

ALPHA® Vaculoy SnCX Plus™ 07, 00

LEAD FREE WAVE SOLDER and REWORK ALLOY

DESCRIPTION

ALPHA® SnCX Plus™ 07 is No-silver lead-free alloy suitable for use as a replacement for SnPb, SAC305 and other low silver SAC alloys in wave solder, selective soldering, lead tinning and rework processes. SnCX Plus™ 07 has been engineered to minimize copper dissolution as compared to silver-bearing alloys and also to improve total cost of ownership. The SnCX Plus™ 00 variant is used as a replenishment alloy in solder baths with elevated copper levels. As with all Alpha Metals bar solder, Alpha's proprietary Vaculoy™ manufacturing process is used to remove certain impurities, particularly oxides. The product is further enhanced with the addition of other elements designed to further improve alloy physical and mechanical properties, reduce drossing, increase wetting speed and force and improve joint reliability.

FEATURES & BENEFITS

Features:

- ❑ RELIABILITY – Comparable to silver bearing alloys (i.e. SAC305) and other enhanced Sn99.3Cu0.7 alloys in thermal fatigue resistance, lap shear and pin pull performance.
- ❑ YIELD – Excellent production yields. Outperforms Sn99.3Cu0.7 based materials.
- ❑ COPPER EROSION – Low erosion in long, hot exposure soldering process.
- ❑ DROSS GENERATION – Lowest in class due to the Vaculoy process in conjunction with the addition of a dross reducing agent.
- ❑ SOLDER FILLET SURFACE – Smooth and bright with no surface crack.

Benefits:

- ❑ Lowers Total Cost of Ownership due to the lower material cost, high yields and low dross generation.
- ❑ Excellent mechanical reliability.
- ❑ Provides very good solderability due to the fast wetting speed.
- ❑ Reduces erosion of copper plating during rework which improving assembly reliability.
- ❑ Friendlier and less aggressive to solder pot material as compared to silver-bearing alloys.
- ❑ Delivers good performance across different soldering processes.

The proprietary Vaculoy process is a highly effective method for removing included oxides from solder. This is extremely important because included oxides generate excessive drossing and increase the viscosity of the solder. Solder with higher viscosity can result in increased soldering defects (i.e solder bridging).

APPLICATION

ALPHA® SnCX Plus™ 07 is suitable for wave soldering, selective soldering, lead tinning and reworking both through hole and surface mount components in a lead-free process. It is suited to single side and relatively complex, dual sided mixed technology boards. A solder pot temperature of 255 - 270° C (491 – 518 F) is recommended with a contact time 2.3 – 3.5 seconds. For suitable wave solder fluxes, please see our selector guide. Lead free Reclaim services including dedicated lead free containers is also available, please consult your local sales office.

TECHNICAL SPECIFICATION

Complies with all requirements of RoHS Directive (Article 4.1 of the European Directive 2002/95/EC). Alloy specification for Maximum Lead (Pb) Content = **0.05%**

Material Property	Units	SnCX Plus™ 07
Solidus	Celsius	227
Liquidus	Celsius	229
Hardness	HV	9.4
Density	g/cc	7.30
Thermal Expansion Coefficient	(30 - 100 °C) $\mu\text{m}/\text{m}^\circ\text{C}$	23.8
	(100 - 180 °C) $\mu\text{m}/\text{m}^\circ\text{C}$	24.3
Toughness	J	51.2
Tensile Stress	MPa	42.0
Tensile Strain	%	7.6
Yield Stress	MPa	33.4
Elongation	%	33.1

RECOMMENDED WAVE SOLDER PROCESS SETTINGS

Wave Configuration	Process Parameter	Suggested Process Settings
Single Wave	Pot temperature	255 - 270 Celsius (491 - 518 F)
	Conveyor speed	1.0 - 1.5 m/min (3.3 - 5 ft/min)
	Contact time	2.3 – 3.5 seconds
	Wave Height	1/2 to 2/3 of board thickness
	Dross removal	Once per 8 hour run time
	Copper Check	Every 8,000 boards until 40,000
Dual Wave	Pot temperature	255 - 270 Celsius (491 - 518 F)
	Conveyor speed	1.0 - 1.5 m/min (3.3 - 5 ft/min)
	Contact time	3.0 - 4.5 seconds
	Wave Height	1/2 to 2/3 of board thickness
	Dross removal	Once per 8 hour run time

These are general guidelines which have proven to yield excellent results; however, depending upon your equipment, components, and circuit boards, your optimal settings may be different. In order to optimize your process, it is recommended to perform a design experiment, optimizing the most important variables (i.e. amount of flux applied, conveyor speed, topside preheat temperature, solder pot temperature and board orientation, etc).

