

Aluminum 5052 (UNS A95052) Spec Sheet

Aluminum alloy 5052 contains nominally 2.5% magnesium and 0.25% chromium. It has good workability, medium static strength, high fatigue strength, good weldability and very good corrosion resistance, especially in marine atmospheres. It also has the low density and excellent thermal conductivity common to all aluminum alloys. It is commonly used in sheet, plate and tube form.

Typical Applications

Architecture, general sheet metal work and heat exchangers.

Chemical Composition

Aluminum Development Council of Australia

Element	Percent (%)	Element	Percent (%)
Aluminum	Balance	Copper	0.10 max
Magnesium	2.2 - 2.8	Manganese	0.10 max
Chromium	0.15 - 0.35	Zinc	0.10 max
Silicon	0.25 max	Others, each	0.05 max
Iron	0.40 max	Others, total	0.15 max

Specified Mechanical Properties

Aluminum Development Council of Australia

Temper	0.2% Proof Stress, MPa min†	Tensile Strength, MPa	Elongation % min‡
O (annealed)	65	170 - 215	14 - 20
H32	160	215 - 265	4 - 10
H34	180	235 - 285	3 - 8
H36	200	255 - 305	2 - 4
H38	220	270 min	2 - 4

† For information only, proof stress is not specified or measured except by prior agreement

‡ Minimum elongation, actual value depends on thickness - thicker gauges have higher elongation

Key to Tempers:

Temper	Condition		
O	Annealed (soft)		
H1x	Strain hardened only		
H3x	Strain hardened and then stabilized (i.e. low temperature heat treated to pre-empt natural aging, by reducing strength and increasing ductility)		
Second digit: (x)			
8	full hard	4	1/2 hard
6	3/4 hard	2	1/4 hard

Description

Aluminum 5052 is an aluminum magnesium alloy which can be hardened by cold work: it is not heat treatable to higher strength. It is about mid way through the series of aluminum magnesium alloys for alloying content and strength. It has excellent fatigue properties, with an endurance limit of 115 MPa in the H32 temper and 125 MPa in the H34 temper.

Austral Wright Metals

Austral Wright Metals can supply this alloy as plate, sheet and strip. See Austral Wright Metals Catalog for normal stock sizes and tempers.

Corrosion Resistance

5052 has the same high resistance to general corrosion as other non heat treatable aluminum alloys. It also has the higher resistance to slightly alkaline conditions common to the 5000 series alloys. The resistance of 5052 to corrosion in marine atmospheres is excellent, exceeding that of 5005, hence the frequent use of 5052 in marine applications.

The corrosion resistance of aluminum alloys relies on a protective surface oxide film, which when damaged is readily repaired by the rapid reaction between aluminum and oxygen. However, the high reactivity of the base metal can give rapid corrosion if the film cannot be repaired, so aluminum alloys are not suitable for use with reducing media. 5052 can be anodised to improve the corrosion resistance by thickening the protective surface film.

Since aluminum is a reactive metal, it may corrode more quickly when in electrical contact with most other metals. The prediction of galvanic corrosion is complex; please consult Austral Wright Metals for specific advice.

Pressure Vessels

AS1210 Pressure Vessels and AS4041 Pressure Piping prequalify the alloy for pressure service for temperatures up to 200°C.

Physical Properties

Property	At	Value	Unit
Density	20°C	2,680	kg/m ³
Melting Range		607 - 650	°C
Modulus of Elasticity			
Tension	20°C	69.3	GPa
Torsion	20°C	25.9	GPa
Compression	20°C	70.7	GPa
Mean Coefficient of Expansion	20°C	23.75	x 10 ⁻⁶ /°C
Thermal Conductivity	25°C	138	W/m . °C
Electrical Resistivity	20°C	.050	micro-ohm . m
Electrical Conductivity			
Equal Volume	20°C	35	% IACS
Equal Weight	20°C	116	% IACS

Fabrication

Aluminum 5052 is not generally hot worked. It is very readily cold formable in the annealed condition, as it is ductile. Forming loads and tool & press wear are generally less than with carbon steel. For piercing and blanking the punch to die clearance should be about 7% of the thickness per side for the H32 and H34 tempers. Sharp tools are required.

Indicative minimum bend radii for 90° cold forming for various thickness, t mm

Temper	0.4	0.8	1.6	3.2	4.8	6.4	9.5	13
H32	0 t	0 t	1 t	1½ t	1½ t	1½ t	1½ t	2 t
H34	0 t	1 t	1½ t	2 t	2 t	2½ t	2½ t	3 t

Machinability

5052 is readily machinable by conventional methods. It should be machined at high speed with copious lubrication to avoid thermal distortion of the workpiece. Sharp tools are essential. High speed steel or tungsten carbide may be used. Cuts should be deep and continuous, with high cutting speeds. Woodworking machinery may be suitable for short runs.

Welding

5052 is readily weldable by standard techniques. It is frequently welded with GTAW (TIG) or GMAW (MIG). Aluminum must be very dry and clean to avoid contamination and porosity of the weld. Filler metals 1100, 4043 or 4047 are used. 4043 is the most crack tolerant. Best color match is obtained with 1188 filler metal. Shielding gas must be dry and free of hydrogen.

Heat Treatment

Aluminum 5052 is annealed at 345°C, time at temperature and cooling rate are unimportant. Stress relief is rarely required, but can be carried out at about 220°C. If loss of strength is of concern, stress relief test should be conducted.

ASTM Product Specifications

Specification	Title
B209	Aluminum and Aluminum Alloy Sheet and Plate
B316	Aluminum and Aluminum Alloy Rivet and Cold Heading Wire & Rods
B210	Aluminum and Aluminum Alloy Drawn Seamless Tubes
B483	Aluminum and Aluminum Alloy Drawn Tubes for General Purpose Applications

Typical strength and ductility of alloys 5005 and 5052 in the H32 and H34 tempers

