



Polyoxymethylene Copolymer - Carbon Filled, Electrostatically Dissipative

1 Scope

1.1 Material Description. This specification covers the properties of a carbon powder filled, pellet formed, injection moldable, polyoxymethylene (acetal) copolymer. The different types are categorized by their level and type of carbon filler:

- **C1:** 4% to 7% Carbon powder
- **C2:** 7% to 10% Carbon powder
- **C3:** 10% to 15% Carbon powder + Carbon fiber blend
- **C4:** 10% to 15% Carbon fiber

1.2 Symbols. The material abbreviation according to ISO 11469 is:

- **C1:** >POM-CD5<
- **C2:** >POM-CD8<
- **C3:** >POM-(CD+CF)12<
- **C4:** >POM-CF12<

1.3 Applicability. Typical applications include fuel system components requiring electrostatically dissipative properties such as:

- **C2:** Inlet control valves and fuel pump module components.
- **C3:** Inlet control valves and filter components.

2 References

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

2.1 External Standards/Specifications.

ASTM D1603	ISO 179/1eA	ISO 1183/A	ISO 11357-3
ASTM E1131	ISO 188	ISO 1817	ISO 11469
IEC 60093	ISO 294-1	ISO 3146	SAE J1645
ISO 75-1/2	ISO 527-1/2	ISO 9988-2	SAE J1681

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221
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3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294-1 with the conditions for injection molding from ISO 9988-2. Unless otherwise specified, test methods and specimen dimensions are to be in accordance with GMW3013. All tests shall be performed on unannealed specimens immediately following a conditioning period of 24 h minimum in a controlled atmosphere per GMW3221, Code A, unless otherwise specified. In addition, tests specified at temperatures below or above 23 °C, shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

3.2 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material, are summarized in Table 1. The color shall be specified on drawings, in material specifications, and otherwise.

3.3 Compound Properties (Black). See Table 1. The following are also required for full standard approval:

- Poisson's Ratio
- Coefficient of Linear Thermal Expansion (CLTE) – In direction of Flow and Cross Flow
- Mold Shrinkage
- Electronic Stress/Strain Curves at -30 °C, +23 °C, +85 °C and after 1000 h fuel soak
- Melt Flow Rate

The minimum number of lots per test required is one (1). See GMW3013 for the test procedures.

3.4 Swell After Fuel Soak. On a standard tensile bar, measure the length, width, and thickness, prior to start of test. Measure length, width, and thickness again after 1000 h fuel soak. Calculate percent change in each direction:

$$\frac{d_2 - d_1}{d_1}$$

Where:

d₁: Is the original measurement, and

d₂: Is the measurement after fuel soak.

Table 1: Compound Properties (Black)

Mechanical Properties	Standard	Unit	Type C1	Type C2	Type C3	Type C4
Density	ISO 1183/A	g/cm ³	1.36 to 1.41	1.39 to 1.45	1.40 to 1.44	1.40 to 1.48
Carbon Black	ASTM D1603 or ASTM E1131 Thermogravimetric Analysis (TGA) - Filler amount and discern/state the ratio of powder to fiber	%	Target Range 4 to 7	Target Range 7 to 10	Target Range 10 to 15	Target Range 10 to 15
Tensile Modulus	ISO 527-1/2	MPa	1800 to 2600	2400 to 3500	Report	2900 to 3600
Tensile Strength at Yield	ISO 527-1/2	MPa	Report	Report	Report	Report
Elongation at Yield	ISO 527-1/2	%	Report	Report	Report	Report
Tensile Strength at Break	ISO 527-1/2	MPa	≥ 44	≥ 44	≥ 70	≥ 44
Charpy Notched Impact Strength at +23 °C	ISO 179/1eA	kJ/m ²	≥ 3.5	≥ 2	≥ 3.5	≥ 2
Charpy Notched Impact Strength at -30 °C	ISO 179/1eA	kJ/m ²	Report one (1) lot	Report one (1) lot	Report one (1) lot	Report one (1) lot
Melting Temperature	ISO 3146 or ISO 11357-3	°C	Target Range 160 to 170	Target Range 160 to 170	Target Range 160 to 170	Target Range 165 to 175