GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17173

Polyamide 6 – General Purpose, Heat Stabilized

1 Scope

1.1 Material Description. This standard covers the properties of heat stabilized, injection moldable polyamide 6 (nylon 6).

1.2 Symbols. The material abbreviation according to ISO 11469 is >PA6<.

1.3 Applicability. Typical applications include non-visible components that require higher strength and heat resistance.

2 References

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

2.1 External Standards/Specifications.

ASTM E831	ISO 294	ISO 3146	ISO 11469
ISO 75-2	ISO 527	ISO 3795	ISO 15512
ISO 179/1eA	ISO 1183	ISO 11357-3	
ISO 188	ISO 1874-2	ISO 11359-2	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14335	GMW16853
GMW3059	GMW3232	GMW14444	
GMW3205	GMW3235	GMW15634	

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 1874-2. Test methods and specimen dimensions are also to be in accordance with ISO 1874-2.

All values indicated herein are based on material considered to be in the dry-as-molded state with moisture content of 0.2% maximum (ISO 15512 Method A or B, or GMW14335). Immediately after molding, per ISO 1874-2, specimens shall be sealed in moisture-proof containers and stored at 22 °C ± 3 °C for at least 24 h. 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 < 22 °C ± 3 °C or > 22 °C ± 3 °C shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

The values specified in Table 1 shall be met by test specimens in natural, black or in a standard sampled color if natural or black are not available.

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 Compound Properties. See Table 1. The following are also required for full standard approval. The minimum number of lots per test required for the following properties is one lot in natural color at multiple temperatures (for example -30 °C, 23 °C, 110 °C). See GMW3013 for all test procedures and parameters.

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- Poisson's Ratio
- Coefficient of Linear Thermal Expansion (CLTE)
- Mold Shrinkage
- Stress Strain Curve

3.4 Performance Requirements. Performance requirements shall be specified on part drawings or in component specifications. All parts manufactured from molding compounds shall be resistant to the media they contact, such as aliphatic and aromatic hydrocarbons, fuels, lubricants, oils, greases and alcohols, at their places of use.

Table 1: Compound Properties (Natural and Black)

Property Note 1	Standard	Unit	Value
ISO Symbol	ISO 11469	Not applicable	>PA6<
Density	ISO 1183	g/cm^3	Target Range 1.11 to 1.15
Moisture Content	ISO 15512, Method A or B or GMW14335	%	≤ 0.2
Tensile Modulus	ISO 527, 1 mm/minute	MPa	2300 to 3300
Tensile Stress at Break	ISO 527, 50 mm/minute	MPa	≥ 70
Tensile Stress at Break after Heat Aging, 1000 h at 110 °C	ISO 527, 50 mm/minute ISO 188	% Retention	≥ 75
Strain at Yield	ISO 527, 50 mm/minute	%	≥ 3.5
Strain at Break	ISO 527, 50 mm/minute	%	≥ 20
Notched Charpy Impact Strength at +22 °C at -30 °C	ISO 179/1eA	kJ/m^2	≥ 3 ≥ 1.5
Notched Charpy Impact Strength after Heat Aging, 1000 h at 110 °C, Notch specimens prior to aging	ISO 179/1eA ISO 188	% Retention	≥ 75
Melting Temperature	ISO 3146 or ISO 11357-3	°C	Target Range 215 to 230
Heat Deflection Temperature Under Load, 1.8 MPa	ISO 75-2	°C	≥ 50
Coefficient of Linear Thermal Expansion (CLTE) Parallel to Flow Perpendicular to Flow	ASTM E831 or ISO 11359-2, Thermal Mechanical Analysis (TMA), Mean secant value over the temperature range -30 °C to +160 °C	10^{-6} mm/mm/°C	Target Value ≤ 100 ≤ 130
Flammability	GWM3232 or ISO 3795 All reporting must be in accordance with GMW3232	mm/minute	Self-Extinguishing (SE) or ≤ 100

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