

PRODUCT PROFILE

ELECTROLOY LEAD FREE BAR

Product Name

Product Code

SOLDER BAR – LEAD FREE ALLOY – Sn99.0/Ag0.3/Cu0.7

LF- 315B

**– LEAD FREE ALLOY – Sn99.7/Ag0.3
(TOP UP ALLOY)**

LF- 315BE

The information and statements herein are believed to be reliable but are not to be construed as a warranty or representation for which we assure legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. No warranty of fitness for a particular purpose is made. Properties are typical and not to be used as specifications.

DOC CATEGORY: 3

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. China . Malaysia . Singapore

Solder Connections

PRODUCT INFORMATION

Electroloy has entered into an agreement with Iowa State University Research Foundation Inc. of US patent no: 5,527,628 issued on 06 July 2006 to be able to offer the patented lead free Sn-Ag-Cu wave solder alloy. Electroloy Product number LF-315B. This is a RoHS compliance solder bar which is able to meet and fulfill International & Environmental requirements.

LF-315 was developed to offer an alternative to SAC305 and yet maintain a good reliability. It is also a more economical option to other lead free alloys

Characteristics of LF-315B

- Good Wetting
- Good through hole fill
- Minimal hot tear
- Comparable reliability to SAC
- Low Cost
- Lower copper dissolution rate compared to SAC

CHEMICAL COMPOSITION OF ALLOY

The composition of Electroloy's LF-315B & LF-315BE lead free bar is strictly controlled to the following specification: -

<u>ELEMENT</u>	<u>LF-315 SPECIFICATION</u>	<u>LF-315BE SPECIFICATION (TOP UP ALLOY)</u>	<u>J-STD-006B*</u>
TIN	REMAINDER	REMAINDER	REMAINDER
LEAD	MAX.0.050 %	MAX.0.050 %	MAX.0.070 %
ALUMINIUM	MAX 0.005 %	MAX 0.005 %	MAX.0.005 %
ANTIMONY	MAX 0.050 %	MAX 0.050 %	MAX.0.200 %
ARSENIC	MAX 0.030 %	MAX 0.030 %	MAX.0.030 %
BISMUTH	MAX 0.050 %	MAX 0.050 %	MAX.0.100 %
COPPER	0.6 – 0.8 %	MAX 0.080 %	-
IRON	MAX 0.010 %	MAX 0.010 %	MAX.0.020 %
ZINC	MAX 0.003 %	MAX 0.003 %	MAX.0.003 %
CADMIUM	MAX 0.002 %	MAX 0.002 %	MAX.0.002 %
SILVER	0.2–0.4 %	0.2–0.4 %	-
NICKEL	MAX 0.010 %	MAX 0.010 %	MAX 0.010%
INDIUM	MAX 0.050 %	MAX 0.050 %	MAX.0.100 %
GOLD	MAX 0.050 %	MAX 0.050 %	MAX.0.050 %

* IPC J-STD-006B Amendment 1

COMPARISON BETWEEN LF- 315B and Sn63/Pb37

Comparison of LF-315B with Sn63/Pb37 on mechanical characteristics

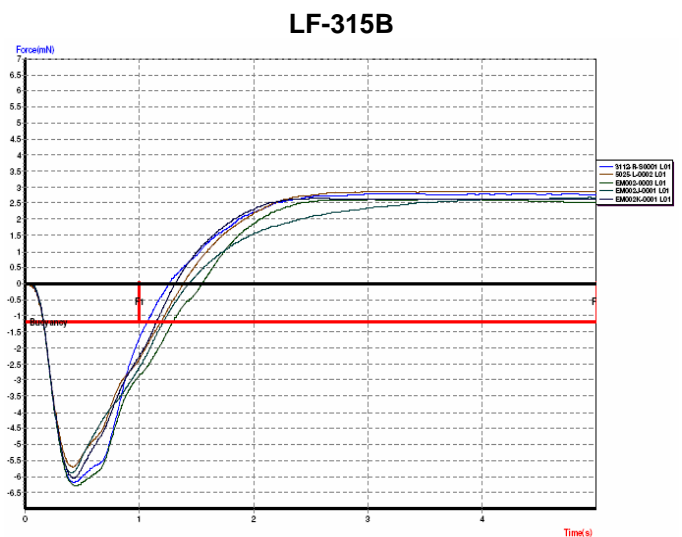
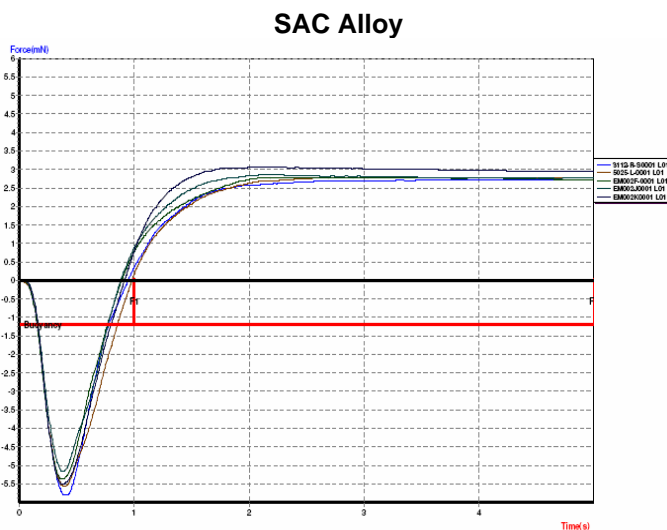
Characteristics	LF-315B	Sn63/Pb37
Alloy composition	Sn99.0/Ag0.3/Cu0.7	Sn63/Pb37
Specific gravity	7.3	8.4
Solidus temperature (°C)	216	183
Liquidus temperature (°C)	228	EUTECTIC
Specific heat (J/KgK)	218	176
Tensile strength (MPa)	30	42
Thermal Conductivity (J/m.s.K°)	64	50
Electrical Resistivity ($\mu\Omega$ -cm)	17	14.5
Elongation (%)	46	25

