ALCOA

ALLOY 7050 PLATE AND SHEET

BEST COMBINATION OF PROPERTIES

SUPPLYING THE WORLD'S BEST

ALLOY 7050

DESCRIPTION

Alloy 7050 is the premier choice for aerospace applications requiring the best combination of strength, stress corrosion cracking (SCC) resistance and toughness. It is particularly suited for plate applications in the 3 to 6 inch (76.20 to 152.40mm) thickness range. Alloy 7050 exhibits better toughness/corrosion resistance characteristics than alloy 7075. Because it is less quench sensitive than most aerospace aluminum alloys, 7050 retains its strength properties in thicker sections while maintaining good stress corrosion cracking resistance and fracture toughness levels.

Alloy 7050 plate is available in two tempers: T7651 combines the highest strength with good exfoliation corrosion resistance and average SCC resistance; and T7451 (formerly T73651) provides better SCC resistance and excellent exfoliation resistance at slightly lower strength levels.

Alloy 7050 sheet is available bare and Alclad in the T76 temper. Alcoa developed alloy 7050 and has been the major supplier of this alloy since the early 1970's.

THICK PLATE FABRICATION IMPROVEMENTS

Through the application of statistical process control techniques recently implemented at Alcoa's Davenport, Iowa plant, additional quality improvements have been made to thick gauges of 7050 plate. The resulting reduction of microporosity significantly improves the short transverse properties. This makes Alcoa 7050 plate a good choice where ST loadings are a design factor.

APPLICATIONS

Typical applications for alloy 7050 plate include fuselage frames and bulkheads where section thicknesses are 2 to 6 inches (50.8 to 152.40mm). Typical applications for alloy 7050 sheet include wing skins. The major usage is in plate applications requiring thicknesses over 2 inches (50.8mm) where 7050 has superior properties.

CHEMICAL COMPOSITION LIMITS (WT %)

Si 0.12	Zn 5.7-6.7
Fe 0.15	Zr. 0.08-0.115
Cu 2.0-2.6	Ti. 0.06
Mn 0.10	Others, each . . . 0.5
Mg 1.9-2.6	Others, total . . . 0.15
Cr 0.04	Balance . . . . . Aluminum

Note: Value maximum if range not shown.

MECHANICAL PROPERTIES

7050-T7651 PLATE (ALL GAUGE RANGES NOT SHOWN)
GUARANTEED MINIMUM LONG TRANSVERSE MECHANICAL PROPERTIES.
ALLOY 7075-7651 PROPERTIES SHOWN FOR COMPARISON.

	7050-T7651		7075-T651
Thickness: in. (mm)	0.250-1.000 (6.35-25.40)	2.001-3.00 (50.83-76.20)	2.500-3.000 (63.5-76.20)
Tensile Strength, ksi (MPa) Yield Strength, ksi (MPa) Elongation %	76 (524) 66 (455) 8	76 (524) 66 (455) 7	72 (496) 61 (421) 5

7050-T7451 PLATE (ALL GAUGE RANGES NOT SHOWN)
GUARANTEED MINIMUM LONG TRANSVERSE MECHANICAL PROPERTIES.
ALLOY 7075-T7351 PROPERTIES SHOWN FOR COMPARISON.

	7050-T7451		7075-T7351
Thickness: in. (mm)	0.250-2.000 (6.35-50.80)	5.001-6.00 (127.03-152.40)	3.501-4.000 (88.93-101.60)
Tensile Strength, ksi (MPa) Yield Strength, ksi (MPa) Elongation %	74 (510) 64 (441) 9	70 (483) 60 (414) 4	61 (421) 48 (331) 6

7050-T76 SHEET (ALL GAUGE RANGES NOT SHOWN)
TENTATIVE GUARANTEED MINIMUM LONG TRANSVERSE PROPERTIES.

	Bare	Clad
Thickness: in (mm)	0.063-0.187 (1.60-4.75)	0.063-0.187 (1.60-4.75)
Tensile Strength, ksi (MPa) Yield Strength, ksi (MPa) Elongation %	77 (531) 67 (462) 7	73 (503) 62 (427) 7

FRACTURE TOUGHNESS

Alloy 7050 is one of a group of controlled-toughness, high-strength alloys as defined by The Aluminum Association's Document T-5 (See "References").

7050-T7651 PLATE (ALL GAUGE RANGES NOT SHOWN)
GUARANTEED MINIMUM K_{Ic} FRACTURE TOUGHNESS VALUES: ksi√in. (MPa√m)

Test Direction:	L-T	T-L	S-L
Thickness Range			
1.001-2.000 in. (25.42-50.80mm)	26 (28.6)	24 (26.4)	-
2.001-3.000 in. (50.83-76.20mm)	24 (26.4)	23 (25.3)	20 (22)

7050-T7451 PLATE (ALL GAUGE RANGES NOT SHOWN)
GUARANTEED MINIMUM K_{Ic} FRACTURE TOUGHNESS VALUES: ksi√in. (MPa√m)

Test Direction:	L-T	T-L	S-L
Thickness Range			
1.001-2.000 in (25.42-50.80mm)	29 (31.9)	25 (27.5)	-
5.001-6.000 in. (127.03-152.40mm)	24 (26.4)	22 (24.2)	21 (23.1)

FATIGUE PROPERTIES

In general, the fatigue properties–including fatigue crack propagation–are similar to other high-strength 7XXX aluminum alloys. For complete data on the numerous tests conducted, refer to Alcoa Green Letter No. 220.

CORROSION RESISTANCE

Long-term controlled and in-service evaluations have shown alloy 7050 plate and sheet products to maintain equal exfoliation and stress corrosion resistance at higher strength levels compared with other high strength alloys such as 7075.

The T76 temper of alloy 7050 provides highest strength with excellent resistance to exfoliation corrosion. SCC resistance in this temper is adequate for most service applications where sustained tensile stresses in the short-transverse direction can be controlled to relatively low levels.

The T74 temper (formerly T736) is intended for more demanding SCC applications, such as certain interference fits or other sustained short transverse loaded structures.

THERMAL TREATMENTS

The recommended practices for heat-treating and aging 7050 plate and sheet are described in MIL-H-6088, “Heat Treatment of Aluminum Alloys.”

FINISHING

Procedures used for cleaning, anodizing, conversion coating and painting alloy 7050 are generally similar to those used for alloy 7075.

PROCUREMENT SPECIFICATIONS

Plate

Temper	7050-T7651
Specification	AMS-4201
MIL-HDBK-5 Coverage	Approved
Temper	7050-T7451
Specification	AMS 4050D
MIL-HDBK-5 Coverage	Approved

Sheet

Temper	7050-T76
Specification	Tentative specification and
MIL-HDBK-5 Coverage	design allowables are available.

OTHER PRODUCT FORMS

Forgings, extrusions, and fasteners in Alloy 7050 are also available.

REFERENCES:

1. Alcoa Green Letter No. 220
2. The Aluminum Association, *Position on Fracture Toughness Requirements and Quality Control Testing T-5*
3. MIL-H-6088, *Heat Treatment of Aluminum Alloys*

The plate tempers shown in the following tables are guaranteed K_{Ic} minimum values. Kc values for sheet are available from your Alcoa sales representative.

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