GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17684

Polyamide 66 – 30% Glass Fiber/Carbon Fiber Reinforced, Fuel Compatible, Conductive, Heat Stabilized

1 Scope

1.1 Material Description. This standard covers the properties of a 30% glass fiber/carbon fiber reinforced, fuel compatible, electrostatically dissipative, heat stabilized polyamide 66, injection moldable, homopolymer.

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

1.3 Applicability. Typical applications include fuel components where electrostatic dissipation is required, including, but not limited to, diesel fuel filter housings.

2 References

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

2.1 External Standards/Specifications.

ASTM D6869	ISO 188	ISO 1183	ISO 9988-2
ASTM E831	ISO 294-3	ISO 1817	ISO 11357-3
IEC 60093	ISO 294-4	ISO 1874-2	ISO 11359-2
ISO 75-1	ISO 527-1	ISO 3146	ISO 11469
ISO 75-2	ISO 527-2	ISO 3451-1	ISO 15512
ISO 179/1eA	ISO 1133	ISO 3915	SAE J1681

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14270	GMW14335
GMW3059			

2.3 Additional References.

- GM Powertrain (GMPT)-5-020
- GM Powertrain (GMPT)-5-036A

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294-3 and ISO 294-4 with the conditions for injection molding from ISO 9988-2. Unless otherwise specified, test methods and specimen dimensions are also to be in accordance with GMW3013.

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 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.

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

Note: For each product, the requirements to Table 1 shall be documented by a Certification Statement according to GMW3013.

3.3 Compound Properties (Natural and Black). See Table 1. 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, and electronic Stress/Strain Curve at multiple temperatures. For example: -30 °C, 23 °C, 150 °C.

See GMW3013 for all test procedures and parameters.

3.4 Swell After Fuel Soak. On a standard tensile bar or flexural modulus bar, measure length, width, and thickness prior to start of test. Measure length, width, and thickness again after 1000 h fuel soak. Calculate percent change in each direction:

$$\frac{d_2 - d_1}{d_1}$$

Where:

- $\mathbf{d_1}$ is the original measurement.
- $\mathbf{d_2}$ is the measurement after fuel soak.

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

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

			Nominal Glass Fiber/Carbon Fiber Percentage
			30% (22% Glass/8% Carbon)
Property	**Standard** [Note 1]	**Units**	**Requirement**
ISO Symbol	ISO 11469		>PA66-(GF22+CF8)<
Density	ISO 1183, Method A, ≥ 10 mm × ≥ 10 mm × 4 mm	g/cm^3	1.27 to 1.33
Ash	ISO 3451-1 Method A, at +950 °C	%	21 ± 3
Moisture Content	ISO 15512 Method A or Method B or GMW14335	%	≤ 0.2
Tensile Modulus	ISO 527-1, ISO 527-2	MPa	≥ 10000
Tensile Stress at Break	ISO 527-1, ISO 527-2	MPa	≥ 155
Tensile Strain at Break	ISO 527-1, ISO 527-2	MPa	≥ 1.0
Charpy Notched Impact Strength at +23 °C	ISO 179/1eA	kJ/m^2	≥ 5
Charpy Notched Impact Strength at -30 °C	ISO 179/1eA	kJ/m^2	≥ 4
Melt Volume Flow Rate (MVFR) 260 °C/5.0 kg	ISO 1133	g/10 minutes or cm^3/10 minutes	≥ 12
Mold Shrink - Flow Direction (report one lot for information only)	ISO 294-3, ISO 294-4, plaque size 60 mm × 60 mm x 2 mm, Type D2 preferred or larger with maximum thickness 4 mm	%	Report one (1) lot

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