



Thermoplastic Elastomers - Styrenic, Exterior, Weatherable

1 Scope

1.1 Material Description. This specification covers the properties of black, heat stabilized, weatherable thermoplastic elastomers consisting of polypropylene (PP) and styrene/ethylene/butylene/styrene (SEBS) rubber for exterior applications. These materials can be processed by extrusion and injection molding.

Material types are delineated by hardness values. The types and corresponding hardnesses are defined in Appendix A, Table A1.

1.2 Symbols. The material abbreviation according to ISO 18064 is >TPS-SEBS<.

1.3 Applicability. Typical applications include exterior lace and closeouts.

2 References

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

2.1 External Standards/Specifications.

ISO 34-1	ISO 812	ISO 1183	ISO 18064
ISO 37	ISO 868	ISO 1431-1	SAE J1976
ISO 188			

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14650
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2.3 Additional References.

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

3 Requirements

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

3.1 Requirements on Test Specimens. Tests shall be conducted using the latest issue of the test methods indicated. Suitable precautions shall be taken to ensure that applicable safe limits are not exceeded when conducting test procedures, processes, and/or handling the materials required by this specification.

3.1.1 Tests specimens shall be die cut from fan gated injection molded plaques having a nominal thickness of 2.0 mm $\pm$ 0.2 mm. Die cut specimens are to be tested with the long axis of the test specimen perpendicular to the direction of flow. Plaque dimensions must be sufficient to permit this.

3.1.2 Tests shall be conducted 40 h minimum after molding and immediately following a conditioning period of 24 h minimum per GMW3221, Code A, unless otherwise specified. All tests shall be performed on unannealed specimens. In addition, tests specified at temperatures $< 22^{\circ}\text{C} \pm 3^{\circ}\text{C}$ or $> 22^{\circ}\text{C} \pm 3^{\circ}\text{C}$ 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 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. For colored grades where other pigment and additive systems (e.g., stabilizer) are used, the impact values shall not decrease $> 10\%$ from the specified minimum value.

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 a Certification Statement according to GMW3013. The color shall be specified on drawings, in material specifications and otherwise.

3.3 Compound Properties. See Table 1. A minimum of six lots shall be tested to Table 1. The following are also required for full specification approval (the minimum number of lots per test required is one):

- Young's Modulus
- Poisson's Ratio
- Coefficient of Linear Thermal Expansion (CLTE)
- Stress-Strain Curve at 23 °C

Table 1: Compound Properties (Black)

Property	Test Method	Unit	Type				
			1	2	3	4	5
Shore A Hardness	ISO 868, 15 s delay	Shore A	50 ± 5	60 ± 5	70 ± 5	75 ± 5	90 ± 5
Density	ISO 1183	g/cm ³	1.12 to 1.26				1.04 to 1.19
Tensile Stress at Break	ISO 37, Type 1 dumbbell, 500 mm/minute	MPa	2.0 minimum	2.7 minimum	4.0 minimum	4.5 minimum	7.5 minimum
Elongation at Break	ISO 37, Type 1 dumbbell, 500 mm/minute	%	500 minimum	300 minimum	300 minimum	450 minimum	250 minimum
Tensile Stress at 100% Elongation	ISO 37, Type 1 dumbbell, 500 mm/minute	MPa	0.2 minimum	1.0 minimum	2.0 minimum	1.5 minimum	5.5 minimum
Tear Strength	ISO 34-1, Method B, angle die, 500 mm/minute	kN/m	15.0 minimum	18.0 minimum	20.0 minimum	26.0 minimum	36.0 minimum
Low Temperature Brittleness	ISO 812, Type B	°C	-40 maximum				
Properties After Long Term Heat Aging	ISO 188, 1000 h at 110 °C in an air-circulating oven followed by indicated property testing at 23 °C. Test methods are the same as for original mechanical property testing.	Change in Property	70 retention minimum 70 retention minimum				
Tensile Stress		%					
Elongation at Break		%					
Ozone Resistance	ISO 1431-1, Procedure A, 100 pphm, 40 °C	-	Zero Rating				
Accelerated Weathering	Test to GMW14650 (Weather-Ometer Resistance) Class 3	-	3.0 maximum No objectionable defects allowed				
Change in Color		ΔE					
Surface Defects		-					