GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17022

Polypropylene Copolymer – Low Density, UV Stable, Mineral Filled

1 Scope

1.1 Material Description. This specification describes low density material grades of mineral filled polypropylene copolymer, ultraviolet (UV) stable, pellet form, injection molding compounds.

1.1.1 Additional Characteristics. Materials certified to this material specification may have additional characteristics, e.g., paintable, mar and scratch resistance, elastomer modified, etc. Possible additional characteristics are defined in GMW3013.

1.2 Symbols. The material abbreviation according to ISO 11469 is >GMW17022P-PP/PE-M07.

1.3 Typical Applications. Typical applications include the following: interior trim.

2 References

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

2.1 External Standards/Specifications.

AATCC 23	ISO 179/1eA	ISO 1133	ISO 3451-1
ASTM D3763	ISO 188	ISO 1183-A	ISO 6603-1/2
ASTM E831	ISO 294	ISO 1873-2	ISO 11359-2
ISO 75-1/2	ISO 527-1/2	ISO 3167	ISO 11469
ISO 178	ISO 1050		

2.2 GM Standards/Specifications.

GM9302P	GMW3221	GMW14162	GMW16172
GMW3013	GMW3232	GMW14444	GMW16853
GMW3059	GMW3235	GMW14688	
GMW3205	GMW3417	GMW15634	

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. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 1873-2. Test methods and specimen dimensions are also to be in accordance with ISO 1873-2 with the following additions: use ISO 3167, Type 1A (GMW3221), thickness 4 mm, for tensile and flexural properties.

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.

3.2 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1 and Table 2.

Note: For each product, the requirements to Table 1 and Table 2 shall be documented by Certification Statement according to GMW3013. The color shall be specified on drawings, in material specifications and otherwise.

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The values specified in Table 1 shall be met by test specimens in natural or black; the values specified in Table 2 shall be met by integrally colored test specimens. For integrally colored grades where other additive systems (e.g., stabilizer) are used, the impact values shall not decrease more than 10% from specified minimum value.

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

3.4 Compound Properties. See Table 1 and Table 2. The following are also required for full specification approval. The minimum number of lots per test required is one in natural: Tensile Modulus, Poisson's Ratio, Stress-Strain Curve at multiple temperatures, e.g., +23 °C, +85 °C, -30 °C; and Multiaxial Impact Curve. See GMW3013 for the test procedures.

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

All finished parts for interior applications shall meet the requirements according to GMW14444.

Table 1: Compound Properties (Black or Natural)

Property	Standard	Units	Type T1 Requirements
ISO Symbol	ISO 11469	N/A	>PP/PE-M7<
Filler Content	ISO 3451-1 Method A (at +750 °C)	%	6 to 9
Density (Target Range)	ISO 1183-A	g/cm^3	0.950 ± 0.015
Melt Flow Rate MFR230/2.16	ISO 1133	g/10 minimum	15 to 25
Melt Volume Flow Rate MVR230/2.16	ISO 1133	cm^3/10 minimum	16 to 26
Flexural Modulus	ISO 178, 2 mm/minimum test speed	MPa	2000 to 2400
Tensile Modulus	ISO 527-1 ISO 527-2 Specimen 1A, 1 mm/minimum test speed	MPa	2100 to 2600
Tensile Stress at Yield	ISO 527-1 ISO 527-2 Specimen 1A, 50 mm/minimum test speed	MPa	≥26
Tensile Stress at Yield after Heat Aging (1000 h ± 5 h at 100 °C ± 3 °C) Note 1	ISO 527-1 ISO 527-2 50 mm/minimum test speed	% Retention	100 Note 2
Multiaxial Impact at 23 °C	ISO 6603-1/2 Specimen 60 mm diameter x 2 mm, or 60 mm x 2 mm x 2 mm plaque 4.4 m/s speed	J at maximum load	≥25
Multiaxial Impact at (minus) -30 °C	ISO 6603-1/2 Specimen 60 mm diameter x 2 mm, or 60 mm x 2 mm x 2 mm plaque 4.4 m/s speed	J at maximum load	≥10
Multiaxial Impact at 23 °C	ASTM D3763 6.6 m/s speed	J at maximum load	≥15

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Property	Standard	Units	Type T1 Requirements
Multiaxial Impact at (minus) -30 °C	ASTM D3763 6.6 m/s speed	J at maximum load	≥8
Notched Charpy Impact at 23 °C	ISO 179/1eA	kJ/m^2	≥4.0
Notched Charpy Impact at -30 °C	ISO 179/1eA	kJ/m^2	≥2.0
Notched Charpy Impact After Heat Aging (1000 h ± 5 h at 100 °C ± 3 °C) **Note 1, Note 3,**	ISO 179/1eA	Retention %	≥ 75
Mold Shrink, 48 h After Molding, Flow Direction	ISO 294, plaque size 101.6 mm x 152 mm x 3.2 mm	%	Target Range 0.80 to 1.30
Mold Shrink, 48 h After Molding, Cross Flow Direction	ISO 294, plaque size 101.6 mm x 152 mm x 3.2 mm	%	Target Range 0.90 to 1.40
Mold Shrink, 48 h at 80 °C After Molding, Flow Direction	ISO 294, plaque size 101.6 mm x 152 mm x 3.2 mm	%	Target Range 1.00 to 1.40
Mold Shrink, 48 h at 80 °C After Molding, Cross Flow Direction	ISO 294, plaque size 101.6 mm x 152 mm x 3.2 mm	%	Target Range 1.10 to 1.50
Heat Deflection Temperature (HDT) - Method B, 0.45 MPa, Flatwise	ISO 75-1 ISO 75-2 80 mm x 10 mm x 4 mm, unannealed	°C	≥105
HDT - Method A, 1.8 MPa, Flatwise	ISO 75-1 ISO 75-2 80 mm x 10 mm x 4 mm, unannealed	°C	≥55
Coefficient of Linear Thermal Expansion (CLTE) - Flow Direction	ASTM E831 or ISO 11359-2	10^{-6} mm/mm °C	Target Range 6.0 to 10.0
CLTE - Cross Flow Direction	ASTM E831 or ISO 11359-2	10^{-6} mm/mm °C	Target Range 7.0 to 12.0
Fogging	GMW3235-B, condensable constituent	mg	≤2.0

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