
ABS (Acrylonitrile Butadiene Styrene) Sheet – Technical Material Specification

1.0 Material Overview & Common Uses

ABS (Acrylonitrile Butadiene Styrene) is a common thermoplastic polymer known for its excellent impact resistance, toughness, and rigidity. It is an amorphous material composed of three monomers: acrylonitrile (chemical resistance and hardness), butadiene (impact strength), and styrene (processability and gloss).

ABS sheet is widely used in thermoforming, vacuum forming, and fabrication for applications such as automotive interior panels, appliance housings, protective enclosures, signage, and consumer goods. It offers good dimensional stability and a smooth surface finish suitable for painting or bonding.

- Common applications: automotive dashboards, refrigerator liners, luggage shells, power tool housings, and medical device enclosures.
- Available in various grades: general purpose, high impact, flame retardant (UL 94 V-0), and UV-stabilized for outdoor use.

2.0 Core Technical Properties & Sizing

- Density: 1.04 – 1.07 g/cm³ (typical for general purpose grade).
- Tensile strength: 40 – 50 MPa (ASTM D638).
- Flexural modulus: 2.0 – 2.4 GPa (ASTM D790).
- Impact strength (Izod notched): 200 – 400 J/m (ASTM D256).
- Melting temperature: Amorphous, no sharp melting point; processing range 190 – 240°C.
- Glass transition temperature (T_g): 105 – 110°C.
- Coefficient of linear thermal expansion: 80 – 110 × 10⁻⁶ /°C.
- Standard sheet sizes: 1220 × 2440 mm (4×8 ft), 1525 × 3050 mm (5×10 ft).
- Thickness tolerances: ±0.005 inch for sheets up to 0.125 inch; ±0.010 inch for 0.125–0.250 inch; ±0.015 inch for thicker sheets (per ASTM D374).
- Hardness: Rockwell R 100 – 115 (ASTM D785).
- Water absorption (24 hr immersion): 0.2 – 0.4% by weight (ASTM D570).

3.0 Processing, Machinability & Application

ABS sheet is easily machined using standard woodworking or metalworking tools. It does not require coolant but may benefit from air blast or mist to reduce heat buildup. The material is prone to melting if feed rates are too slow or tooling is dull.

- Cutting: Use carbide-tipped blades with 10–12 teeth per inch for sawing; feed rate 0.005–0.010 inch per tooth.
- Drilling: Use high-speed steel (HSS) or carbide drill bits with a 118° point angle; peck drilling recommended for depths > 3× diameter.
- Routing: Use single-flute or two-flute carbide bits at 15,000–20,000 RPM; chip load 0.002–0.005 inch per tooth.

- Thermoforming: Pre-dry sheet at 80°C for 2–4 hours to remove moisture; forming temperature 140–180°C; mold temperature 50–80°C.
- Bonding: Use solvent cements (e.g., methyl ethyl ketone, tetrahydrofuran) or cyanoacrylate adhesives; apply pressure for 30–60 seconds.
- Welding: Ultrasonic welding is effective; use 20–40 kHz frequency with amplitude 20–40 µm.
- Painting: Use acrylic or polyurethane paints; primer recommended for adhesion.

4.0 Common Defects & Quality Control

- Reject if surface has visible scratches deeper than 0.002 inch (0.05 mm) that cannot be removed by light sanding.
- Reject if there are bubbles, blisters, or voids greater than 0.5 mm in diameter on any surface.
- Reject if thickness variation exceeds ± 0.010 inch across the sheet (measured at four corners and center).
- Reject if sheet is warped more than 1.5 mm per 300 mm length when placed on a flat surface.
- Reject if there are visible inclusions, contamination, or discoloration spots larger than 1 mm.
- Reject if the sheet does not meet specified impact strength (Izod notched) by more than 10% of nominal value.
- Acceptable surface finish: matte to glossy, free of die lines or flow marks beyond 0.001 inch depth.

5.0 Storage, Handling & WHMIS Guidelines

- Store in a cool, dry area away from direct sunlight and heat sources; temperature range 15–30°C.
- Relative humidity should be kept below 60% to prevent moisture absorption; use desiccant packs if stored for extended periods.
- Shelf life: 2 years from date of manufacture if stored properly; rotate stock using FIFO (first-in, first-out) protocol.
- Handle with clean, dry gloves to avoid oil contamination; use suction cups or padded clamps for large sheets.
- WHMIS classification: Not classified as hazardous under WHMIS 2015 (GHS) for solid form. Dust or fumes from machining may be irritating.
- PPE for machining: Safety glasses with side shields, dust mask (N95) if generating airborne particles, and cut-resistant gloves when handling sharp edges.
- Ventilation: Use local exhaust ventilation when sawing, sanding, or routing to control airborne particulates.
- Disposal: Recyclable as plastic #7; incinerate with energy recovery or landfill as per local regulations.

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.