
Delrin Acetal POM C Homopolymer Technical Material Specification

1.0 Material Overview & Common Uses

Delrin Acetal POM C (Polyoxymethylene Homopolymer) is a high-performance engineering thermoplastic known for its high stiffness, low friction, excellent dimensional stability, and resistance to creep and wear. It is produced by the polymerization of formaldehyde and is characterized by a crystalline structure that provides superior mechanical properties compared to acetal copolymers.

Common industrial applications include precision machined parts such as gears, bearings, bushings, conveyor components, pump impellers, valve seats, electrical insulators, and automotive fuel system components. It is widely used in the automotive, consumer electronics, plumbing, and industrial machinery sectors due to its low moisture absorption and excellent machinability.

2.0 Core Technical Properties & Sizing

- Density: 1.41 g/cm³ (ASTM D792)
- Melting Point: 175°C (347°F) (crystalline melting temperature)
- Tensile Strength at Yield: 70 MPa (10,150 psi) (ASTM D638)
- Elongation at Break: 15-30% (ASTM D638)
- Flexural Modulus: 2,800 MPa (406,000 psi) (ASTM D790)
- Impact Strength (Izod Notched): 75 J/m (1.4 ft-lb/in) (ASTM D256)
- Hardness: Rockwell M94 (ASTM D785)
- Coefficient of Linear Thermal Expansion: $110 \times 10^{-6} / ^\circ\text{C}$ (ASTM E831)
- Water Absorption (24 hr immersion): 0.25% (ASTM D570)
- Standard Sheet Sizes: 1220 mm x 2440 mm (4 ft x 8 ft) in thicknesses from 1 mm to 100 mm
- Standard Rod Diameters: 6 mm to 300 mm, available in 1 m or 2 m lengths
- Thickness Tolerance (Sheet): ± 0.10 mm for thicknesses up to 6 mm; ± 0.20 mm for 6-25 mm; ± 0.30 mm for 25-50 mm
- Diameter Tolerance (Rod): h8 tolerance class (e.g., 20 mm rod: -0.033 mm to 0 mm)

3.0 Processing, Machinability & Application

Delrin POM C exhibits excellent machinability with tight tolerances achievable. It is typically machined using conventional metalworking equipment. Due to its low thermal conductivity, heat buildup must be managed to prevent melting or dimensional distortion. Sharp, polished tooling with positive rake angles is recommended.

- Cutting: Use carbide-tipped or high-speed steel (HSS) tools with a 10-15° rake angle and 5-10° clearance angle.
- Turning: Spindle speed 500-2000 RPM, feed rate 0.05-0.15 mm/rev, depth of cut 0.5-2.0 mm.
- Milling: Use 2- or 3-flute end mills, spindle speed 800-3000 RPM, feed rate 0.05-0.20 mm/tooth.
- Drilling: Use standard twist drills with a 118° point angle; peck drilling recommended for holes deeper than 3x diameter. Speed 1000-3000 RPM, feed 0.05-0.15 mm/rev.

- Threading: Use thread mills or taps designed for plastics; avoid forming taps due to material springback.
- Coolant: Compressed air or water-soluble coolant mist is recommended to dissipate heat. Avoid oil-based coolants that may cause stress cracking.
- Welding: Ultrasonic welding is preferred; hot plate welding at 200-220°C with controlled pressure. Not suitable for solvent welding.
- Adhesive Bonding: Use cyanoacrylate or two-part epoxy designed for polyacetals. Surface etching with chromic acid may improve bond strength.
- Annealing: For stress relief, heat parts at 160°C for 30 minutes per 25 mm thickness, then slow cool in oven.

4.0 Common Defects & Quality Control

- Reject if surface porosity or pitting exceeds 0.2 mm depth on any visible face.
- Reject if internal voids or bubbles are detected via ultrasonic inspection (any size > 0.5 mm diameter).
- Reject if discoloration (yellowing or dark streaks) is present, indicating thermal degradation.
- Reject if warpage exceeds 0.5 mm per 300 mm length when measured on a flat surface.
- Reject if surface scratches deeper than 0.1 mm are present on finished parts.
- Reject if dimensional tolerance exceeds ± 0.05 mm for critical features (e.g., bearing surfaces, gear teeth).
- Reject if moisture content exceeds 0.3% by weight (measured via Karl Fischer titration) before processing.
- Reject if material exhibits a 'chalky' or powdery surface finish, indicating UV degradation or improper storage.

5.0 Storage, Handling & WHMIS Guidelines

- Store in a cool, dry environment at 15-25°C with relative humidity below 50%.
- Shelf life: 12 months from date of manufacture when stored in original sealed packaging. After opening, use within 6 months.
- Follow FIFO (First-In, First-Out) inventory rotation to prevent aging and moisture absorption.
- Pre-dry material at 80-90°C for 2-4 hours before processing if packaging has been opened or if moisture content is suspect.
- WHMIS Classification: Not classified as a hazardous material under WHMIS 2015 (GHS). However, dust generated during machining may be a respiratory irritant.
- Mandatory PPE: Safety glasses with side shields, cut-resistant gloves (ANSI A2 or higher), and dust mask (N95) during machining operations.
- Avoid prolonged skin contact with dust; wash with soap and water if contact occurs.
- Machining dust should be collected via local exhaust ventilation to prevent accumulation. Do not allow dust to accumulate on hot surfaces (fire risk).
- Spill procedure: Sweep or vacuum dust; do not use compressed air to avoid airborne dust. Dispose of waste in accordance with local regulations.
- Fire safety: Delrin is combustible. In case of fire, use dry chemical, CO₂, or water fog. Avoid direct water stream on molten material. Burning may release formaldehyde gas.

Regulatory Disclaimer: This document is a generic technical material specification provided for educational purposes. The end-user assumes all liability for reviewing, adapting, and validating all tolerances, properties, and safety protocols against specific OEM data sheets and local regulations before deployment.