GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16647

Polypropylene Homopolymer - Glass Fiber Reinforced, Chemically Coupled, High Heat Resistant, Copper Deactivated, Injection Moldable

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose/Material Description. This specification covers the properties of a glass filled, chemically coupled, high heat resistant, copper deactivated, injection moldable grade polypropylene homopolymer.

1.2 Symbols. The material abbreviation according to ISO 11469 is shown in Table 1.

1.3 Applicability. Typical applications include the following: Radiator fan blades and shrouds.

1.4 Remarks. The specification is classification according to following types: The tensile modulus, and tensile strength and elongation at higher temperature:

- **T1:** High tensile modulus and strength, and a low elongation at higher temperature, crystalline Polypropylene (PP) homopolymer with 25% Glass Fiber (GF) for radiator fan blades and fan shrouds application.
- **T2:** Typical tensile modulus and strength, and a higher elongation at higher temperature, PP homopolymer with 30% GF for fan shrouds application.
- **T3:** Very high tensile modulus and strength, and a low elongation at higher temperature, high crystalline, and high performance PP homopolymer with 30% GF for radiator fan blades and fan shrouds application.

2 References

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

2.1 External Standards/Specifications.

ASTM D3012	ISO 294	ISO 1133	ISO 11469
ASTM E831	ISO 294-4	ISO 1183	ISO 19069-2
ISO 75	ISO 527-1	ISO 3451-1	
ISO 179-1/1eA	ISO 527-2	ISO 3795	
ISO 188	ISO 527-1/2	ISO 11359-2	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14270	GMW15634
GMW3059	GMW3232	GMW14444	GMW15725
GMW3205	GMW3235	GMW14650	GMW16853

2.3 Additional References.

Plastic Submission Template

3 Requirements

Materials approved to this specification shall meet the requirements of GMW3013.

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3.1 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 19069-2. Test methods and specimen dimensions are also to be in accordance with ISO 19069-2 with the following additions:

- All tests shall be performed on specimens 40 h minimum after molding and immediately following a conditioning period of 24 h minimum in a controlled atmosphere per GMW3221, Code A unless otherwise specified. All tests shall be performed on unannealed specimens.
- The values specified in Table 1, shall be met by test specimens in natural or black. For integrally colored grades where other additive systems, e.g., stabilizer, are used, the impact values shall not decrease more than 10% from the specified minimum value.

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.

Note: For each product the requirements to Table 1 shall be documented by Certification Statement according to GMW3013. The color shall be specified on drawings, in material specifications and otherwise.

3.4 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 in natural:

- Interior Emissions report per GMW16853.
- Poisson's Ratio.
- Stress Strain Curve at multiple temperatures: -30 °C, +23 °C, +85 °C, +110 °C. See the GMMPD tab on Plastic Submission Template for test parameters (contact specification owning group named in Section 6 for access).
- Coefficient of Linear Thermal Expansion (CLTE) data. See GMMPD tab on Plastic Submission Template for test parameters (contact specification owning group named in Section 6 for access).
- Differential Scanning Calorimetry (DSC) Curve.
- Fourier Transform Infrared (FTIR) Spectroscopy Curve.
- Multiaxial Impact Curve.
- Mold Shrinkage.

See the Polypropylene tab on the Plastic Submission Template for the test procedures (contact specification owning group named in Section 6 for access).

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

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

- All finished parts for interior applications shall meet the requirements according to GMW14444.
- All finished parts for exterior applications shall meet the requirements according to GMW14650.
- All finished parts for underhood applications shall meet the requirements according to GMW15725.

3.7 Tensile Strength after Copper Exposure. On five standard tensile bars, wrap neck portion with 40 mm × 25 mm × 0.127 mm ± 0.05 mm thick copper foil. Secure the copper foil using a binder clip. Suspend specimens on rack in oven using binder clips. Expose the bars for 1500 h at 140 °C ± 2 °C. Rotate the rack 180 degrees weekly to ensure uniform heat exposure. Remove tensile bars and copper foil and condition the samples for 40 h at 23 °C ± 2 °C and 50% ± 2% Relative Humidity. Test the tensile bars per ISO 527-1 and report average tensile strength value.

3.8 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.

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