



Polypropylene Crystalline Homopolymer - Glass Filled, Chemically Coupled, High Heat Resistant, Injection Molding

1 Scope

1.1 Material Description. This standard covers the properties of a glass filled, chemically coupled, and high heat resistant, injection molding grade polypropylene homopolymer.

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

1.3 Applicability. Typical applications include the following: radiator fan shrouds, brackets and sunroof frames.

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

- **T1:** Normal tensile modulus, strength, normal crystalline polypropylene homopolymer (PP) with 30% glass fiber (GF) for radiator fan blades and fan shrouds application.
- **T2:** High tensile modulus, strength and high crystalline, polypropylene homopolymer with 30% glass fiber for fan shrouds application.
- **T3:** Very high tensile modulus, and strength, and high crystalline high performance polypropylene homopolymer with 45% glass fiber for brackets and sunroof frames.
- **T4:** High crystalline, high performance polypropylene homopolymer with 60% glass fiber with very high tensile modulus and strength for brackets

2 References

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

2.1 External Standards/Specifications.

ISO 75	ISO 294	ISO 1183	ISO 11359-1/2
ISO 178	ISO 294-4	ISO 1873-2	ISO 11469
ISO 179/1eA	ISO 527-1/2	ISO 3451-1	
ISO 188	ISO 1133	ISO 3167	

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221
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2.3 Additional References.

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

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

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

Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 1873-2.

All test specimens shall be brought to equilibrium in standard conditions for temperature and moisture and tested in that state as defined in GMW3221, Code A, unless the test method indicates that standard conditioning is not required. Condition specimens for a minimum of 24 h prior to testing or until moisture equilibrium is reached. If specimens are tested outside the conditioned environment, they shall be tested within 10 minutes of removal.

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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. 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.

3.2.1 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: Poisson's Ratio, , Stress/Strain Curve at multiple temperatures (for example -30 °C, 23 °C, 90 °C and 120 °C), Differential Scanning Calorimetry (DSC) and Thermal Gravimetric Analysis(TGA) Curve. See GMW3013 for the test procedures and parameters.

3.2.2 Performance Requirements. Performance requirements (e.g., flammability, fogging or resistance to odor) shall be specified on part drawings or in component specifications.

Table 1: Compound Properties (Natural and Black)

Property	Standard	Units	Types and Requirements			
			T1	T2	T3	T4
ISO Symbol	ISO 11469	-	>PP-GF30<	>PP-GF30<	>PP-GF45<	>PP-GF60<
Glass Filler	ISO 3451-1, Method A	% by mass	28 to 32	29 to 33	43 to 47	58 to 60
Density	ISO 1183, Method A	g/cm ³	Target Range 1.11 to 1.15	Target Range 1.12 to 1.17	Target Range 1.28 to 1.32	Target Range 1.46 to 1.52
Melt Flow Rate (MFR) 230/2.16	ISO 1133	g/10 minute	3 to 12	3 to 8	1 to 6	2 to 6
Melt Volume Flow Rate (MVR) 230/2.16	ISO 1133	cm ³ /10 minutes	Report	Report	Report	Report
Flexural Modulus	ISO 178 4 mm thick Type A bar, 2 mm/minute	MPa	4500 to 6500	5100 to 7800	9500 to 12 800	12 500 to 16 500
Tensile Modulus	ISO 527-1/2, ISO 3167, 4 mm thick Type A bar, 1 mm/minute	MPa	4500 to 6500	7000 to 8600	9200 to 13 000	13 500 to 17 000
Tensile Strength at Break at 23 °C	ISO 527-1, ISO 527-2, specimen A, test speed 5 mm/minute	MPa	≥70	≥75	≥100	≥100
Tensile Strength at Break at 120 °C			≥15	≥15	≥25	≥25
Tensile Strength at Break After Heat Aging	ISO 527-1/2, Test speed 5 mm/minute; Heat Age per ISO 188, 1000 h at 140 °C	% Retention	≥85 ^{Note 1}	≥85 ^{Note 1}	≥85 ^{Note 1}	≥85 ^{Note 1}
Notched Charpy Impact at +23 °C	ISO 179/1eA, 80 mm x 10 x 4 mm	kJ/m ²	≥7	≥7	≥7	≥7
Notched Charpy Impact after Heat Aging	ISO 179/1eA, 80 mm x 10 x 4 mm; Heat Age per ISO 188, 1000 h at 140 °C	% Retention	≥85 ^{Note 1}	≥85 ^{Note 1}	≥85 ^{Note 1}	≥85 ^{Note 1}

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