WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW15584

Styrene Maleic Anhydride Copolymer

1 Scope

1.1 Material Description. This standard describes materials types of Styrene Maleic Anhydride (S/MA) copolymer that are used in injection components. Code letters, in addition to GMW3013 guidelines that apply to this standard, are listed in 1.2.

1.1.1 Types. The classification into groups is according to the different properties as described in Table 1 and Table 2.

1.2 Symbols. The material abbreviation according to ISO 11469 is >S/MA<, >S/MA-GF12<, >S/MA-GF16<, or >S/MA-GF20<.

1.3 Typical Applications. Typical applications include interior substrates that require high level of dimensional stability - not **"A"** surface colorable.

2 References

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

2.1 External Standards/Specifications.

ASTM D955	ISO 294-3/4	ISO 1133	ISO 3167
ISO 75-1/2	ISO 306	ISO 1183-A	ISO 3451-1
ISO 179/1eA	ISO 527-1/2	ISO 2580-2	ISO 11469
ISO 294			

2.2 GM Standards/Specifications.

GMW3013	GMW3205	GMW3235	GMW16853
GMW3059	GMW3221	GMW15634	

2.3 Additional References.

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

3 Requirements

3.1 Material Requirements. Materials approved to this standard shall meet the requirements of GMW3013, **General Requirements for Handling of Technical Terms of Delivery for Plastics.**

3.2 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1.

Note: For each product, the requirements to Table 1 shall be documented by Certification Statement according to GMW3013. The color shall be specified on drawings, in material specifications, and otherwise.

3.3 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 2580-2. Test methods and specimen dimensions are also to be in accordance with ISO 2580-2 with the following additions: use ISO 3167, Type 1A, thickness 4 mm for tensile and flexural properties.

3.3.1 All tests shall be performed on specimen 40 h minimum after molding and immediately following a conditioning period of 24 h minimum in a controlled atmosphere per GMW3221, Code A, unless otherwise specified. All tests shall be performed on unannealed specimens.

3.3.2 The values specified in Table 1 shall be met by test specimens in natural or black. For integrally colored grades where other additive systems (e.g., stabilizer) are used, the impact values shall not decrease more than 10% from the specified minimum value.

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3.3.3 Chemical Requirements. All parts manufactured from molding compounds shall be resistant to the media they contact at their place of use.

3.4 Compound Properties. See Table 1. The following are also required for full specification approval. The minimum number of lots per test required is one in natural: Tensile Modulus, Poisson Ratio, and Stress Strain Curve at +23 °C, +85 °C, -30 °C. Test Report according to GMW16853.

3.5 Performance Requirements. 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 [Note 1]	Units	T1	T2	T3	T4
Tensile Modulus	ISO 527-1/2	MPa	1900 to 2500	3300 to 4300	4700 to 5700	4900 to 5900
Tensile @ Yield/Break	ISO 527-1/2	MPa	25 to 35	45 to 65	65 to 85	65 to 85
Charpy Notched Impact Strength @ +23 °C	ISO 179/1eA	kJ/m^2	≥6	≥6	≥6	≥6
Charpy Notched Impact Strength @ -30 °C	ISO 179/1eA	kJ/m^2	No specification requirement			
Density	ISO 1183-A	g/cm^3	1.04 to 1.10	1.12 to 1.18	1.15 to 1.21	1.17 to 1.23
Ash	ISO 3451-1 at +950 °C	% by mass	Not applicable	10 to 14	14 to 18	18 to 20
Mold Flow Rate	ISO 1133	cm^3/10 minimum	No specification requirement			
Mold Shrink - Flow Direction (information only)	ISO 294-3/4 or ASTM D955	%	0.50	0.40	0.35	0.30
Mold Shrink - Cross Flow Direction (information only)	ISO 294-3/4 or ASTM D955	%	0.50	0.40	0.35	0.30
Heat Deflection Temperature (HDT) - 0.45 MPa	ISO 75-1/2	°C	No specification requirement			
HDT - 1.8 MPa	ISO 75-1/2	°C	95 to 105	115 to 125	115 to 125	118 to 128
Vicat	ISO 306	°C	No specification requirement			
Emission Testing of Interior Materials (Odor, Fogging, Emissions):	GMW16853					
Odor	GMW3205-B3	Rating	≥6			
Fogging	GMW3235-B-Y1-T2	mg	Requirements see GMW16853			
Emissions	GMW15634 Volatile Organic Compound (VOC) value	µg/g	Requirements see GMW16853			
	Semi-volatile Organic Compound (SVOC) value	µg/g	Requirements see GMW16853			

Note 1: Standard test specimen and test setup should follow GMW3013.

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