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MANAGEMENT OF COPPER LEVELS IN THE SOLDER BATH

Copper should be controlled in the solder bath between 0.7% and 1.0%

Management of the copper level in the wave solder bath is critical to ensure low defects in the soldering process. There is a tendency for the copper levels within a high tin bearing alloy wave solder bath to increase due to copper dissolution from the PCB. This effect increases based on the level of exposed copper on the assembly, as in the case of boards using OSP pad finishes.

Studies have shown a typical leaching rate of **0.01% Cu per 1000 boards**. As each process is unique, this rate should be viewed as a guideline only.

It is recommended that the copper is controlled at between 0.7% and max 1.0% for **SnCX Plus™ 07** alloy. If the copper levels are higher than 1.0% then this will increase the liquidus temperature which in turn may mean that the solder bath temperature has to be increased to maintain the process yields.

The copper levels in the bath can be controlled by means of adding **SnCX Plus™ 00** to the wave solder pot. It may be the case that equilibrium can be attained by continuing with **SnCX Plus™ 00** additions as the only means of solder top up, however each process is unique and we would recommend regular analysis of the solder bath so that good control of copper can be maintained.

This analysis service is available from **Alpha**, contact your local sales office for details.

RECOMMENDED ACTION LEVELS FOR WAVE SOLDER IMPURITIES

Please find below a list of recommended action levels for wave solder bath impurities. For information of specific action plans to bring your solder bath back to an acceptable condition please contact your local sales office.

Element	ACTION Levels	Notes
Sn	BAL	No Action level.
Pb	0.07	RoHS Directive 2002/95/EC states a maximum Lead content of 0.1%
As	0.03	Levels greater than 0.03% can cause de-wetting.
Cu	1.00	SnCX Plus 07 is tolerant to copper levels up to 1.0%, SnCX Plus 00 copper free should be added to maintain copper levels. Levels above 1.0% may cause more bridging
Bi	0.20	Lead Free alloys are tolerant to Bi up to 1.0%, however if levels above 0.20% are detected this indicates some contamination issues that should be investigated
Zn	0.003	Levels greater than 0.003% may cause higher levels of bridging and icicling and a greater level of surface oxidation in the solder bath.
Fe	0.02	Greater than 0.02% Iron can be an indicator of pot erosion and may cause gritty joint formation and the formation of FeSn ₂ IMC needles that can cause bridging.
Ag	0.50	Silver levels of 4% are used in some SAC alloys, however if the levels in SnCX rise above 0.5% then some investigations should be held to establish the cause. Solderability should not be affected
Sb	0.20	Lead Free alloys are tolerant to Sb up to 1.0%, however if levels above 0.20% are detected this indicates some contamination issues that should be investigated
Ni	0.05	Levels greater than 0.04% may start to slow the wetting speed and could affect the hole fill performance. If process performance is OK then levels up to 0.05% are OK.
Cd	0.003	RoHS Directive 2002/95/EC states a maximum Cadmium content of 0.01%. Levels of 0.003% may cause higher level of bridging and icicling.
Al	0.002	Levels greater than 0.002% may cause higher levels of bridging and icicling and a greater level of surface oxidation in the solder bath.
Au	0.1	At levels above 0.1% there may be some problems with joint strength.

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SAFETY

Please refer to MSDS for advice on proper handling and safety instructions.

STORAGE

Store the solder bar in a cool, dry and non-corrosive environment. Wrap up the solder bar when not in use to reduce exposure to environment.

AVAILABILITY

ALPHA® SnCX Plus™ 07 is available in 1kg (2.2lb) Bar, Chunks, Feeder Ingots and Autofeed Wire.

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