
Polyurethane PU Elastomer – Technical Material Specification

1.0 Material Overview & Common Uses

Polyurethane PU Elastomer is a high-performance thermoset polymer known for its exceptional abrasion resistance, high tear strength, and excellent load-bearing capacity. It combines the elasticity of rubber with the toughness of plastic, making it ideal for demanding industrial applications.

Common uses include heavy-duty wheels and rollers (forklift tires, conveyor rollers), hydraulic seals and wipers, mining screens and liners, vibration dampeners, and high-wear bushings. It is also widely used in the automotive, oil and gas, and material handling industries for parts requiring resilience and durability.

2.0 Core Technical Properties & Sizing

- Hardness range: Shore A 40 to Shore D 80 (typical industrial grades: 70A, 80A, 90A, 95A, 60D)
- Density: 1.10 – 1.25 g/cm³ (varies with hardness and filler content)
- Tensile strength: 20 – 55 MPa (depending on grade and formulation)
- Elongation at break: 200% – 600% (higher for softer grades)
- Tear strength (Die C): 30 – 120 kN/m
- Abrasion resistance (NBS Index): 100 – 500 (excellent)
- Compression set (22h @ 70°C): 15% – 40% (lower is better for sealing applications)
- Operating temperature range: -40°C to +100°C (continuous); up to +120°C intermittent
- Standard sheet sizes: 600 x 600 mm, 1000 x 1000 mm, 1200 x 1200 mm; thicknesses from 1 mm to 100 mm
- Rod diameters: 6 mm to 300 mm, standard lengths 1 m or 2 m
- Tolerances on thickness (sheet): ±0.5 mm for thickness ≤ 10 mm; ±1.0 mm for thickness > 10 mm
- Tolerances on diameter (rod): ±0.2 mm for diameters ≤ 50 mm; ±0.5 mm for diameters > 50 mm

3.0 Processing, Machinability & Application

Polyurethane PU Elastomer can be machined using conventional metalworking equipment, but requires sharp tooling and proper cooling to prevent melting or gumming. It is not weldable but can be bonded using specialized polyurethane adhesives or cast directly into molds.

- Use high-speed steel (HSS) or carbide tooling with polished flutes to reduce friction and heat buildup.
- Recommended cutting speed for turning: 100 – 200 m/min; feed rate: 0.1 – 0.3 mm/rev.
- For milling, use a 2-flute or 3-flute end mill with a 30° helix angle; cutting speed: 80 – 150 m/min; chip load: 0.05 – 0.15 mm/tooth.
- Drilling: use a 118° point angle drill; peck drilling recommended for depths > 3x diameter; speed: 50 – 100 m/min; feed: 0.05 – 0.15 mm/rev.
- Coolant: use air blast or water mist to cool; avoid oil-based coolants that may cause swelling.

- Bonding: use two-part polyurethane adhesives (e.g., Lord 7542A/B) or cyanoacrylates for small parts; surface must be abraded and cleaned with isopropyl alcohol.
- Casting: liquid polyurethane systems require degassing under vacuum (29 inHg for 5–10 minutes) and curing at 80–100°C for 2–4 hours depending on formulation.
- Do not weld or thermally cut polyurethane; it will decompose and release toxic isocyanates.

4.0 Common Defects & Quality Control

- Reject if visible voids or bubbles exceed 1 mm in diameter on any surface or cross-section.
- Reject if surface cracks or crazing are present under 5x magnification.
- Reject if thickness variation exceeds $\pm 10\%$ of nominal value across the part.
- Reject if hardness deviates more than ± 5 Shore points from specified grade.
- Reject if any foreign inclusions (metal, dirt, unmixed resin) are visible to the naked eye.
- Reject if parts exhibit excessive flash or incomplete fill in castings (flash > 0.5 mm on edges).
- Acceptable warp limit: maximum 0.5 mm per 100 mm of length for flat sheets.
- For bonded assemblies, perform a 90° peel test; reject if adhesive failure occurs at less than 5 N/mm width.

5.0 Storage, Handling & WHMIS Guidelines

- Store in a cool, dry environment at 15–25°C and below 50% relative humidity to prevent moisture absorption.
- Keep away from direct sunlight, ozone sources, and strong oxidizers.
- Shelf life: 2 years from date of manufacture when stored in original sealed packaging.
- Follow FIFO (First In, First Out) inventory rotation to prevent aging degradation.
- WHMIS Classification: Not classified as hazardous in solid form. Machining dust may be an irritant.
- Mandatory PPE during machining: safety glasses, dust mask (N95), and cut-resistant gloves.
- If thermal decomposition occurs (burning), evacuate area and use self-contained breathing apparatus; decomposition products include carbon monoxide, hydrogen cyanide, and isocyanates.
- Spills of liquid polyurethane components: contain with inert absorbent, dispose as hazardous waste per local regulations.
- Wash hands thoroughly after handling; do not eat, drink, or smoke in work areas.

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