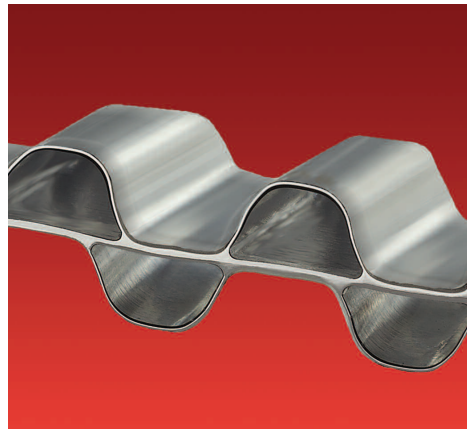


Brazing Foils for Titanium and Titanium Alloys



Product Description

The EMS family of titanium based brazing foils has been developed to address the technical challenges of brazing titanium and titanium alloys. They are produced by the cladding process and supplied in thin gauge foil condition* in a range of thicknesses and widths.

These clad brazing foils consist of layers of constituent metals which alloy *in situ* during the brazing process. After brazing, brazements (braze joints) are homogenous with no indication of the multi-layered foil precursor.

Brazing of Titanium and Titanium Alloys

EMS titanium brazing foils are particularly suitable to meet the challenging requirements of brazing titanium:

Wetting: titanium based brazing foils wet the titanium and titanium alloys despite the stable scales normally found on the surfaces of these reactive metals.

Temperatures: the wide range of brazing temperatures of EMS titanium brazing foils provides flexibility for brazing and heat treating of titanium and titanium alloys.

Consistency: brazing filler in foil

form provides more consistent joint quality than braze powder which is prone to particle size variation. Additionally, no binder is required (binder variability can cause uneven powder deposition).

Environments: titanium and titanium alloys are easily embrittled by the absorption of interstitial elements. EMS brazing foils are thoroughly cleaned during cladding to virtually eliminate possible contamination.

Properties: titanium brazing foils provide high joint strength and corrosion resistance comparable to the titanium and titanium alloys.



Properties of EMS Titanium Based Brazing Foils

The brazing temperatures of EMS titanium brazing alloy foils range between 930°C and 1050°C. Table 1 provides composition information by alloy (weight %) for each of the clad foils available. Table 2 provides the solidus and liquidus temperatures for each alloy as well as the recommended brazing temperatures.

EMS titanium brazing foils are available in thicknesses of 0.0012” (30µm) and up. The maximum width is up to 24”(600mm).

Brazing Alloys	Nominal Composition (wt%)		
	Ti	Cu	Ni
Ti15Cu25Ni	60	15	25
Ti15Cu15Ni	70	15	15

Table 1: Compositions of EMS Titanium Brazing Foils

Brazing Alloys	Solidus (°C)	Liquidus (°C)	Brazing Temp. (°C)
Ti15Cu25Ni	900	915	930-1000
Ti15Cu15Ni	902	935	975-1050

Table 2: Solidus, Liquidus and Brazing Temperatures of EMS Titanium Brazing Foils

Characteristics of EMS Titanium Brazing Foils

EMS titanium brazing foils have several unique features which are valuable for brazing titanium and titanium alloys:

- The EMS cladding process bonds the elemental components as multi-layer composites which meet the composition of titanium brazing alloys.

- EMS titanium brazing strip allows thin gauge foils to be produced to meet brazing requirements.
- EMS titanium strip is processed to finish thickness without intermediate annealing to avoid compounding between the layers.
- Compositions of EMS titanium brazing foils are consistent through the length and across the width even for heavily alloyed compositions.
- Brazing temperature requirements can be met by modifying the ratio of component materials to allow composition optimization.

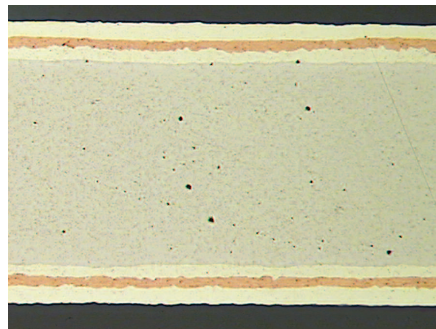


Figure 1: Roll Bonded, Multi-Layered Ti15Cu15Ni Brazing Foil

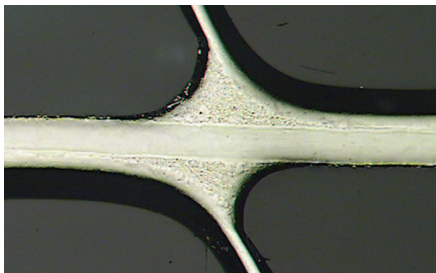


Figure 2: CP-Ti Braze Joints using Ti15Cu15Ni Foils from EMS Roll Bonding Process

Figure 2 shows the cross section of Ti15Cu15Ni braze joints after vacuum brazing at 950°C. The brazements are homogeneous showing no trace of the original layered foil.

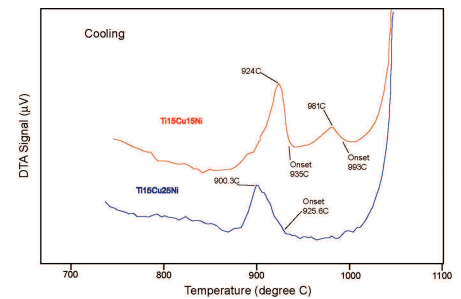


Figure 3: Differential Thermal Analysis (DTA) Cooling Curve for Ti15Cu15Ni and Ti15Cu25Ni Brazing Foils Produced by EMS Roll Bonding Process

Application and Technical Support

EMS is a world leader in clad metals. A QS9002 organization with almost one hundred years experience in metallurgical materials technology, we develop tailored solutions to materials challenges to give our customers a competitive edge. EMS is equipped with complete processing and testing laboratory facilities for new product development and customer support from concept validation to prototype trial to quality assurance.

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