GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17257

Polypropylene Copolymer – General-purpose, Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of unfilled general-purpose polypropylene copolymer, heat stabilized, injection-molding compounds.

1.1.1 Types. The classification into groups is according to the different properties as described in Table 1.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PP/PE<.

1.3 Applicability. Typical applications include the following: Non-visible and under hood components.

2 References

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

2.1 External Standards/Specifications.

ASTM D3012	ISO 188	ISO 1133	ISO 4577
ASTM E831	ISO 294	ISO 1183	ISO 11359-2
ISO 75-1/2	ISO 527-1	ISO 1873-2	ISO 11469
ISO 179/1eA	ISO 527-2	ISO 3167	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14444	GMW15725
GMW3059	GMW3232	GMW14650	GMW16853
GMW3205	GMW3235	GMW15634	

2.3 Additional References.

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

3 Requirements

3.1 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294, using the injection molding conditions specified in 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, 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.

The values specified in Table 1 shall be met by test specimens in natural and or black color. 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.

3.2 Material Requirements. Materials approved to this specification shall meet the requirements of GMW3013, General Requirements for Handling of Technical Terms of Delivery for Plastics.

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. See Table 1. The following are also required for full specification approval.

- The minimum number of lots per test required is one in natural.

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- Tensile Modulus.
- Poisson's Ratio.
- Stress Strain Curve at multiple temperatures e.g., +23 °C, +85 °C, -30 °C.
- Differential Scanning Calorimetry (DSC) Curve.

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

- All finished parts for interior applications shall meet the requirements specified in GMW14444.
- All finished parts for exterior applications shall meet the requirements specified in GMW14650.
- All finished parts for under hood applications shall meet the requirements specified in GMW15725.

Table 1: Compound Properties (Black or Natural)

Property	Standard	Unit	Requirement
Density	ISO 1183, Method A	g/cm^3	Target Range 0.89 to 0.92
Melt Flow Rate (MFR) MFR 230 °C/Load 2.16 kg	ISO 1133	g/10 minutes	Target Range 20 to 30
Tensile Modulus	ISO 527-1, ISO 527-2 Specimen 1A 1 mm/minute test speed	MPa	800 to 1550
Tensile Stress at Yield	ISO 527-1, ISO 527-2 Specimen 1A 50 mm/minute test speed	MPa	≥ 24
Tensile Stress at Yield after Heat Aging 1000 h ± 5 h at 105 °C ± 3 °C Note 1	ISO 527-1, ISO 527-2 50 mm/minute test speed	% Retention	≥ 85
Notched Charpy Impact at 23 °C	ISO 179/1eA	kJ/m^2	≥ 5
Notched Charpy Impact at 23 °C after Heat Aging 1000 h ± 5 h at 102 °C ± 3 °C Note 1	ISO 179/1eA	kJ/m^2	≥ 4
Mold Shrink, 48 h after molding, longitudinal	ISO 294, plaque size 101.6 mm × 152 mm × 3.2 mm	%	Target Range 1.2 to 1.8
Mold Shrink, 48 h after molding, transverse	ISO 294, plaque size 101.6 mm × 152 mm × 3.2 mm	%	Target Range 1.4 to 2.0
Heat Deflection Temperature (HDT) HDT Method A, 0.45 MPa, flatwise	ISO 75-1/2, specimen 80 mm x 10 mm x 4 mm, flatwise, unannealed	°C	≥ 70
CLTE Flow Direction -30 °C to +30 °C	ASTM E831 or ISO 11359-2	10^{-5} mm/mm/°C	Target Range 12 to 20
CLTE Cross Flow Direction -30 °C to +30 °C	ASTM E831 or ISO 11359-2	10^{-5} mm/mm/°C	Target Range 12 to 20
Thermal Oxidative Stability	ASTM D3012 or ISO 4577 336 h at 150 °C	N/A	No visual indication of local discoloration and or brittleness by material degradation

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