GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17247

Polycarbonate (PC) + Polybutylene Terephthalate (PBT), 10% Glass Fiber Reinforced, Impact Modified, Weatherable

1 Scope

1.1 Material Description. This specification covers the properties of an engineering thermoplastic, 10% glass fiber reinforced, impact modified, injection molding grade, pellet form, weatherable Polycarbonate (PC) and Polybutylene Terephthalate (PBT) blend.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PC+PBT-I-GF10<.

1.3 Applicability. Typical applications include the following: Door Handle Assembly.

1.4 Remarks. Approved paint systems that can be used on this material are listed in the General Motors Approved Paint on Parts Systems (GM APOPS) database.

2 References

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

2.1 External Standards/Specifications.

ISO 75-1/2	ISO 527-1/2	ISO 3451	SAE J1545
ISO 179/1eA	ISO 1133	ISO 7792-2	SAE J1976
ISO 188	ISO 1183	ISO 11357-3	
ISO 294	ISO 3146	ISO 11469	

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW14650

2.3 Additional References.

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

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 Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Tables 1 and 2. The color shall be specified on drawings, in material specifications and otherwise.

3.2 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 7792-2. Test methods and specimen dimensions are also to be in accordance with ISO 7792-2.

Test specimens shall be conditioned in a controlled atmosphere of 22 °C ± 3 °C and 50% ± 5% Relative Humidity (RH) for at least 24 h prior to test. All tests shall be performed on unannealed specimens in a controlled atmosphere of 22 °C ± 3 °C and 50% ± 5% RH unless otherwise specified. In addition, tests specified at temperatures below or above 22 °C ± 3 °C and 50% ± 5% shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

The minimum values specified in Table 1 shall be met by test specimens in natural, black or in a standard sampled color if natural or black are not available. The values specified in Table 2 shall be met by a typical exterior color for approval to the specification and/or test specimens in specific colors as required during color

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development. For colored grades where other pigment and additive systems, e.g. stabilizer, are used, the impact values shall not decrease more than 10% from the specified minimum value.

3.3 Compound Properties. See Tables 1 and 2. The following are also required for full standard approval. The minimum number of lots per test required for the following properties is one 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, and 85 °C). See GMW3013 for all test procedures and parameters.

3.4 Performance Requirements. Performance requirements shall be specified on part drawings or in component specifications. All parts manufactured from molding compounds shall be resistant to the media they contact, such as aliphatic and aromatic hydrocarbons, fuels, lubricants, oils, greases and alcohols, at their places of use.

Table 1: Compound Properties (Natural and Black)

Property	Standard	Unit	Value
Ash	ISO 3451	Percent (%) by mass	9 to 13
Density	ISO 1183/A	g/cm^3	Target Range 1.25 to1.36
Tensile Modulus	ISO 527-1/2	MPa	3200 to 5500
Tensile Stress at Yield	ISO 527-1/2 Test speed 50 mm/minute	MPa	≥ 63
Tensile Stress at Yield after heat aging Note 1	ISO 527-1/2 ISO 188	% retention	≥ 75
Notched Charpy Impact Strength at 23 °C at -30 °C	ISO 179/1eA	kJ/m^2	≥ 2.2 ≥ 1.2
Notched Charpy Impact after Heat Aging Note 1	ISO 179/1eA ISO 188	% retention	≥ 75
Melting Temperature	ISO 3146 or ISO 11357-3	°C	Target Range 218 to 227
Heat Deflection Temperature under Load, 1.8 MPa	ISO 75-1/2	°C	≥ 91
Melt Mass Flow Rate (MFR)	ISO 1133 Temperature (°C) = 250 Load (kg) = 2.16	g/10 minutes	14 to 18
Melt Volume Flow Rate (MVR)	ISO 1133 Temperature (°C) = 250 Load (kg) = 2.16	cm^3/10 minutes	Report results

Note 1: Properties measured after heat aging 1000 h ± 5 h at 100 °C ± 3 °C according to ISO 188 Method A (air oven method). Property retention as indicated relative to unaged specimens tested concurrently. Notch Charpy specimens prior to aging.

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