



Thermoplastic Elastomers – Polyolefinic, Fully Crosslinked, Heat Stabilized, Weatherable

1 Scope

1.1 Material Description. This specification covers the properties of black, heat stabilized, weatherable, Thermoplastic Vulcanizates (TPV) containing fully crosslinked Ethylene Propylene Diene Monomer (EPDM) elastomer particles dispersed in a continuous Polypropylene (PP) matrix. These materials can be processed by extrusion, injection molding, and other melt processing techniques. Processing techniques shall be identified in material callout.

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

1.2 Symbols. The material abbreviation according to ISO 18064 is: >TPV-(EPDM + PP)<.

1.3 Applicability. Typical applications include backlight moldings, roof ditch moldings, reveal moldings, air dam deflectors, air inlet panel seals, weatherstrips, gaskets, closeouts, and seals and parts where softness and conformity are needed.

2 References

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

2.1 External Standards/Specifications.

ASTM D3012	ISO 527	ISO 1183	SAE J2527
ISO 34-1	ISO 812	ISO 1431-1	
ISO 37	ISO 815	ISO 18064	
ISO 188	ISO 868	SAE J1976	

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14270
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2.3 Additional References.

Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02

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 should 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 below or above +23 °C $\pm$ 3 °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 more than 10% from the specified minimum value.

3.2 Compound Properties. See Table 1. A minimum of six (6) lots shall be tested to Table 1. An alpha character shall follow the type designation in the material callout to define the processing technique of the material.

- "E" shall be used to define extrudable grades.
- "M" shall be used to define moldable grades.

If no alpha character is designated in the material callout, the material can be processed by multiple techniques. The following are also required for full specification approval (the minimum number of lots per test required is one (1)):

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

3.3 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.

Table 1: Compound Properties (Black) ^{Note 1}

Property	Test Method	Unit	Type 1	Type 2	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10
Shore A Hardness	ISO 868, 15 s delay	Shore A	25 ± 5	35 ± 5	55 ± 5	65 ± 5	75 ± 5	80 ± 5	87 ± 5	N/A	N/A
Shore D Hardness	ISO 868, 15 s delay	Shore D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	40 ± 5	50 ± 5
Density	ISO 1183	g/cm ³	0.89 to 0.99	0.89 to 0.99	0.89 to 0.99	0.89 to 1.01	0.94 to 1.02	0.89 to 0.99	0.89 to 0.99	0.93 to 0.99	0.92 to 1.00
Tensile Stress at Break	ISO 37, Type 1 dumbbell, 500 mm/minute	MPa	1.5 min.	2.0 min.	2.7 min.	3.9 min.	5.0 min.	5.0 min.	5.3 min.	16 min	N/A
Tensile Stress at Break	ISO 527, Type 1BA dumbbell, 50 mm/minute	MPa	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12 min
Elongation at Break	ISO 37, Type 1 dumbbell, 500 mm/minute	%	400 min.	340 min.	250 min.	300 min.	220 min.	330 min.	400 min.	535 min.	N/A
Elongation at Break	ISO 527, Type 1BA dumbbell, 50 mm/minute	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17 min.
Tensile Stress at 100% Elongation	ISO 37, Type 1 dumbbell, 500 mm/minute	MPa	0.4 min.	0.6 min.	0.9 min.	1.9 min.	1.0 min.	2.6 min.	4.1 min.	8.5 min.	N/A
Compression Set	ISO 815, Type A, 22 h at +70 °C 70 h at +125 °C	%	NA 65 max.	NA 50 max.	NA 50 max.	NA 50 max.	45 max. 60 max.	55 max. 60 max.	60 max. 85 max.	65 max. N/A	80 max. N/A
Tear Strength	ISO 34-1, Method B, angle die, 500 mm/minute	kN/m	5.0 min.	6.5 min.	10 min.	13 min.	10 min.	16 min.	24 min.	55 min.	N/A

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Property	Test Method	Unit	Type 1	Type 2	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	Type 10
Tear Strength	ISO 34-1, Method B, angle die, 50 mm/minute	kN/m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	90 min.
Low Temperature Brittleness	ISO 812, Type B	°C	-56 max.	-56 max.	-56 max.	-56 max.	-56 max.	-56 max.	-50 max.	-48 max.	-28 max.
Properties After Long Term Heat Aging	ISO 188, 1000 h at 135 °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	60 Retention minimum								60 min. 50 min.
Tensile Stress Elongation at Break		% %	60 Retention minimum								
Ozone Resistance	ISO 1431-1, Procedure A, 100 pphm, +40 °C		Zero Rating								
Thermal Oxidative Stability ^{Note 2}	ASTM D3012 336 h at +150 °C	N/A	No visible indication of local discoloration and/or crumbling, crazing or pin holes that open when sample is flexed on any part of the specimen directly exposed to air flow. The area within 5 mm of the clips shall not be included in this evaluation.								
Accelerated Weathering Change in Color Surface defects	SAE J2527 with Extended ultraviolet (UV) filters, 2500 kJ/m²	ΔE	≤ 3.0 No objectionable defects allowed								
Natural Weathering ^{Note 3} Change in Color Surface Defects	2 years exposure to Natural weathering in Arizona and Florida per SAE J1976, Procedure A	ΔE	≤ 3.0 No objectionable defects allowed								

Note 1: ΔE = Delta E (Color Change), max. = Maximum, min. = Minimum, N/A = Not applicable, pphm = Parts per Hundred Million, UV = Ultraviolet.

Note 2: Required for materials that contain 50% or greater Polypropylene content.

Note 3: In case of conflict between accelerated and natural weathering, natural weathering takes precedence.

3.4 Performance Requirements. Performance requirements, e.g., flammability, resistance to odor, etc., shall be specified on part drawings or in component specifications.

3.5 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.