

# Alloy and Flux Selection Guide

*We listen and respond.*

## Introduction

Picking the correct alloy and flux for your product is the first step towards ensuring process viability and product quality. This document is a primer on the selection of an alloy and flux for electronic, electro-mechanical, and mechanical soldering applications.

## Technical Support

Our Product Specialists and Technical Service Team are available to evaluate your process and develop a soldering solution with you. For product samples and experienced technical support, call 800-338-4353.

## Alloy Selection

When choosing an alloy, the three most important factors are composition solidus, and liquidus temperatures. Alloy **composition** affects joint strength, visual fillet quality, wetting, leaching, and suitability as a lead-free alternative.

At the **solidus** temperature, 100% of the alloy is in a solid crystalline form. Soldering begins upon reaching the solidus. At the **liquidus** temperature, 100% of the alloy is in a fluid, non-crystalline form. In the “**plastic range**,” between the solidus and liquidus, some portion of the alloy is solid but the majority is liquid. Alloys are eutectic when the solidus and liquidus are equal.

Step soldering, multiple soldering processes at different temperatures, requires careful selection. The peak reflow temperature for the lower temperature alloy must not reach the solidus of the higher temperature alloy.

<b>Alloy:</b>	<b>Solidus (°C)</b>	<b>Liquidus (°C)</b>	<b>Tensile Strength (psi)</b>	<b>Shear Strength (psi)</b>
Sn42 Bi58	-E-	138	8000	NA
Sn43 Pb43 Bi14	144	163	6120	NA
Sn62 Pb36 Ag2	179	189	6700	6250
Sn63 Pb37	-E-	183	6700	6060
Sn60 Pb40	183	191	6200	5680
Sn96.5 Ag3.0 Cu0.5	217	219	NA	NA
Sn96.3 Ag3.7	-E-	221	8900	4600
Sn100	MP	232	1800	2560
Sn95 Sb5	232	240	5900	6200
Sn95 Ag5	221	245	10100	8400
Sn89 Sb10.5 Cu0.5	242	262	12000	NA
Sn10 Pb88 Ag2	268	290	4900	4300
Sn5 Pb92.5 Ag2.5	287	296	4210	2240
Sn10 Pb90	275	302	4600	3900
Sn5 Pb95	308	312	4190	3000
-E-: Eutectic    MP: Melting point    : Lead free				

## Solder Powder Sizes

It is important to choose a solder powder size that will meet your processing needs. To ensure the most consistent and robust process possible, pick the size recommended for the smallest solder feature in your application.

<b>Powder Type</b>	<b>Size (micron)</b>	<b>Mesh Count</b>	<b>Gullwing Lead Pitch (mm)/(in)</b>	<b>Square/ Circle Aperture (mm)/(in)</b>	<b>Dispense Dot Dia. (mm)/(in)</b>
II	75-45μ	-200+325	0.65 / 0.025	0.65 / 0.025	0.8 / 0.030
III	45-25μ	-325+500	0.5 / 0.020	0.5 / 0.020	0.5 / 0.020
IV	38-25μ	-400+500	0.3 / 0.012	0.3 / 0.012	0.3 / 0.012
V	25-20μ	-500+635	0.2 / 0.008	0.15 / 0.006	0.25 / 0.010
VI	15-5μ	NA	0.1 / 0.004	0.05 / 0.002	0.1 / 0.004

## NC

No-Clean (NC) flux consists of rosin, solvent, and a small amount of activator. NC flux has low activity and is suited to easily solderable surfaces. NC residue is clear, hard, non-corrosive, non-conductive, and designed to be left on your assembly. Residue may be removed with an appropriate solvent if so desired.

## RMA

Rosin mildly activated (RMA) flux consists of rosin, solvent, and a small amount of activator. Most RMA flux is fairly low in activity and best suited to easily solderable surfaces. RMA flux residue is clear, soft, non-corrosive, and non-conductive. Cleaning is optional. Residue may be removed with an appropriate solvent if so desired.

## RA





Rosin activated (RA) flux consists of rosin, solvent, and aggressive activators. RA flux has higher activity than RMA for moderately oxidized surfaces. RA flux residue is corrosive and should be removed as soon as possible after reflow to prevent damage to your assembly. Maximum safe time before cleaning is product dependent. Residue may be removed with an appropriate solvent.

## WS

Water soluble (WS) flux consists of organic acids, thixotrope, and solvent. WS flux comes in a wide range of activity levels for soldering to even the most difficult surfaces. WS flux residue is corrosive and should be removed as soon as possible after reflow to avoid damage to your assembly. Maximum safe time before cleaning is product dependent. Residue may be removed with 60°C (140°F) water and 40psi pressure.

## Solderability Matrix

	RMA	RA	WS	No-Clean	High Activity WS
Aluminum					
Beryllium Copper					
Brass					
Bronze					
Cadmium					
Chromium	Non-solderable				
Copper					
Galvanized Steel					
Gold					
Kovar					
Magnesium	Non-solderable				
Mild Steel					
Monel					
Nichrome					
Nickel					
Nickel Iron/ Alloy42					
Nickel silver					
Palladium					
Platinum					
Silver					
Solder Plated					
Stainless Steel					
Tin					
Titanium	Non-solderable				
Zinc					

**Key:**  wets readily  wets clean surfaces  
 not recommended  alloy specific, call technical support at 800-338-4353.



EFD Inc., 14 Blackstone Valley Place, Lincoln, RI 02865 U.S.A. [www.efdsolder.com](http://www.efdsolder.com)  
 telephone: 401-333-3800 fax: 401-333-4954 e-mail: [solder@efd-inc.com](mailto:solder@efd-inc.com)

EFD, PrintPlus, SolderPlus, and FluxPlus are trademarks of EFD Inc.

SSL004e p2 of 2 ©2003-2005 EFD Inc