GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17411

Polyamide 46 – Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of a heat stabilized Polyamide 46, pellet form, injection molding compound.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PA46<.

1.3 Applicability. Typical applications include: high temperature bearings, electrical connectors, cable ties and gears.

2 References

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

2.1 External Standards/Specifications.

ASTM D6869	ISO 188	ISO 1183	ISO 11357-3
ISO 75	ISO 294-1	ISO 1874-2	ISO 11469
ISO 179/1eA	ISO 527	ISO 3146	ISO 15512

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14335

3 Requirements

3.1 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294-1 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.

3.1.1 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, 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 below or above 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 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 in natural:

- Poisson's Ratio
- Coefficient of Linear Thermal Expansion (CLTE).
- Mold Shrinkage.
- Stress Strain Curve at multiple temperatures (for example: -30 °C, 23 °C, 120 °C).

See GMW3013 for all test procedures and parameters.

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3.3 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 or Black)

Property	Standard	Units	Value
Density	ISO 1183	g/cm^3	Target Range 1.16 to 1.20
Moisture Content	GMW14335 or ISO 15512, Method A or Method B	%	≤ 0.1
Tensile Modulus	ISO 527	MPa	2500 to 3700
Tensile Stress at Yield	ISO 527	MPa	≥ 90
Stress at Break after Heat Aging	ISO 188 ISO 527 1000 h at 150 °C	% Retention	≥ 90
Notched Charpy Impact Strength at +23 °C at -30 °C	ISO 179/1eA	kJ/m^2	≥ 5 ≥ 1.5
Notched Charpy Impact Strength after Heat Aging	ISO 188 ISO 179/1eA 1000 h at 125 °C	% Retention	≥ 75
Melting Temperature	ISO 3146 or ISO 11357-3	°C	Target Range 280 to 295
Heat Deflection Temperature (HDT)-A under Load, 1.8 MPa	ISO 75	°C	≥ 145

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of bulk supplies.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.

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