GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17457

Thermoplastic Elastomers – Poly(ether-ester) Block Copolymers – Extrusion Grade

1 Scope

1.1 Material Description. This specification covers the properties of black and natural, high viscosity, heat stabilized, polyester thermoplastic elastomers. These materials can be processed by extrusion.

Material types are delineated by Flexural Modulus. The types and corresponding modulus ranges are identified in Appendix A, Table A1.

1.2 Symbols. The material abbreviation according to ISO 18064 is >TPC-ET<.

1.3 Applicability. Typical applications include hoses, hose liners, and tubing.

1.4 Remarks. Not applicable.

2 References

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

2.1 External Standards/Specifications.

ISO 34-1	ISO 306	ISO 1183	ISO 14910-2
ISO 178	ISO 527	ISO 3795	ISO 15512
ISO 179-1eA	ISO 868	ISO 11357	ISO 18064
ISO 188	ISO 1133		

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW3232

2.3 Additional References. None.

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 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.

3.2 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.

Unless otherwise specified, preparation of specimens and standard test methods shall be in accordance with ISO 14910-2.

All test values herein are based on material with a moisture content of 0.1% maximum at the time of molding.

Immediately after molding, specimens shall be sealed in a moisture-proof container/envelope and aged for a minimum of 21 days at 22 °C ± 3 °C. Samples shall then be removed from the moisture-proof container/envelope and conditioned for a period of 24 h minimum per GMW3221, Code B.

Test immediately following this conditioning period, unless otherwise specified. All tests shall be performed on unannealed specimens. In addition, test specified at temperatures **less than** 22 °C ± 3 °C, shall be conducted

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at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum. Tests specified at temperatures **greater than** 22 °C ± 3 °C shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 20 minutes minimum.

The minimum values specified in the property tables must be met by test specimens in black, natural, or in a standard sampled color, if natural or black are not available. For colored grades, where other pigment and additive systems (e.g., stabilizers) are used, the impact values shall not decrease by more than 10% from the specified minimum value.

3.3 Compound Properties. See Table 1. The minimum of number of lots required to be tested shall be according to the GMW3013 template. For most properties, the minimum number of lots is six (6). 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

Table 1: Compound Properties (Black and Natural)

Property	Test Method	Unit	Type 1	Type 2
Flexural Modulus	ISO 178, 64 mm span, 2 mm/minute test speed, chord modulus using 0.5 mm to 2.5 mm strain	MPa	170 to 340	280 to 420
Shore D Hardness	ISO 868, 15 s delay	Shore D	53 to 63	55 to 69
Density	ISO 1183	g/cm^3	1.17 to 1.23	1.21 – 1.25
Tensile Stress at Break	ISO 527, Type 1BA dumbbell, 50 mm/minute	MPa	30 minimum	35 minimum
Elongation at Break	ISO 527, Type 1BA dumbbell, 50 mm/minute	%	514 minimum	300 minimum
Tensile Stress at 10% Elongation	ISO 527, Type 1BA dumbbell, 50 mm/minute	MPa	13 minimum	15 minimum
Tear Strength, Parallel	ISO 34-1, Method B, angle die, 500 mm/minute	kN/m	150 minimum	100 minimum
Tear Strength, Perpendicular	ISO 34-1, Method B, angle die, 500 mm/minute	kN/m	105 minimum	100 minimum
Notched Charpy at -40 °C	ISO 179-1eA	kJ/m^2	3.6 minimum	5.0 minimum
Moisture Content	ISO 15512 Method A or Method B	%	0.10 maximum	0.10 maximum
Melt Temperature Range	ISO 11357,10 °C/minute, report 2nd melt	°C	203 to 213	205 to 215
Melt Mass Flow Rate	ISO 1133, 230 °C, 2.16 kg load	g/10 Minutes	2.0 to 6.0	3.0 to 7.0
Vicat Softening Temperature	ISO 306, Method A, 50 °C/h, 10 N load	°C	174 minimum	190 minimum
Properties After Long Term Heat Aging	ISO 188, Method A, 1008 h at 120 °C, followed by indicated property testing at 23 °C. Test methods are the same as for original property testing.			
Tensile Stress		% retention	75 minimum	
Elongation		% retention	75 minimum	
Flammability	GMW3232 or ISO 3795, reporting in accordance with GMW3232	mm/minute	≤ 100	

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