
Aluminium Alloy 3003 Data Sheet

Alloy 3003

Alloy 3003 is a non-heat-treatable 1.2% manganese, 0.12% copper alloy commonly available in flat rolled coil, sheet and plate from a wide range of producing mills. It is one of the most commonly used of all aluminium alloys, essentially commercially pure aluminium with the addition of manganese to increase its strength about 20%. It has all the excellent properties of alloy 1100; excellent corrosion resistance plus the ability to be easily drawn or spun, welded or brazed. Alloy 3003 is fairly low strength, but it can be hardened to a significant degree by cold working, enabling a series of "H" tempers.

Alloy 3003 is also produced as a bright finish treadplate (also known as chequer plate) with industrial and decorative applications.

The alloy is also produced as drawn or extruded seamless tube, forgings, wire and bar and foil; these forms are available on indent from Atlas.

Corrosion Resistance

Excellent in a wide range of atmospheric environments, in food and architectural applications.

Heat Treatment

Alloy 3003 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 H12 (¼ Hard) and H14 (½ Hard) – as well as the soft annealed Temper O condition.

Alloy 3003 is usually supplied in H1x tempers, where the product is strain hardened only; there is no stabilisation treatment as is usual for the 5xxx series alloys.

To soften Alloy 3003, it can be annealed by heating to 415°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 1100 although other alloys are possible. Welding of strain hardened tempers will reduce strengths in the heat affected zones.

Machining

Machinability of the softer tempers O and H12 is poor, with the harder tempers such as H14 and above being somewhat easier to machine.

Treadplate

Treadplate in alloy 3003 is typically used in decorative architectural applications, due to its bright reflective finish. It is usually produced in a "1-bar" or "propeller" tread pattern. Alloy 3003 treadplate is available on indent from Atlas.

Typical Applications

Cooking utensils, decorative trim, awnings, siding, storage tanks and chemical equipment.

Specified Properties

These properties are specified for flat rolled product (plate, sheet and coil) in ASTM B209M.

Aluminium Alloy 3003 Data Sheet

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
3003	0.6	0.7	0.05-0.20	1.0-1.5	-	-	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				
			0.20-0.32mm	0.33-0.63mm	0.64-1.20mm	1.21-6.30mm	6.31-80.0mm
3003-O	95 - 130	35	18	20	23	25	23
3003-H12	120 - 160	85	-	3	4	6	9 *
3003-H14	140 - 180	115	1	2	3	5	8 *
3003-H16	165 - 205	145	1	2	3	4 *	-
3003-H18	185 min.	165	1	1	2	4 *	-

- Tempers H22 and H24 etc may not meet maximum tensile strength and minimum yield strength limits, but if supplied in place of ordered H12 or H14 all limits must be complied with.
- * Elongation limits stated do not cover the full range of thicknesses shown.
- Specialist tempers such as F, H112 and the H2x range are also possible in 3003 – 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)
3003	2730	69	23.2	193	29	92	34

Grade Specification Comparison

Alloy	UNS No	ISO	BS	DIN	
				No	Name
3003	A93003	AlMn1Cu	N3	3.0517	AlMnCu

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.

Aluminium Alloy 3003 Data Sheet

Possible Alternative Alloys

Alloy	Why it might be chosen instead of 3003
5005	Bright (decorative) anodising finish is required.
5052	Higher strength required, and less bright finish is acceptable.
5083	Higher strength or improved corrosion resistance required, particularly for ship hull applications.

Bending Radii

Minimum Bend Radius for Sheet or Plate thickness "t"								
Temper	0.4mm	0.8mm	1.6mm	3.2mm	4.8mm	6.0mm	10mm	12mm
O	0t	0t	0t	0t	½t	1t	1t	1½t
H12	0t	0t	0t	½t	1t	1t	1½t	2t
H14	0t	0t	0t	1t	1t	1½t	2t	2½t
H16	½t	1t	1t	1½t	2½t	3t	3½t	4t
H18	1t	1½t	2t	2½t	3½t	4½t	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.

References

- ASTM B209M – 10. Standard Specification for Aluminium and Aluminium-Alloy Sheet and Plate.
- Aluminium Association – Aluminium Standards and Data – 2009 Metric SI.
- WTIA Technical Note 2 – Successful Welding of Aluminium.

Limitation of Liability

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