
5052 H32 Aluminum Sheet – Bending/Forming Grade Technical Material Specification

1.0 Material Overview & Common Uses

5052 H32 aluminum is a non-heat-treatable wrought alloy with magnesium as its primary alloying element (nominally 2.2–2.8% Mg). The H32 temper indicates it has been strain-hardened and then stabilized to a quarter-hard condition, providing an excellent balance of strength, formability, and corrosion resistance. This grade is widely specified for sheet metal components that require moderate strength and superior bendability without cracking.

- Common applications include marine components (fuel tanks, hatches), automotive body panels, electronic enclosures, architectural cladding, and general sheet metal fabrication where tight-radius bends are required.
- Preferred over 6061 for complex forming operations due to its higher elongation and lower tendency to work-harden during bending.

2.0 Core Technical Properties & Sizing

- Density: 2.68 g/cm³ (0.0968 lb/in³)
- Melting range: 607–649°C (1125–1200°F)
- Tensile strength (H32 temper): 210–260 MPa (30–38 ksi)
- Yield strength (0.2% offset): 130–180 MPa (19–26 ksi)
- Elongation in 50 mm: 12–20% minimum (dependent on thickness)
- Hardness: 60–70 HRB (Rockwell B scale)
- Modulus of elasticity: 70.3 GPa (10.2×10^6 psi)
- Shear strength: 125–165 MPa (18–24 ksi)
- Fatigue strength (5×10^8 cycles): 110–140 MPa (16–20 ksi)
- Standard sheet thicknesses: 0.032 in (0.81 mm), 0.040 in (1.02 mm), 0.050 in (1.27 mm), 0.063 in (1.60 mm), 0.080 in (2.03 mm), 0.090 in (2.29 mm), 0.100 in (2.54 mm), 0.125 in (3.18 mm)
- Standard sheet sizes: 48 in × 96 in (1220 mm × 2440 mm), 48 in × 120 in (1220 mm × 3050 mm), 60 in × 120 in (1525 mm × 3050 mm)
- Thickness tolerance (per ASTM B209): ± 0.005 in for thicknesses up to 0.063 in; ± 0.007 in for 0.064–0.125 in
- Flatness tolerance: 0.125 in over any 48 in length (standard sheet); tighter tolerances available on request
- Surface finish: mill finish (typical Ra 0.5–1.5 μ m); bright or anodized finishes available as special order

3.0 Processing, Machinability & Application

5052 H32 is rated as having excellent formability and good machinability. Its moderate strength and high elongation make it ideal for bending, stamping, deep drawing, and roll forming. The material does not require annealing for most cold-forming operations, but tight-radius bends (less than $1 \times$ material thickness) may benefit from localized heating to 150–200°C to reduce springback.

- Minimum bend radius (90° bend, perpendicular to grain): 0.5× material thickness for thicknesses up to 0.080 in; 1.0× for 0.081–0.125 in.
- Springback allowance: typically 2–5° for air bending; compensate with overbend or coining technique.
- Cutting: shearing, laser cutting (recommended 1–2 kW fiber laser, 200–400 ipm for 0.063 in), plasma cutting (40–60 A, 100–150 ipm), or waterjet (60,000–90,000 psi, 20–40 ipm).
- Machining: use sharp carbide tooling with high rake angles (10–15°). Recommended spindle speed: 2000–4000 SFM (surface feet per minute). Feed rate: 0.005–0.015 in/rev for turning; 0.002–0.006 in/tooth for milling.
- Welding: readily weldable by GTAW (TIG) with 5356 or 4043 filler rod. Preheat not required for thicknesses under 0.5 in. Use AC current, 150–250 A, argon shielding gas at 15–25 CFH.
- Adhesive bonding: compatible with epoxy, polyurethane, and acrylic adhesives after proper surface preparation (degreasing + light abrasion).
- Anodizing: responds well to sulfuric acid anodizing (Type II) producing a clear to light gray coating; thickness range 0.0002–0.0010 in.

4.0 Common Defects & Quality Control

- Reject if surface exhibits scratches deeper than 0.002 in (0.05 mm) that cannot be removed by light sanding (180 grit).
- Reject if surface pits, die marks, or roll marks exceed 0.005 in (0.13 mm) in depth or are visible after forming.
- Reject if edge burrs exceed 10% of material thickness (e.g., >0.006 in on 0.063 in sheet).
- Reject if camber (edge curvature) exceeds 0.125 in over any 96 in length.
- Reject if twist (warp) exceeds 0.0625 in per foot of width or length.
- Reject if thickness is outside ASTM B209 tolerance band (see Section 2.0).
- Reject if material exhibits orange peel or Luders lines after forming (indicates incorrect temper or excessive cold work).
- Reject if cracking occurs during bend test at specified minimum radius (per ASTM E290).
- Reject if chemical composition deviates from AA 5052 limits: Mg 2.2–2.8%, Cr 0.15–0.35%, Fe ≤0.40%, Si ≤0.25%, Cu ≤0.10%, Mn ≤0.10%, Zn ≤0.10%, remainder Al.

5.0 Storage, Handling & WHMIS Guidelines

- Store indoors in a dry, climate-controlled environment with relative humidity below 60% and temperature between 10–30°C.
- Do not store directly on concrete floors; use wooden pallets or plastic dunnage to prevent moisture wicking and galvanic corrosion.
- Shelf life: indefinite under proper storage conditions, but FIFO (first-in, first-out) rotation is recommended to avoid surface oxidation buildup.
- Separate from copper, brass, and stainless steel to prevent galvanic corrosion from contact.
- WHMIS classification: Not classified as a hazardous material under WHMIS 2015 (no GHS pictograms required for solid aluminum sheet).
- Potential hazards during processing: airborne aluminum dust (combustible), sharp edges, and hot surfaces from welding/cutting.
- Mandatory PPE during handling: cut-resistant gloves (ANSI A4 or higher), safety glasses with side shields, and steel-toed boots.
- Additional PPE for machining/welding: N95 respirator (if dust or fume generation), welding helmet with appropriate shade (10–12 for GTAW), and flame-resistant clothing.
- Fire safety: aluminum dust is combustible; use wet collection systems or HEPA vacuums with explosion-proof motors. Keep water or Class D extinguishers nearby.
- Disposal: scrap aluminum is fully recyclable; segregate from other metals and send to a licensed recycler.

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