Characteristics of SAC –LF-315B

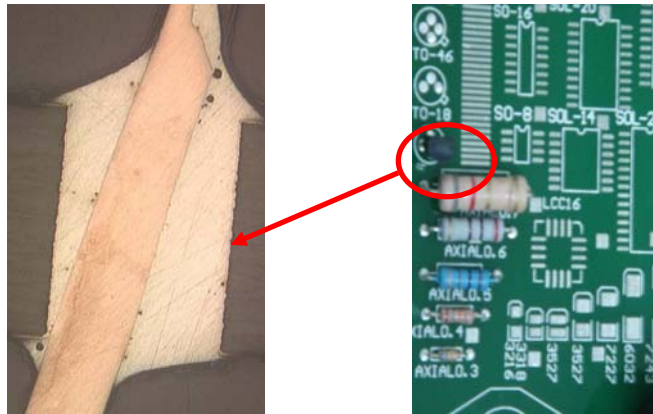
Good Wetting

Test Temperature : 260°C
Test Time : 5 sec.

Immersion Depth : 5 mm
Immersion Speed : 20mm/s



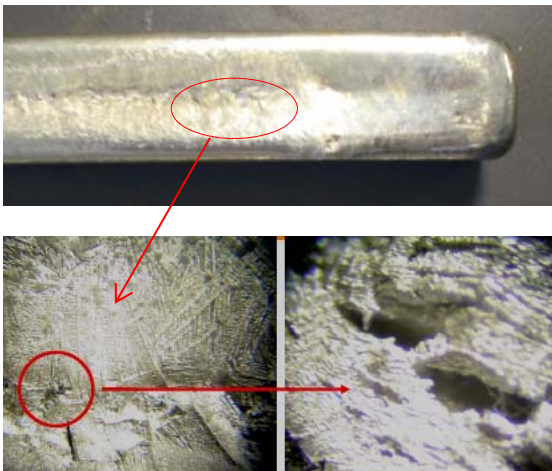
Good Through Hole Fill



It is noted that the solder penetrated completely, though the pin was inserted in a slanting manner, showing good hole penetration.

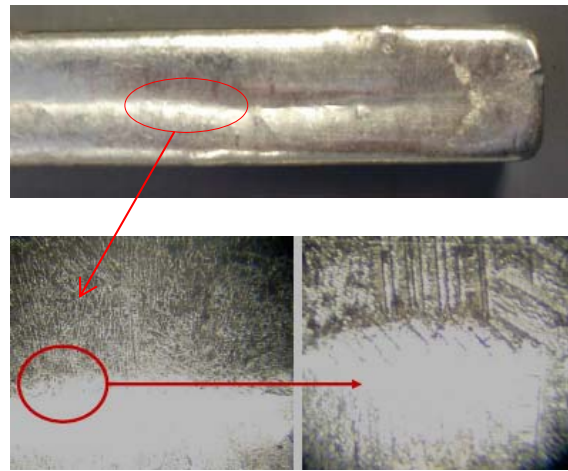
Minimal Hot Tear

Major hot tear



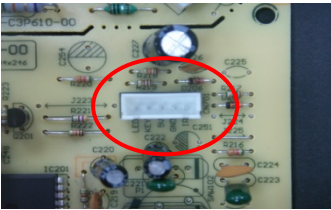

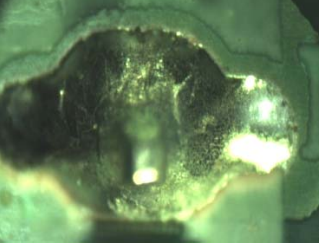
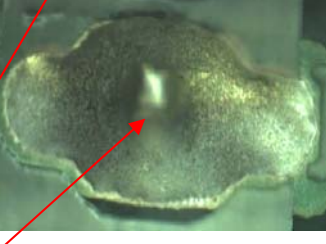

