



Polyamide 6 – Thermally Conductive, Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of a thermally conductive, heat stabilized polyamide 6 for injection molding.

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

1.3 Applicability. Typical applications include, but are not limited, to the following: heat sinks for lighting and other electrical components.

1.4 Remarks. This material is classified by ability to dissipate heat. Additional types may be added as required.

1.4.1 T1: For applications where heat dissipation up to 22 Watts is required and electrical insulation is not required.

2 References

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

2.1 External Standards/Specifications.

ASTM D6869	ISO 294	ISO 1874-1	ISO 11469
ISO 75	ISO 527	ISO 1874-2	ISO 15512
ISO 179/1eA	ISO 527-1/2	ISO 3451	ISO 22007-4
ISO 188	ISO 1183	ISO 3795	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14270	GMW16853
GMW3059	GMW3232	GMW14335	
GMW3205	GMW3235	GMW15634	

3 Requirements

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 1874-1.

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, specimens shall be sealed in moisture-proof containers and stored at $+23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for at least 24 h prior to test as specified in ISO 1874-2. 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 below or above $+23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

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.

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.

3.3 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 (1) in natural:

- Poisson's Ratio
- Electronic Stress/Strain Curve at multiple temperatures, (for example: -30 °C, +23 °C, +85 °C, +140 °C)
- Coefficient of Linear Thermal Expansion (CLTE)
- Mold Shrinkage

See GMW3013 for all test procedures and parameters.

3.4 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

Table 1: Compound Properties (Black)

Property	Standard	Units	Value
			T1
ISO Symbol	ISO 11469		>PA6-(CS+ZnO)55<
Ash	ISO 3451	%	51 to 59
Density	ISO 1183	g/cm ³	Target Range 1.45 to 1.65
Moisture Content	ISO 15512, Method A or B or GMW14335	%	≤ 0.2
Tensile Modulus	ISO 527-1/2	MPa	≥ 5800
Tensile Stress at Break	ISO 527-1/2	MPa	28 to 48
Tensile Stress at Break after Heat Aging ^{Note 1}	ISO 188 ISO 527	% Retention	≥ 65
Tensile Strain at Break	ISO 527-1/2	%	≥ 0.25
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eA	kJ/m ²	≥ 1.5 ≥ 1
Notched Charpy Impact after Heat Aging ^{Note 2}	ISO 188 ISO 179/1eA	% Retention	≥ 75
Heat Deflection Temperature under Load 1.8 MPa	ISO 75	°C	≥ 170
Thermal Conductivity Average in plane	ISO 22007-4	W/m-K	≥ 17
Thermal Conductivity Average through plane	ISO 22007-4	W/m-K	≥ 2.8
Emission Testing of Interior Materials: For initial approval, test 1 lot in black.	GMW16853	-	-
Odor	GMW3205-B3	Rating	≥ 6
Fogging - Gravimetric	GMW3235-B-Y2-T2	mg	Requirements see GMW16853
Emissions	GMW15634 VOC value	µg/g	Requirements see GMW16853