
Aluminium Alloy 5052 Data Sheet

Alloy 5052

Alloy 5052 is a non-heat-treatable 2.5% magnesium, 0.25% chromium alloy commonly available in flat rolled coil, sheet and plate from a wide range of producing mills. Like all the 5000-series high magnesium alloys 5052 has a fairly high strength and is hardenable to a significant degree by cold working, enabling a series of “H” tempers.

Alloy 5052 is also produced as a treadplate (also known as chequer plate) with mainly industrial applications.

Stucco finish sheet is produced typically in 1.0 – 1.5mm thickness.

The alloy is also produced as drawn seamless tube, wire and bar and foil, available on indent from Atlas.

Corrosion Resistance

Excellent in a wide range of atmospheric environments, in food and architectural applications and it is also acceptable in many marine environments. The magnesium content is low enough that it does not suffer from the stress corrosion cracking that can affect alloys with more than about 3.5% Mg, such as 5083.

Heat Treatment

Alloy 5052 is not hardenable by heat treatment. It can be significantly hardened by cold work (e.g. by cold rolling) and various “H” tempers are produced – most commonly H32 (¼ Hard) and H34 (½ Hard) – as well as the soft annealed Temper O condition.

The alloy spontaneously age-softens at room temperature immediately after cold work but will eventually reach a stable condition; all flat rolled mill products are supplied with stable properties. This is usually achieved by a stabilisation thermal treatment, either a low temperature thermal treatment or as a result of heat introduced during rolling, which results in the H3x tempers. H2x tempers are more severely strain hardened and then partially annealed, again to quickly reach the required stable temper properties.

To soften Alloy 5052, it can be annealed by heating to 345°C, hold until uniform temperature then cool; the rate of cooling is not important.

Welding

Excellent weldability by all standard methods; gas, electric and resistance welding. GMAW and GTAW are preferred and widely used to produce structural welds. Filler alloys are usually 5356 although other filler alloys are possible. Welding of strain hardened tempers will reduce strengths in the heat affected zones.

Machining

Machinability of the softer tempers O and H32 is poor, with the harder tempers such as H34 being somewhat easier to machine.

The 5251 Alternative

It has become common practice in Australia and New Zealand for Alloy 5251 to be offered as an alternative to 5052. The two alloys are very similar in composition and properties and in many cases, they are functionally interchangeable. They are however different alloys and a piece of

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metal that complies with one cannot also comply with the other. Some users can only accept one alloy or the other. Purchasers of these alloys must decide whether alternatives are acceptable.

Typical Applications

Small marine craft ("tinnies"), food processing equipment, cabinets, and in treadplate form is used for industrial and marine flooring, trailers and tool boxes. Stucco finish sheet is used in building panelling and similar applications.

Specified Properties

These properties are specified for flat rolled product (plate, sheet and coil) in ASTM B209M. Similar but not necessarily identical properties are specified for other products such as tube and bar in their respective specifications.

Composition Specification (%) (Single values are maxima except as noted)

Alloy	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Others	
									Each	Total
5052	0.25	0.40	0.10	0.10	2.2-2.8	0.15-0.35	0.10	-	0.05	0.15

Mechanical Property Specification (Single values are minima except as noted)

Alloy & Temper	Tensile Strength (Mpa)	Yield Strength 0.2% Proof (Mpa) min.	Elongation (% in 50mm)				
			Minimum for sheet or plate thicknesses shown				
			0.15-0.32mm	0.33-0.63mm	0.64-1.20mm	1.21-6.30mm	6.31-80.0mm
5052-O	170 - 215	65	13	15	17	19	18
5052-H32	215 - 265	160	-	4	5	7	11
5052-H34	235 - 285	180	3	3	4	6	10
5052-H36	255 - 305	200	2	3	4	4 *	-
5052-H38	270 min.	220	2	3	4	4 *	-

- Tempers H22 and H24 etc. may not meet maximum tensile strength and minimum yield strength limits, but if supplied in place of ordered H32 or H34 all limits must be complied with.
- * Properties for H36 only specified up to 4.0mm, and for H38 up to 3.2mm thick.
- Specialist tempers such as F, H116, H112 and H141 are also possible in 5052 – refer to standards for details.

Physical Properties (Typical values)

Alloy	Density (kg/m ³)	Elastic Modulus (GPa)	Mean Coefficient of Thermal Expansion	Thermal Conductivity	Electrical Conductivity MS/m at 20°C		Electrical Resistivity
			20-100°C (µm/m/°C)	at 25°C (W/m.K)	Equal Volume	Equal Mass	(nΩ.m)
5052	2680	70	23.8	138	20	67	50

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Grade Specification Comparison

Alloy	UNS No	ISO	BS	DIN	
				No	Name
5052	A95052	AlMg2.5	L80, L81	3.3523	AlMg2.5

These comparisons are approximate only. The list is intended as a comparison of functionally similar materials **not** as a schedule of contractual equivalents. If exact equivalents are needed original specifications must be consulted.

Possible Alternative Alloys

Alloy	Why it might be chosen instead of 5052
3003	Brighter appearance required, particularly when considering treadplate.
5005	Bright (decorative) anodising finish is required.
5083	Higher strength or improved corrosion resistance required, particularly for ship hull applications.

Bending Radii

Temper	Minimum Bend Radius for Sheet or Plate thickness "t"							
	0.4mm	0.8mm	1.6mm	3.2mm	4.8mm	6.0mm	10mm	12mm
O	0t	0t	0t	½t	1t	1t	1½t	1½t
H32	0t	0t	1t	1½t	1½t	1½t	1½t	2t
H34	0t	1t	1½t	2t	2t	2½t	2½t	3t
H36	1t	1t	1½t	2½t	3t	3½t	4t	4½t
H38	1t	1½t	2½t	3t	4t	5t	5½t	6½t

Recommended minimum bending radius for sheet of thickness given, at 90° to the rolling direction. These values are recommended but are not guaranteed; the minimum possible bend radius will depend on the type of bending equipment and on the tooling and its condition.

Treadplate

Treadplate is poorly specified – ASTM B632 covers this product but not in the alloys and tempers usual in Australia. The common approach is to specify as ASTM B209 in Alloy 5052 and Temper O, with mechanical properties as on page 2 of this datasheet. The usual tread pattern is "5-bar" with appearance as at right. The tread pattern stands proud of the base sheet or plate, so a 6mm thick treadplate has a thickness of nominal 6.0mm with the tread additional.



Other tread patterns may be available subject to enquiry. Alloy 3003 "1-bar" or "propeller pattern" treadplate is another alternative, particularly for decorative applications.

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References

- ASTM B209M – 10. Standard Specification for Aluminium and Aluminium-Alloy Sheet and Plate.
- ASTM B928M – 09. Standard Specification for High Magnesium Aluminium-Alloy Sheet Service and Similar Environments.
- Aluminium Association – Aluminium Standards and Data – 2009 Metric SI.
- WTIA Technical Note 2 – Successful Welding of Aluminium.
- Atlas Tech Note No. 14 – Aluminium Alloys 5052 and 5251 - Quite Similar but Completely Different.

Limitation of Liability

The information contained in this Atlas Steels Aluminium Alloy 5052 Data Sheet document is not an exhaustive statement of all relevant information. It is a general guide for customers to the products and services available from Atlas Steels and no representation is made or warranty given in relation to this information or the products or processes it describes.