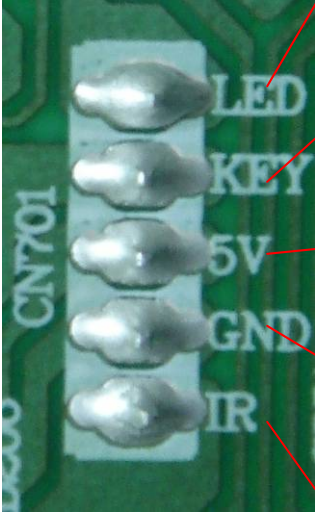

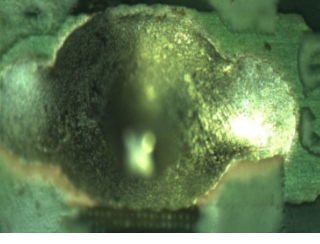
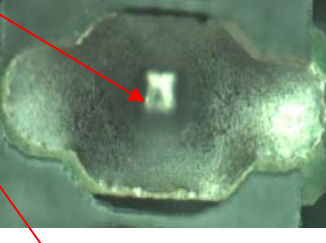
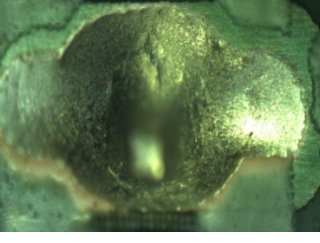
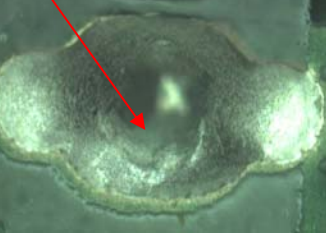
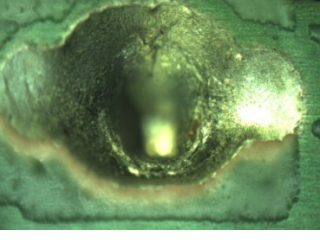
Major hot tear observed in the SAC305 alloy for the same cooling rate. Due to a large amount of the Ag_3Sn IMC, this is one of the causes for the shrinkage cracks.

Minimal or no hot tear



LF-315 alloy shows minimal or no hot tear for the same cooling rate. However the LF-315 retains reliability of the SAC alloy due to Ag_3Sn , but do not exhibit the shrinkage cracks.

Reliability

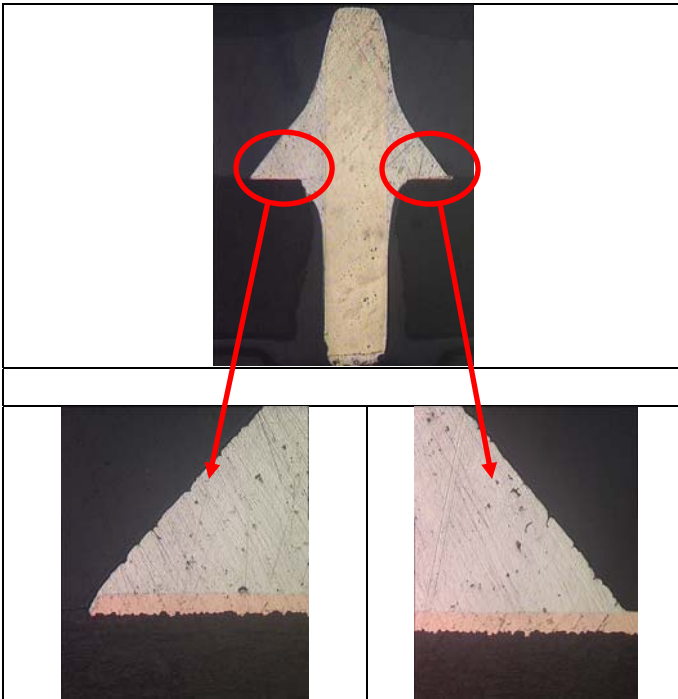
CN 701 Component	500 cycles	1000 cycles
		
		
		
		
		

Thermal cycling condition:

