GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW15815

Thermoplastic Elastomers - Polyolefinic Plus Nitrile Rubber Based

1 Scope

1.1 Material Description. This specification covers the properties of black, fuel and oil resistant, thermoplastic vulcanizates containing fully cured Acrylonitrile-Butadiene Rubber (NBR) elastomer particles dispersed in a continuous Polypropylene (PP) matrix. These materials can be processed by extrusion and injection molding.

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-(NBR + PP)<.

1.3 Applicability. Typical applications include the following: gaskets and connectors.

2 References

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

2.1 External Standards/Specifications.

ASTM D3012	ISO 188	ISO 868	ISO 1817
ISO 34-1	ISO 812	ISO 1183	ISO 18064
ISO 37	ISO 815	ISO 1431-1	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14270
GMW3059	GMW3235	

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 ± 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 ± 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.

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3.2 Compound Properties. See Table 1. A minimum of six (6) 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 (1)):

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

3.3 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.

3.4 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)

Property	Test Method	Unit	Type 1
Shore A Hardness	ISO 868, 15 s delay	Shore A	70 ± 5
Shore D Hardness	ISO 868, 15 s delay	Shore D	Not applicable
Density	ISO 1183	g/cc	0.99 to 1.04
Tensile Stress at Break	ISO 37, Type 1 dumbbell, 500 mm/minute	MPa	4.1 minimum
Elongation at Break	ISO 37, Type 1 dumbbell, 500 mm/minute	%	170 minimum
Tensile Stress at 100% Elongation	ISO 37, Type 1 dumbbell, 500 mm/minute	MPa	2.1 minimum
Compression Set	ISO 815, Type A, 70 h at +125 °C	%	50 maximum
Tear Strength	ISO 34-1, Method B, angle die, 500 mm/minute	kN/m	18 minimum
Low Temperature Brittleness	ISO 812, Type B	°C	-27 maximum
Thermal Oxidative Stability Note 1	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.
Properties After Short Term Heat Aging	ISO 188, 168 h at +125 °C in an air-circulating oven followed by the indicated property testing at +23 °C. Test methods are the same as for original mechanical property testing.	Change in Property	-

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