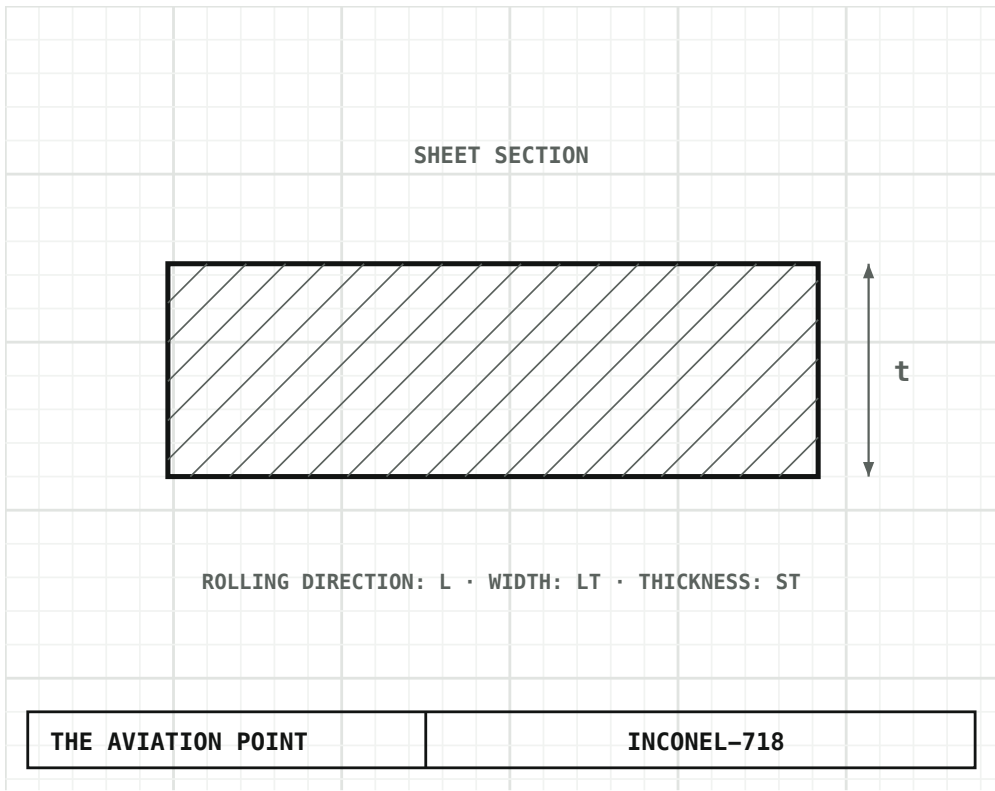
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Inconel 718 — nickel-base alloy

The precipitation-hardened nickel alloy: 180 ksi sheet, strong to 1,300 °F, welds without strain-age cracking.



Schematic

Designation

Item	Value
Designation	Inconel 718
Class	Nickel alloys
Type	nickel-base alloy

Composition

Item	Limit	Source
Composition	Nickel 50–55 %, chromium 17–21 %, niobium 4.75–5.5 %, molybdenum 2.8–3.3 %, titanium 0.65–1.15 %, aluminum 0.2–0.8 %, iron balance	Special Metals, Inconel alloy 718 bulletin, limiting chemical composition

Properties

Property	Value	Source
Type	Vacuum-melted, precipitation-hardened nickel-base alloy	MIL-HDBK-5J, par. 6.3.5.0
Use range	Creep and stress rupture to 1,300 °F, strength at cryogenic temperature, oxidation resistance to 1,800 °F	MIL-HDBK-5J, par. 6.3.5.0
Welding and forming	Welded easily, excels in resistance to strain-age cracking, readily formable	MIL-HDBK-5J, par. 6.3.5.0
Sheet	AMS 5596 (sheet), 5597 (plate), 5589 (sheet and plate)	MIL-HDBK-5J, Table 6.3.5.0(b)
Tubing	AMS 5590	MIL-HDBK-5J, Table 6.3.5.0(b)

Design allowables — Inconel 718 sheet, solution treated and aged (AMS 5596)

Property	A basis	B basis	Unit
Ftu, L	180	192	ksi
Ftu, LT	180	191	ksi
Fty, L	145	156	ksi
Fty, LT	147	158	ksi
Fcy, LT	158	170	ksi
Fsu	124	132	ksi
Elongation LT (S basis)	12	—	%
E	29.4	29.4	10^3 ksi
Density	0.297	0.297	lb/in^3

Design allowables come from material supplied solution treated and aged by the suppliers to show heat-treatment response; properties of material formed or cold worked may be different. Plate and AMS 5589 columns carry S-basis values around 180 ksi; $G = 11.4 \times 10^3$ ksi.

Notes

- **Heat-treated design values.** They do not apply after welding or hot work without the correct treatment.
- **The engine or airframe manual governs repairs.**

SOURCES · MIL-HDBK-5J, Metallic Materials and Elements for Aerospace Vehicle Structures · FAA-H-8083-31B, Aviation Maintenance Technician Handbook, Airframe, Volume 1 · MMPDS · Special Metals, Inconel alloy 718

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Reference data. The aircraft manufacturer's documentation (SRM / IPC) takes precedence.