- 1) Temperature cycle : - 40°C to 70°C
- 2) Dwell time : 30 mins.
- 3) Transit time : less than 30 seconds
- 4) Frequency of cycles : 500 & 1000

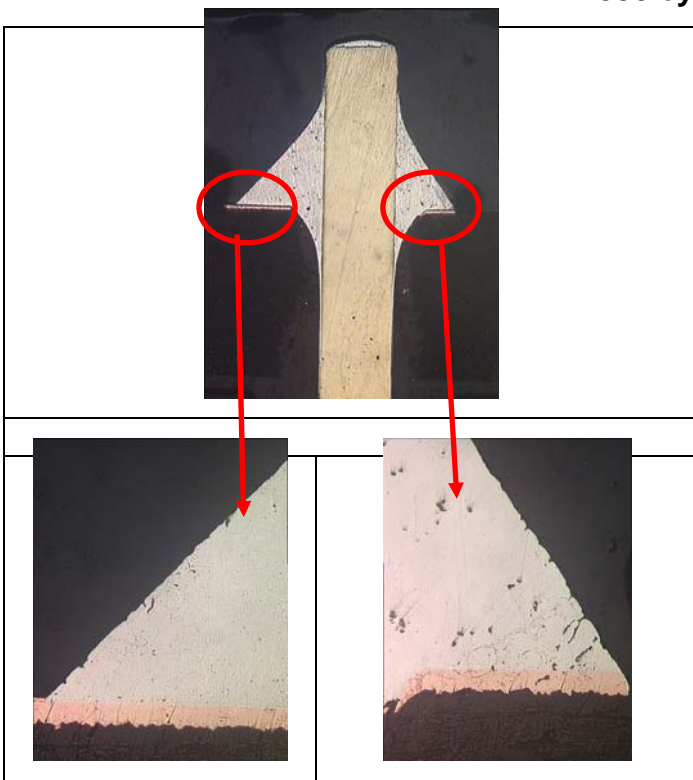
Reliability

500 cycles



The soundness of the solder appears intact after 500 cycles. Delamination between the solder and copper pad was not observed. Only micro cracks were formed.

1000 cycles



The soundness of the solder still appears intact after 1000 cycles. Delamination is still not observed, although the microcracks appear to have grown larger.

PRODUCT APPLICATION

LF-315B lead free solder has proven to perform well in automated wave soldering, selective soldering, and static solder pots.

In the LF-315B solder bath, copper tends to dissolve into the solder from the boards and component leads. If the copper content of the solder bath exceeds 0.85%, it is likely to cause an increase in the incidence of bridges, icicles, and other defects.

In order to maintain the copper level within the permissible limit in the solder bath, Electroloy recommends the LF-315BE top-up alloy. The LF-315BE has a lower copper content than the LF-315B to ensure that the copper content in the solder pot stays below the critical level of 0.85%.

Verification of copper content is easy with the free Solder Pot Analysis offered by Electroloy. The statistical analysis of your LF-315B solder pot will help you monitor the copper level over time & make critical decision to achieve good production yield with our LF-315B bars.

- **Wave soldering**

Recommended Process Parameter Setting

Recommended Process Setting	
PROCESS PARAMETERS	LF-315B
Pot Temperature	250-260°C
Top Side Preheat	100-130°C
Conveyer Speed	1.0m – 1.5m/min.
Contact Time	2.0s – 3.0s

- **Dip Soldering**

The LF-315B bars are also suitable to be used in high temperature dip thinning of fine copper wire in component Manufacturing.

PHYSICAL APPEARANCE

The LF-315B exhibit a shiny appearance & uniform silver grey in color. The brand & alloy code is embossed onto the surface of each bar. Each bar is approximately 700 – 900 grams in weight. The physical dimension is about 330mm X 20mm X 13mm. The LF-315B also comes in 4 kg bar of dimension about 535mm X 50mm X 20mm.

PACKAGING

The LF-315B lead free bars are pack into “Green “carton boxes of 20kg each. Each box contain the following traceable information:

1. The Supplier
2. Grade
3. Product Code / Type
4. Lot Number
5. Weight per Box

For 4 kg bar type, the packing can be in palletized form.

DELIVERY

Each shipment shall be accompanied with a Certificate of Analysis for each lot, which indicates the impurity level of each element according to LF-315 Specification.

STORAGE AND SHELF LIFE

Electroloy’s LF-315B lead free bars have no limited shelf life when handled properly. Storage must be in a dry & non-corrosive environment.

To minimize the bars from further oxidation, ensure that the packaging is not damaged.

The solder surface may lose its shine & appear a dull shade of light yellow. This is a surface phenomenon & is not detrimental to product functionality & performance.

HEALTH AND SAFETY

Refer to the MSDS for guidance on safety and health issues.