Aluminum 2018 Alloy (UNS A92018)

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Topics Covered

Introduction

Aluminium / aluminum can be easily fabricated into many forms such as sheets, tubes, shapes, foil, rods, and wires. It is known to possess excellent machinability and plasticity in cutting, bending, and drawing.

Aluminium / aluminum 2018 alloy is a heat treatable wrought alloy. It is a high strength, age hardening, forging alloy. Copper is the chief alloying element.

The following datasheet will provide more details about aluminium / aluminum 2018 alloy.

Chemical Composition

The following table shows the chemical composition of aluminium / aluminum 2018 alloy.

Element	Content (%)
Copper, Cu	3.5 - 4.5
Nickel, Ni	1.7 - 2.3
Magnesium, Mg	0.45 - 0.9
Iron, Fe	1 max

Zinc, Zn	0.25 max
Silicon, Si	0.9 max
Manganese, Mn	0.2 max
Chromium, Cr	0.1 max
Other (each)	0.05 max
Other (total)	0.15 max
Aluminum, Al	Remainder

Physical Properties

The physical properties of aluminium / aluminum 2018 alloy are outlined in the following table.

Properties	Metric	Imperial
Density	2.82 g/cm³	0.102 lb/in³
Melting point	507 - 638°C	945 - 1180°F

Mechanical Properties

The mechanical properties of aluminium / aluminum 2018-T61 alloy are tabulated below.

Properties	Metric	Imperial
Tensile strength (@diameter 12.7 mm/0.500 in)	421 MPa	61000psi
Yield strength (@diameter 12.7 mm/0.500 in)	317 MPa	46000 psi
Elongation at break (@diameter 12.7 mm/0.500 in)	12%	12%
Poisson’s ratio	0.33	0.33
Elastic modulus	74.5 GPa	10800 ksi
Shear strength	269 MPa	39000 psi
Hardness, Brinell (@load 500 kg; thickness 10.0 mm/1100 lb;0.394 in)	120	120
Hardness, Knoop (converted from Brinell hardness value)	150	150
Hardness, Rockwell A (converted from Brinell hardness value)	47	47
Hardness, Rockwell B (converted from Brinell hardness value)	75	75
Hardness, Vickers (converted from Brinell hardness value)	137	137

Thermal Properties

The thermal properties of aluminium / aluminum 2018-T61 alloy are tabulated below.

Properties	Metric	Imperial
Thermal expansion co-efficient (@20-100°C/68-212°F)	22.3 µm/m°C	12.4 µin/in°F
Thermal conductivity	154 W/mK	1070 BTU in/hr.ft².°F

Other Designations

Equivalent materials to aluminium / aluminum 2018 alloy are ASTM B247 and QQ A-367.

Fabrication

Aluminium / aluminum 2018 alloy, especially in the aged condition, is easily machinable and it provides a smooth finish. In the case of solution heat treatment, this alloy becomes softer. During these processes, use of lubricating oils is recommended.

Heat treatment and quenching

Solution heat treatment should be carried out at 510°C (950°F) for ample time so that heating is uniform throughout. As a next step, water quenching has to be performed. It is recommended that heavy section size parts should be water quenched using water at about 93°C (200°F).

Forging and hot working

Forging and hot working of this alloy is possible; however, cold working can be performed only in the annealed condition. The ideal temperature range for forging is 482-521°C (900-970°F) and finishing at 260°C (500°F) before reheating to 521°C (970°F) if required. Similarly, hot working should be carried out at (500-970°F).

Welding

Aluminium / aluminum 2018 alloy should be welded using arc or resistance welding methods. Other traditional methods should be avoided. This alloy can be hardened by heat treatment and aging. Cold working also helps to harden. Age hardening is performed by solution treating the alloy and then aging at 171°C (340°F) for 10 h, which is followed by air cooling to achieve T61 temper. To achieve T71 temper, it should be aged at 232°C (450°F) for 6 h and air cooled.

Applications

Aluminium / aluminum 2018 alloy is chiefly used in the manufacture of aircraft engine cylinders and in heads and pistons.