



Polyphthalamide - Glass Fiber Reinforced, Impact Modified, Heat Stabilized, Hot Oil Moldable

1 Scope

1.1 Material Description. This standard covers properties of various types of glass fiber reinforced, impact modified, heat stabilized polyphthalamide (PPA), injection moldable, hot oil moldable.

1.2 Symbols. The material abbreviations according to SAE J1344 are shown in Table 1.

1.3 Applicability. Typical applications include the following: Quick connectors, electric motor components.

1.4 Remarks. The classification into groups is according to the different ranges of glass fiber content. Additional glass ranges will be added as they become necessary.

2 References

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

2.1 External Standards/Specifications.

ASTM D6869	ISO 294	ISO 1874-2	ISO 11357-3
ISO 75	ISO 527	ISO 3146	ISO 15512
ISO 179/1eA	ISO 1183	ISO 3451	SAE J1344
ISO 188	ISO 1874-1	ISO 3795	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14335
GMW3059	GMW3232	

2.3 Additional References.

TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. 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 B, or GMW14335). Immediately after molding, specimens shall be sealed in moisture-proof containers and stored at $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ 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 $< 22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ or $> 22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ 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 in natural: Poisson's Ratio, electronic Stress/Strain Curve at multiple temperatures (for example $-30\text{ }^{\circ}\text{C}$, $23\text{ }^{\circ}\text{C}$, $85\text{ }^{\circ}\text{C}$), Coefficient of Linear Thermal Expansion (CLTE), Mold Shrinkage and Fogging. See GMW3013 for all test procedures and parameters.

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

Table 1: Compound Properties (Natural and Black)

Property	Standard	Nominal Glass Fiber Reinforcement Percentage	
			15%
Property	Standard	Units	Range
SAE Symbol	SAE J1344	Not applicable	> PPA-I-GF15 <
Ash	ISO 3451	%	12 to 20
Density	ISO 1183	g/cm ³	Target Range 1.24 to 1.30
Tensile Modulus	ISO 527	MPa	5500 to 7500
Tensile Stress at Break	ISO 527	MPa	≥ 130
Stress at Break after Heat Aging Note 1	ISO 188 ISO 527 1000 h at 160 °C	% Retention	≥ 75
Moisture Content	ISO 15512 Method A or B or GMW14335	%	≤ 0.2
Notched Charpy Impact Strength at +23 °C at -30 °C	ISO 179/1eA	kJ/m ²	≥ 5 ≥ 4
Notched Charpy Impact Strength after Heat Aging Note 1	ISO 188 ISO 179/1eA 1000 h at 170 °C	% Retention	≥ 75
Melting Temperature	ISO 3146 or ISO 11357-3	°C	Target Range 310 to 320
Heat Deflection Temperature under Load, 1.8 MPa	ISO 75	°C	≥ 225
Flammability	GMW3232 or ISO 3795 All reporting must be in accordance with GMW3232	mm/minute	Self-Extinguishing (SE) or < 100

Note 1: Specimens tested for Stress at Break to ISO 527 and Notched Charpy Impact Strength to 179/1eA at +23 °C ± 3 °C after heat aging 1000 h ± 5 h at +160 °C ± 5 °C according to ISO 188 Method A (air oven method) shall have a minimum of 60% retention for tensile strength and 75% retention for notched Charpy impact relative to unaged specimens tested concurrently.

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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