AVIATIONEU NEW ERA QUALITY SUPPLIES

BRIEF GUIDE ON ALUMINUM GRADES & TEMPER DESIGNATIONS

The selection of the proper grades of aluminum will depend on the both application as well as its working conditions. Temper designations refer to variations of the physical properties that are achievable within an alloy providing information on how the alloy has been mechanically and/or thermally treated to achieve the properties desired. The first character in the temper designation (a capital letter, F, O, H, W, or T) indicates the general class of treatment. This table offers a brief guide for grade selection and understanding different tempers of offered AVIATIONEU NEW ERA aluminum products.

GRADE SERIES & FEATURES	APPLICATIONS/ADDITIONAL INFO
Series 1xxx: 1050, 1060, 1100, 1145, 1200, 1230 & 1350 High thermal & electrical conductivity, low mechanical properties, relatively easy workability and high resistance to corrosion. Strain hardening can moderately increase strength.	Grade 1100 is non-heat treatable, with a high resistance to corrosion and susceptible to decorative finishes. Widely used in the food processing industry.
Series 2xxx: Low resistance to corrosion, limited weldability (exc. 2219), superior machinability. Require heat treatment to bring out properties similar and sometimes exceeding those of low-carbon steel.	2011 with its excellent mechanical properties is widely used in automatic screw machine parts requiring extensive machining. 2024, with its high resistance to corrosion, high strength, excellent resistance to fatigue, machinability and heat treatability, is used in various applications for parts such as truck wheels, hardware and structural components for aircraft. It is one of the best known high strength aluminum alloys used today.
Series 3xxx: 20% higher strength than series 1xxx aluminum alloy grades. Generally non-heat treatable.	Non-heat treatable, 3003 grade has the great characteristics of the 1100 grade, with an increased strength. it offers great workability, a high resistance to corrosion and commonly used for decorative trims, chemical equipment, cooking utensils and storage tanks.
Series 4xxx: Major alloying element is silicon. Can be added up to 12% to lower melting range. Suitable for use in welding wire or as brazing alloys for joining aluminium.	
Series 5xxx: Major alloying element is magnesium. Moderate to high strength, work-hardenable alloy. Good weldabilty and a relatively good resistance to corrosion in marine environments.	With the same applications as grade 3003, 5005 aluminum alloy is also well suited for anodizing and has a lesser tendency of streaking and discoloring. 5052 features a higher fatigue strength from most of the other aluminum alloys, excellent workability and higher resistance to salt water corrosion. Preforms well, showing a good resistance, to marine atmospheres. 5083 & 5086 present good welding characteristics, a great resistance to corrosion, good design efficiency and the same economy as non-heat treatable alloys. Used in various applications like missile containers, boat hulls, superstructures, unfired pressure vessels ad heavy-duty truck and trailer assemblies.
Series 6xxx: Heat treatable alloy with silicon and magnesium content featuring weldability, relatively good resistance to corrosion, good formability & medium strength. Not as strong as most of the grades in Series 2xxx & 7xxx. Can be formed in the T4 temper (solution heat treated).	6061 is heat-treatable, the least expensive grade as well as the most versatile of all the heat-treatable alloys. Offering a range of good mechanical properties, good resistance to corrosion, great workability in its hardened condition, it can be subjected to fairly severe forming operations in T4 condition and accomplish full T6 properties through artificial aging for increased weldability. Also available in clad form with a thin layer of high purity aluminium on its surface for improvement of appearance and resistance to corrosion. Used to make structural components, screw machine parts, truck bodies and frames, etc. 6063 (also referred to as 'architectural alloy') has a high resistance to corrosion, a high tensile strength and brilliant finishing features. Best suited for plain or colored anodizing applications and can be found in interior, exterior and architectural applications.
Series 7xxx: Major alloying element is zinc. When combined with magnesium, alloys become heat-treatable with a moderate to high strength. Reduced resistance to stress corrosion cracking. Used in highly stressed parts like mobile equipment & airframe structures.	With an excellent strength-to-weight ratio, 7075 is the highest strength aluminum alloy available today. It can be formed in its hardened condition and can undergo subsequent heat treatment. Also available in clad form, only moderately affecting its overall strength but improving resistance to corrosion. 7075 is used for applications that require high stressed parts.
Series 8xxx: Nickel and iron used as alloying elements to increase strength without significant loss in electrical conductivity. Aluminum-lithium alloy 8090, developed for aerospace applications, features an exceptionally high strength and stiffness.	

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TEMPER DESIGNATION	TEMPER SHORT DESCRIPTION
F, As Fabricated	Most F-temper products are “semi-finished” products. They are used in shaping, finishing or thermal processes to achieve other finished forms or tempers.
O, Annealed	Annealing treatments are used to achieve the lowest-strength condition for the alloy. The main reason is to maximize workability or increase toughness and ductility.
H, Strain-Hardened	This is for non-heat-treatable alloys that have had their strength increased by strain hardening, usually at room temperature. H Temper Strain Hardening Codes are listed below. The second digits (required) after the first H temper digit indicates the level of strain hardening and is based on the minimum ultimate tensile strength obtained. The third digit (optional) is a variation of the two digit temper. H1 - Strain hardened only H2 - Strain hardened and partially annealed H3 - Strain hardened and stabilized H4 - Strain hardened and lacquered or painted. This assumes that thermal affects from the coating process affect the strain hardening; seldom encountered.
W, Solution Heat-Treated	This designation applies only to alloys that age naturally and spontaneously after solution heat treating. It is rarely a finished temper.
T, Thermally Treated	This applies to any product form of any heat-treatable alloy that has been given a solution heat treatment followed by quenching and aging. T designations are listed below. Additional digits may be used after the first T temper digit to indicate subsequent stress relieving by processes such as stretching, compressing, or a combination. T1 - Cooled from an elevated temperature shaping process and naturally aged to a substantially stable condition. T2 - Cooled from an elevated temperature shaping process, cold worked, and naturally aged to a substantially stable condition. T3 - Solution heat treated, cold worked, and naturally aged to a substantially stable condition. T4 - Solution heat treated, and naturally aged to a substantially stable condition. T5 - Cooled from an elevated temperature shaping process then artificially aged. T6 - Solution heat treated then artificially aged. T7 - Solution heat treated then overaged/stabilized. T8 - Solution heat treated, cold worked, then artificially aged. T9 - Solution heat treated, artificially aged, then cold worked. T10 - Cooled from an elevated temperature shaping process, cold worked, then artificially aged.