPa	ISO 75-1, ISO 75-2	°C	≥ 215	≥ 205
Flammability	UL 94 ≥ 1.5 mm		V-0	V-0

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