

Soldering to Aluminum

Pure aluminum and high aluminum alloys quickly form a tenacious, refractory ceramic oxide on the surface that requires special techniques to remove and achieve successful soldering. There are two approaches that can be used to successfully solder to aluminum and high aluminum-containing alloys:

- 1. Use specific solder alloys along with a flux specifically designed to remove the aluminum oxide film.** Although traditional tin-lead solders can be used to solder aluminum, the large difference in the electropotentials of the aluminum substrate and the tin-lead solder present a galvanic couple that can lead to accelerated corrosion. To avoid this problem, it is recommended that either the tin-zinc eutectic solder or higher temperature zinc-aluminum braze be the bonding alloys for soldering/brazing aluminum. The alloys are listed below:

Indalloy® Number	Melting Temperature	Composition
# 201	199°C Eutectic	91Sn/9Zn
# 176	382°C Eutectic	95Zn/5Al

When using Indalloy #201 to solder to aluminum, Indium Corporation's flux #3 is recommended for removing oxides and to promote wetting. This high viscosity flux has an activation range from 96°C-343°C. The post-reflow residue can be easily removed using water with mechanical scrubbing. **A NOTE OF CAUTION:** Flux #3 is not recommended for electrical applications.

Indalloy #176, having a melting temperature of 382°C, is outside of the temperature range for Flux #3 to be effective. Therefore, a suitable brazing flux must be used.

- 2. Electroplate the aluminum with a solderable metallization such as copper or nickel and then solder using conventional solder alloys and flux.** Like in soldering, the aluminum oxide needs special treatment prior to electroplating. The aluminum oxide film is removed by a special pre-plating procedure called zincating. In this process, the aluminum oxide film is replaced with a thin layer of zinc metal. Once this process is performed, the zinc-coated aluminum can then be electroplated using conventional plating procedures. Copper alone, copper followed by nickel, or copper-nickel-gold electroplating will create a solderable metallization surface, which then can be soldered using conventional solder alloys and flux. Detailed information on the zincate process or electroplating procedures is beyond the scope of this application note, but can be readily found in standard textbooks on electroplating.

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