GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16948

Polyamide 6 - Heat Stabilized, Impact Modified, UV Stabilized

1 Scope

1.1 Material Description. This standard covers properties of various types of heat stabilized, impact modified, Ultraviolet (UV) stabilized Polyamide 6 (Nylon 6) which are used in injected form for molded components.

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

1.3 Applicability. Typical applications include the following: interior components.

1.4 Remarks. The specification is classified by level of impact modifiers as follows. Additional types may be added as necessary.

- **T1:** High Impact modified.

2 References

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

2.1 External Standards/Specifications.

ASTM D3763	ISO 188	ISO 3146	ISO 15512
ASTM D6869	ISO 294	ISO 3795	ISO 16396-2
ASTM E831	ISO 294-3/4	ISO 11357-3	SAE J1545
ISO 75	ISO 527	ISO 11359-2	
ISO 179/1eA	ISO 1183	ISO 11469	

2.2 GM Standards/Specifications.

GMW3013	GMW3232	GMW14270	GMW15634
GMW3059	GMW3235	GMW14334	GMW16853
GMW3205	GMW3417	GMW14335	
GMW3221	GMW14162	GMW14444	

3 Requirements

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

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 16396-2. Test methods and specimen dimensions are also to be in accordance with ISO 16396-2.

All values indicated herein are based on material considered to be in the dry-as-molded state with moisture content of 0.2% maximum (ASTM D6869, ISO 15512 Method A or Method B, or GMW14335). Immediately after molding, per ISO 16396-2, specimens shall be sealed in moisture proof containers and stored at +23 °C ± 2 °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 other than +23 °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. The values specified in Table 2 shall be met by four interior colors (black, gray, tan/neutral and either red or blue) for approval to the specification. These test specimens may be produced using generic colorants in the four colors or by specific colors required by a GM program.

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

3.1.2 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1 and Table 2. The color shall be specified on drawings, in material specifications and otherwise.

Note: For each product, the requirements to Table 1 and Table 2 shall be documented by the Plastic Submission Template according to GMW3013.

3.2 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:

- Interior Emissions report per GMW16853.
- Poisson's Ratio.
- Stress Strain Curve at multiple temperatures: -30 °C, +23 °C, +85 °C, +110 °C, conditioned at +23 °C and 50% Relative Humidity (RH) (see GMMPD tab on Plastics Submission Template for test details).
- Coefficient of Linear Thermal Expansion (CLTE) data (see GMMPD tab on Plastics Submission Template for test details).
- Differential Scanning Calorimetry (DSC) Curve.
- Fourier Transform Infrared Spectroscopy (FTIR) Curve.
- Mold Shrinkage.

See the Polyamides tab on the Plastic Submission Template for the test procedures.

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

3.4 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.

3.5 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.

Table 1: Compound Properties (Natural and Black)

Property Note 1	**Standard**	**Units**	**High Impact Grade, T1 Value**
Density	ISO 1183	g/cm^3	Target Range 1.05 to 1.09
Moisture Content	GMW14335 or ISO 15512, Method A or Method B	%	≤ 0.2
Tensile Modulus	ISO 527	MPa	1600 to 2400
Tensile Strength at Yield	ISO 527	MPa	40 to 55
Tensile Strength at Yield after Heat Aging Note 2	ISO 188 ISO 527 1000 h at +110 °C	% Retention	≥ 95
Notched Charpy Impact Strength at +23 °C at -30 °C	ISO 179/1eA	kJ/m^2	 ≥ 50 ≥ 7

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