GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16733

Polybutylene Terephthalate – Glass Fiber Reinforced, Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of injection-moldable, glass-reinforced, heat-stabilized, polybutylene terephthalate (PBT).

1.2 Symbols. The material abbreviations according to ISO 11469 are shown in Table 1.

1.3 Applicability. Typical applications include electrical connectors and module housings.

2 References

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

2.1 External Standards/Specifications.

ASTM D6869	ISO 294-1	ISO 1874-2	ISO 11359-2
ASTM E831	ISO 294-3	ISO 3146	ISO 11469
ISO 75	ISO 294-4	ISO 3451	ISO 15512
ISO 179	ISO 527-1	ISO 3795	UL 94
ISO 179/1eA	ISO 527-2	ISO 7792-2	
ISO 179/1eU	ISO 1183	ISO 11357-3	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14270	GMW15634
GMW3059	GMW3232	GMW14335	GMW16853
GMW3205	GMW3235	GMW14444	

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. Materials approved to this specification shall meet the requirements of GMW3013. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294-1, with the conditions for injection molding from ISO 7792-2.

3.1.1 All values indicated herein are based on material considered to be in the dry-as-molded state, with moisture content of 0.02% maximum (ASTM D6869; ISO 15512, Method A or Method B, or GMW14335). Immediately after molding, specimens shall be sealed in moisture-proof containers and stored at 23 °C ± 2 °C for at least 24 h prior to test as specified in ISO 1874-2. All tests shall be performed on unannealed specimens immediately after their removal from the containers in a controlled atmosphere per GMW3221, Code A, unless otherwise specified.

In addition, tests specified at temperatures below or above 23 °C ± 2 °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.

3.2 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 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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3.4 Compound Properties (Natural and Black). See Table1. 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 (-30 °C, +23 °C, +125 °C)

See GMW3013 for the test procedures.

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

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)

			Nominal Glass Fiber Reinforcement			
Property	**Standard**	**Units**	**10%**	**15%**	**20%**	**30%**
ISO Symbol	ISO 11469	Not applicable	>PBT-GF10<	>PBT-GF15<	>PBT-GF20<	>PBT-GF30<
Ash	ISO 3451	% by Mass	8 to 12	12 to 18	17 to 23	28 to 32
Density	ISO 1183	g/cm^3	Target Range: 1.37 ± 0.03	Target Range: 1.41 ± 0.03	Target Range: 1.45 ± 0.03	Target Range: 1.53 ± 0.03
Tensile Modulus	ISO 527-1, ISO 527-2	MPa	≥ 4300	≥ 4600	≥ 6000	≥ 8300
Stress at Break	ISO 527-1, ISO 527-2	MPa	≥ 85	≥ 89	≥ 100	≥ 120
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eU	kJ/m^2	≥ 3 ≥ 2	≥ 4 ≥ 3	≥ 5 ≥ 4	≥ 5 ≥ 4
Tensile Strength at Break After 1000 h at 140 °C	ISO 527-1, ISO 527-2	% Retention	≥ 75			
Notched Charpy Impact Strength After 1000 h at 140 °C	ISO 179/1eA 1000 h at 140 °C	% Retention	≥ 75			
Melting Temperature	ISO 3146 or ISO 11357-3	°C	≥ 215	≥ 215	≥ 215	≥ 215
Heat Deflection Temperature Under Load: 1.8 MPa	ISO 75	°C	≥ 170	≥ 170	≥ 180	≥ 185

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