

Inconel 718 Welding

[Inconel 718](#) is a fully austenitic nickel alloy. It is strengthened by a precipitation hardening (age hardening) reaction involving columbium. A commonly used heat treatment is to anneal 1700-1850°F, rapid air cool or quench. Strength is achieved by aging at 1325°F for 8 hours, furnace cool to 1150°F, hold at 1150°F for a total time of 18 hours in the furnace, then air cool.

Cleanliness of both the base metal and the weld wire affect welding this grade. Freshly cleaned Inconel 718 may be covered with plastic wrap to maintain cleanliness before welding.

Heat input and interpass temperature should be low. Do not preheat. Make small stringer beads, and remove all oxide film before depositing the next bead.

Inconel 718 may be welded either in the annealed, or in the precipitation hardened condition. For many non-aerospace applications the only heat treatment required after welding is the 1325/1150°F aging, to strengthen the weld bead and base metal near the fusion line. This does leave a zone near the weld in an over-aged, relatively low strength, condition. To maximize the properties of the weldment it is necessary to re-anneal sheet gauges 1700-1850°F, followed by 1325/1150°F age.

For highly restrained joints where some reduction in weldment strength is permitted, fillers such as [Alloy 625](#) (ERNiCrMo-3) or Hastelloy W (ERNiMo-3) are sometimes used. Alloy 625 offers more strength than alloy W.

GTAW shielding is commonly argon torch and back-up gas, for material up to 1/4" thick. Helium torch and back-up gas is preferred for heavier sections.

Weldments in Inconel 718 are subject to formation of a brittle Laves phase during solidification. This reduces the strength and toughness of weldments. The effect is more pronounced in plate gauges (over 3/16") than in sheet. Solution annealing 1900-1950°F should re-dissolve the Laves phase and increase the tensile ductility of the weldment. Following this higher temperature solution anneal the normal aging treatment is 1400°F 10hours, furnace cool to 1200°F, hold at 1200°F for a total aging time in the furnace of 18 hours, air cool.

M.Prager and C.S. Shira, Welding of Precipitation-Hardening Nickel Base Alloys, *WRC Bulletin 128*, February 1968



NiWire Industries | Inconel 718 Wire | Inconel 718 Bar | Inconel 718 Plate
Email: sales@niwire.com Web: www.niwire.com