

Characteristics of Aluminium Alloy 5754

It is appropriate to briefly note some of the basic characteristics of this Aluminium Alloy 5xxx that make it desirable candidates for a wide range of application.

Physical / Mechanical Properties

Corrosion Resistance: As a result of a naturally occurring tenacious surface oxide film, many aluminium alloys provide exceptional resistance to corrosion in many atmospheric and chemical environments. Alloy of 5xxx system is especially favourable in the respect and are even used in application where it is in direct contact with seawater (marine application) and antiskid salts.

Strength/Weight ratio: The combination of relatively high strength with low density means high strength efficiency for aluminium alloys 5754 and many opportunities for replacement of heavier metals with no loss (and perhaps a gain) in load-carrying capacity. This characteristic combined with excellent corrosion resistance and recyclability, has led to the broad use of aluminium in containers, aircraft, and automotive applications.

Fracture Toughness and Energy Absorption Capacity: Many aluminium alloys are exceptionally tough and make excellent choice for critical application where resistance to brittle fracture and unstable crack growth are imperatives. Alloys of the 5xxx Series, for example, are prime choice for liquefied natural gas tankage. In addition, a special high-toughness version of aircraft alloys. Such as 2124, 7050, and 7475, replace the standard versions of these alloys for critical bulkhead applications.

Cryogenic Toughness: Aluminium alloys, especially of 5xxx, and 6xxx, series, are ideal for very low temperature applications because of the detailed documentation that their ductility and toughness as well as strength, are higher at subzero temperatures, even down to near absolute zero, than at room temperature.

Workability: Aluminium alloys are readily workable by a great variety of metalworking technologies and are especially amenable to extrusion (the

process of forcing heated metal through shaped dies to produce specified shaped sections). This characteristic enables aluminium to be produced in a remarkable variety of shapes in which the metal can be placed in locations where it can most efficiently carry the applied loads.

Electrical Conductivity: Along with copper, aluminium has an electrical conductivity high enough for use as an electrical conductor. Although the conductivity of the commonly used conducting alloy (1350) is only around 62% of annealed copper, it is only one third the weight and can therefore conduct twice as much electricity when compared with copper of the same weight.

Thermal Conductivity: Aluminium and aluminium alloy are good conductors of heat about three times greater than that of steel, and while they melt at lower temperature than steels, approximately 535 0C (1000 0F). They are slower than steel to reach very high temperature in fire exposure

Ease of Joining: Aluminium alloys can be joined by a very broad variety of commercial methods, including welding, brazing, soldering, riveting, bolting, and even nailing. In addition to an unlimited variety of mechanical procedures, Welding while considered difficult by those familiar only with joining steel and who try to apply the same techniques to aluminium, is particularly easy when performed by proven technique such as gas metal arc welding (GMAW or MIG) or gas tungsten arc welding (GTAW or TIG).

Reflectivity: From UV to infra-red, aluminium is an excellent reflector of radiant energy. Visible light reflectivity of around 80% means it is widely used in light fixtures. The same properties of reflectivity makes aluminium ideal as an insulating material to protect against the sun's rays in summer, while insulating against heat loss in winter.

Understanding of ALLOY 3_{xxx} AND ALLOY 5_{xxx} advantages and limitations.

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3_{xxx}, Manganese. Manganese provides only modest strength increase even when strain hardened but relatively high formability and ductility, and high resistance to corrosion in almost all environments. Alloys of 3_{xxx} series are readily weldable and are among the best for brazing and soldering applications.

Commercial aluminium-manganese alloy contain up to 1.2% manganese, but it is appropriate to note that manganese is commonly employed as a supplementary alloying constituent in alloys of the other series to enhance strength.

5_{xxx}, Magnesium. Magnesium additions to aluminium provide among the highest strength non-heat-treatable alloys. These alloys also are exceptionally tough absorbing lots of energy during fracture, and so can be used in critical applications where superior toughness is vital. Alloys of the 5_{xxx} series are readily welded by commercial procedures.

5_{xxx} alloys have excellent resistance to atmospheric and seawater corrosion to the point that they may be used in severe marine environments.

However, alloys with more than 3% Mg. are not recommended for service in which significant exposure to high temperature may be encountered because some sensitization to SCC may develop. For these type of applications, alloys such as 5052, 5054, and 5754 containing less magnesium are recommended.

Chemical Composition:

**Table 1 Alloys 3xxx
Chemical Composition**

Mn:	1.0-1.5
Fe:	0.7
Cu:	0.25
Si:	0.3
Mg:	0.8-1.3
Zn:	0.25
Each:	0.05
Cr:	
Ti:	
Total:	0.15
Al:	Remainder

**Table 2 Alloys 5xxx
Chemical Composition**

Mg:	2.6-3.6
Fe:	0.40
Cu:	0.10
Si:	0.4
Mn:	0.5
Zn:	0.20
Each:	0.05
Cr:	0.30
Ti:	0.15
Total:	0.15
Al:	Remainder

Mechanical characteristics:

**Table 3 Alloys 3xxx
Mechanical characteristics**

Ultimate Tensile Strength N/mm ² :	220
Yield Strength, Rp0.2, N/mm ² :	170
Elongation in 50mm, %:	1

**Table 4 Alloys 5xxx
Mechanical characteristics**

Ultimate Tensile Strength N/mm ² :	320
Yield Strength, Rp0.2, N/mm ² :	280
Elongation in 50mm, %:	4

Applications:

**Table 5 Alloys 3xxx
Applications**

Applications:	Drawing and forming stock, industrial roofing seam welded irrigation tubes, container sheet, road transport applications.
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**Table 6 Alloys 5xxx
Applications**

Applications:	Marine applications requiring a combination of strength and resistance to corrosion in sea water, accessible roofing applications, flooring applications, welded chemical and nuclear structures, equipment and containers in fish processing and other food industries, Treadplate.
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General characteristics:

**Table 7 Alloys 3xxx
General characteristics**

Strength:	Low
Corrosion Resistance:	Good
Walkability:	Low (Ductile material)
Anodising :	Good (for surface protection only)
Formability :	Good
Machinability	Poor
Weldability :	Very Good
DENSITY g/cm3:	2.66

**Table 8 Alloys 5xxx
General characteristics**

Strength:	Very high
Corrosion Resistance:	Excellent
Walkability:	Excellent (Elastic material)
Anodising :	Very Good
Formability :	Very Good
Machinability	Fair
Weldability :	Excellent
DENSITY g/cm3:	2.72