



Polyamide 46 – Glass Fiber Reinforced, Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of glass fiber reinforced, heat stabilized polyamide 46, pellet form, injection molding compound.

1.2 Symbols. The material abbreviation according to ISO 11469 is shown in Table 1.

1.3 Applicability. Typical applications include: timing surfaces, transmission components, dampeners, light bulb sockets, corrugated tubing, and gears.

2 References

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

2.1 External Standards/Specifications.

ASTM D6869	ISO 294-1	ISO 1183	ISO 11469
ISO 75	ISO 527	ISO 1874-2	ISO 15512
ISO 179/1eA	ISO 527-1	ISO 3451	
ISO 188	ISO 527-2	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. Reference GMW3221, Code A.

3.1.1 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.

3.1.2 All values indicated herein are based on material 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. All tests shall be performed on unannealed specimens immediately after their removal from the containers in a controlled atmosphere of $+23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $50\% \pm 5\%$ relative humidity (RH) 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.

3.1.3 The minimum values specified in Table 1, must 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, +150 °C).

See GMW3013 for all test procedures and parameters.

3.3 Performance Requirements. 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. Part performance requirements, e.g., flammability, fogging or resistance to odor, shall be specified on part drawings or in component specifications.

Table 1: Compound Properties (Natural and Black)

Property	Standard	Units	Glass Fiber Reinforcement Percentage				
			15%	30%	40%	50%	60%
Property	Standard	Units	Value	Value	Value	Value	Value
ISO Symbol	ISO 11469	-	>PA46-GF15<	>PA46-GF30<	>PA46-GF40<	>PA46-GF50<	>PA46-GF60<
Ash	ISO 3451	%	13 to 17	27 to 33	37 to 44	47 to 53	57 to 63
Density	ISO 1183	g/cm ³	Target Range 1.26 to 1.30	Target Range 1.38 to 1.42	Target Range 1.48 to 1.52	Target Range 1.57 to 1.64	Target Range 1.70 to 1.76
Moisture Content	ISO 15512, Method A or Method B. or GMW14335	%	≤ 0.2				
Tensile Modulus	ISO 527-1 ISO 527-2	MPa	5250 to 7150	8500 to 11250	11250 to 15500	15000 to 19200	17400 to 23450
Tensile Stress at Break	ISO 527-1 ISO 527-2	MPa	≥ 120	≥ 180	≥ 210	≥ 230	≥ 210
Tensile Strain at Break	ISO 527-1 ISO 527-2	%	≥ 2.0	≥ 2.0	≥ 2.0	≥ 1.7	≥ 0.3
Tensile Stress at Break after Heat Aging Note 1	ISO 188 ISO 527	% Retention	≥ 75				
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eA	kJ/m ²	≥ 4 ≥ 3.5	≥ 8 ≥ 6	≥ 9 ≥ 8	≥ 11 ≥ 10	≥ 9 ≥ 11
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	≥ 280	≥ 280	≥ 280	≥ 280	≥ 280
Flammability	GMW3232 or ISO 3795 All reporting shall be in accordance with GMW3232	mm/minute	Self-Extinguishing (SE) or ≤ 100				