



Polyamide 66 and Polyphenylene Ether (PA66+PPE) – Impact Modified, Heat Stabilized, Conductive

1 Scope

1.1 Material Description. This standard covers the properties of an impact modified, heat stabilized, conductive polyamide 66 and polyphenylene ether (PA66+PPE) blend which is used in injected form for molded components. The conductivity improves paint efficiency.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PA66+PPE-I<.

1.3 Applicability. Typical applications include the following:

- T1: Impact modified - fuel filler doors.
- T2: High-impact modified - fuel filler doors, fenders.

2 References

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

2.1 External Standards/Specifications.

ASTM D3763	ISO 294-3/4	ISO 3146	ISO 60093
ASTM D6869	ISO 527	ISO 6603-1/2	
ISO 75	ISO 1133	ISO 11357-3	
ISO 179/1eA	ISO 1183	ISO 11469	
ISO 188	ISO 1874-2	ISO 15512	

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14335
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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 Test Specimens. Reference GMW3221. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 1874-2. Test methods and specimen dimensions are also to be in accordance with ISO 1874-2.

All values indicated herein are based on material considered to be in the dry-as-molded state with moisture content of 0.2% maximum (ASTM D6869, ISO 15512 Method A or B, or GMW14335). Immediately after molding, per ISO 1874-2, specimens shall be sealed in moisture-proof containers and stored at $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ for at least 24 h. 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 $< 22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ or $> 22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

The 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. For colored grades where other pigment and additive systems (e.g., stabilizer) are used, the impact values shall not decrease $> 10\%$ from the specified minimum value.

3.2 Compound Properties. See Table 1. 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, 85 °C). See GMW3013 for all test procedures and parameters.

3.3 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	Units	Impact Grade, T1	High Impact Grade, T2
			Range	Range
Density	ISO 1183	g/cm ³	Target Range 1.07 to 1.12	
Melt Volume Rate	ISO 1133 280 °C, 5.0 kg	cc/10 minutes	4.0 to 24.0	12 to 24
Tensile Modulus	ISO 527 1 mm/minute	MPa	1900 to 2900	2000 to 2600
Tensile Stress at Yield	ISO 527 50 mm/minute	MPa	≥ 49	≥ 45
Tensile Stress at Yield after Heat Aging	ISO 188 ISO 527 1000 h at 80 °C	% Retention	≥ 75	
Notched Charpy Impact Strength at +23 °C at -30 °C	ISO 179/1eA	kJ/m ²	≥ 6.5 ≥ 2	≥ 17 ≥ 6
Notched Charpy Impact Strength after Heat Aging	ISO 188 ISO 179/1eA 1000 h at 80 °C	% Retention	≥ 75	
Multiaxial Impact - Exterior at 23 °C	ASTM D3763 2.2 m/s	J at Maximum Load	≥ 13	≥ 30
Multiaxial Impact - Exterior	ISO 6603-1/2 4.4 m/s	J at Maximum Load	Report	
Melting Temperature	ISO 3146 or ISO 11357-3	°C	Target Range 245 to 265	
Heat Deflection Temperature under Load 1.8 MPa	ISO 75	°C	≥ 90	≥ 110
Volume Resistivity	ISO 60093	Ω m	≥ 1000	
Mold Shrinkage (for reference only) after 48 h at 23 °C Parallel to Flow Perpendicular to Flow	ISO 294-3/4	%	Target Range 1.4 to 1.6 1.4 to 1.6	Target Range 1.3 to 1.5 1.7 to 1.9

3.4 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.

4 Manufacturing Process

Not applicable.