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| GM | WORLDWIDE ENGINEERING STANDARDS | Material Specification | GMW17511 |

# Polyamide 6 - 30% Glass Fiber Reinforced, Fatigue Resistant, Heat Stabilized

## 1 Scope

**1.1 Material Description.** This standard covers the properties of a 30% by mass glass fiber reinforced, fatigue resistant, heat stabilized, polyamide 6 (nylon 6) which is used in injected form for molded components.

**1.2 Symbols.** The material abbreviation according to ISO 11469 is >PA6-GF30<.

**1.3 Applicability.** Typical applications include air intake manifolds with increased duty cycles.

## 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 11469 |
| ISO 75 | ISO 294 | ISO 1874-2 | ISO 13003 |
| ISO 179/1eA | ISO 527-1/2 | ISO 3451 | ISO 15512 |

**2.2 GM Standards/Specifications.**

| | | | |
|---|---|---|---|
| GMW3013 | GMW3059 | GMW3221 | GMW14335 |

## 3 Requirements

**3.1 Requirements on Test Specimens.** Reference GMW3221.

**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.

Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from 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 (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 +22 °C ± 3 °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 +22 °C ± 3 °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.

**3.2.1 Compound Properties (Natural, Black and Integrally Colored).** See Table 1. The following are also required for full standard approval.

- 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.)
- Shear Modulus Curve; Differential Scanning Calorimetry (DSC) Curve.
- Infrared Spectroscopy Curve. See GMW3013 for the test procedures.

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

## 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.

**5.4 Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS).** For new product submissions, or when a change in chemical composition of an existing product has occurred, a complete copy of the Material Safety Data Sheet/Safety Data Sheet must be submitted in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific MSDS/SDS requirements.

**5.5** All materials supplied to this standard must comply with the requirements of the International Material Data System (IMDS) and GMW3059, **Restricted and Reportable Substances.**

**Table 1: Compound Properties (Natural and Black)**

| Property | Standard | Units | Value |
|---|---|---|---|
| Ash | ISO 3451 | % | 27 to 33 |
| Density | ISO 1183 | g/cm$^3$ | Target Range 1.33 to 1.39 |
| Moisture Content | ISO 15512 Method A, Method B, or GMW14335 | % | ≤ 0.2 |
| Tensile Modulus | ISO 527-1/2 | MPa | 8800 to 11 000 |
| Tensile Stress at Break | ISO 527-1/2 | MPa | ≥ 170 |
| Tensile Stress at Break after Heat Aging Note 1 | ISO 188<br>ISO 527 | % Retention | ≥ 75 |
| Tensile Strain at Break | ISO 527-1/2 | % | ≥ 2.0 |
| Notched Charpy Impact Strength<br>• at +23 °C<br>• at -30 °C | ISO 179/1eA | kJ/m$^2$ | <br>≥ 8.0<br>≥ 7.0 |

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