



Polyamide 66 - Glass Fiber Reinforced, Heat Stabilized, Post-Industrial Recycled or Post-Consumer Recycled

1 Scope

1.1 Material Description. This standard describes material types of glass fiber reinforced, heat stabilized Post Industrial Recycled (PIR) and Post-Consumer Recycled (PCR) Polyamide 66 (nylon 66) which are used in injected form for molded components.

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

1.3 Applicability. Applicable for a GMW3038 replacement provided the materials pass part validation. Typical applications: Fans and Fan Shroud.

1.4 Remarks. The classification into groups is according to percentage of glass fiber reinforcement and recycle source:

- Type 1 (T1) = PIR
- Type 2 (T2) = PCR

2 References

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

2.1 External Standards/Specifications.

ASTM D6869-17	ISO 527-1	ISO 3146	ISO 11469
ISO 75-1	ISO 527-2	ISO 3451-1	ISO 15512
ISO 179/1eA	ISO 1183-1	ISO 3451-4	ISO 16396-2
ISO 188	ISO 1183-2	ISO 3795	
ISO 294	ISO 1874-1	ISO 11357-3	

2.2 GM Standards/Specifications.

GMW3013	GMW3205	GMW3235	GMW14444
GMW3038	GMW3221	GMW14270	GMW15634
GMW3059	GMW3232	GMW14335	GMW16853

2.3 Additional References.

- Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02 (available at www.gmsupplypower.covisint.com).

3 Requirements

3.1 Requirements on Test Specimens.

3.1.1 Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 16396-2. Test methods and specimen dimensions are also to be in accordance with ISO 16396-2.

3.1.2 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 D6869-17, 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 under or over $+23\text{ °C} \pm 2\text{ °C}$ shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

3.1.3 The minimum values specified in the property tables shall be met by test specimens in black.

3.2 All materials supplied to this standard must comply with GMW3059, Restricted and Reportable Substances, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.

3.3 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in charts. The color shall be black.

3.4 Compound Properties. See Table 1. The following are also required for full specification approval. The minimum number of lots per test required is one (1) in black:

- Interior Emissions report per GMW16853.
- Poisson's Ratio.
- Stress Strain Curve at multiple temperatures: -30 °C , $+23\text{ °C}$, $+85\text{ °C}$, $+110\text{ °C}$, $+125\text{ °C}$, $+150\text{ °C}$ (see GM Material Property Database (GMMPD) tab on Plastic Submission Template for test parameters).
- Coefficient of Linear Thermal Expansion (CLTE) data (see GMMPD tab on Plastic Submission Template for test parameters).
- Differential Scanning Calorimetry (DSC) Curve.
- Fourier Transform Infrared Spectroscopy (FTIR) Curve.
- Mold Shrinkage.
- See the Polyamide Tab on the Plastic Submission Template for the test procedures.
- Reference GMW3013 for all test procedures and parameters.

3.5 Performance Requirements. Performance requirements shall be specified on part drawings or in component specifications.

3.6 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.

Table 1: Compound Properties (Black)

			Nominal Glass Fiber Reinforcement Percentage	
Property	Standard	Units	35%	35%
			T1	T2
			Range	Range
ISO Symbol	ISO 11469		>PA66-GF35<	>PA66-GF35<
Ash	ISO 3451-1 ISO 3451-4	%	31 to 38	31 to 39
Density	ISO 1183-1 ISO 1183-2	g/cm ³	Target Range 1.37 to 1.43	Target Range 1.36 to 1.43
Tensile Modulus	ISO 527-1 ISO 527-2	MPa	9700 to 13300	8800 to 12500
Tensile Stress at Break	ISO 527-1 ISO 527-2	MPa	≥ 150	≥ 130
Stress at Break after Heat Aging ^{Note 1}	ISO 188 ISO 527-1 ISO 527-2 1000 h at $+140\text{ °C}$	% Retention	≥ 75	