

ALPHA[®] SACX Plus[®] 0307, 0300

LEAD FREE WAVE SOLDER & REWORK ALLOY

DESCRIPTION

ALPHA SACX Plus 0307 is a next generation lead-free alloy suitable for use as a replacement for SnPb, SAC305 and other low silver SAC alloys including the original SACX 0307 in wave solder, lead tinning and rework processes. SACX Plus 0307 has been engineered for improved copper dissolution performance during the long hot exposure times associated with rework and lead tinning. The SACX Plus 0300 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 materials designed to further reduce drossing, increase wetting speed and force and improve joint cosmetics.

FEATURES & BENEFITS

Features:

- **RELIABILITY** – Comparable to higher Ag alloys (i.e. SAC305) in thermal fatigue resistance, lap shear and pin pull performance.
- **YIELD** – Comparable to SAC305, superior performance for hole fill and SMT related defects compared to Ag free alloys like Sn99.3/Cu0.7.
- **COPPER EROSION** – Low erosion during long rework exposure times
- **DROSS GENERATION** – Lowest in class due to the Vaculoy process in conjunction with the addition of a dross reducing agent.

Benefits:

- Lowers Total Cost of Ownership due to the lower material cost, high yields and low dross generation.
- Excellent mechanical reliability.
- Gives very good hole fill and drainage due to the lower surface tension attributed to Ag.
- Reduces erosion of copper plating during rework improving assembly reliability.
- Delivers good performance across a range of flux technologies.

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 SACX Plus 0307 is suitable for wave 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 - 265° C (491 – 509F) 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.

AVAILABILITY

ALPHA SACX Plus 0307 is available in 1kg (2.2lb) bar, chunks, feeder ingots and solid wire.

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SAFETY

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

TECHNICAL SPECIFICATION

Complies with all requirements of RoHS Directive (Article 4.1 of the European Directive 2011/65/EU). Alloy specification for Maximum Lead (Pb) Content = 0.07% SACX Plus 0307 is also available as an Ultra Low Lead (ULL) version which contains a maximum of 0.05% Pb. All alloy properties remain the same for SACX Plus 0307 ULL.

Material Property	Units	Vaculoy SACX Plus 0307
Solidus	Celsius	217
Liquidus	Celsius	228
Hardness	HV	14.1
Density	g/cc	7.33
Specific Heat Capacity	J/kg C	0.17
Stress at MAX Load (N/mm ²)	Mean	29.5
	Std Dev	0.64
Elongation at failure (%)	Mean	21.8
	Std Dev	8.8
Thermal Expansion Coefficient	(30-100C)/C x 10 ⁻⁵	1.79
	(100-150C)/C x 10 ⁻⁵	2.30
Silver Content	%	0.3 +0.15/-0.05
Copper Content	%	0.70 +/- 0.1
Lead Content	%	Max 0.07%

RECOMMENDED WAVE SOLDER PROCESS SETTINGS

Wave Configuration	Process Parameter	Suggested Process Settings
Single Wave	Pot Temperature	255 - 265 Celsius (491 - 509 F)
	Conveyor Speed	1.0 - 1.5 m/min (3.3 - 5 ft/min)
	Contact Time	2.3 - 2.8 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 - 265 Celsius (491 - 509 F)
	Conveyor Speed	1.0 - 1.5 m/min (3.3 - 5 ft/min)
	Contact Time	3.0 - 3.5 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, 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 SACX Plus 0307 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 SACX Plus 0300 to the wave solder pot. It may be the case that equilibrium can be attained by continuing with SACX Plus 0300 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	0.10	RoHS Directive 2011/65/EU states a maximum Lead content of 0.1%
As	0.03	Levels greater than 0.03% can cause de-wetting.
Cu	1.0	SACX Plus 0307 is tolerant to copper levels up to 1.0%; SACX Plus 0300 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 increased bridging and icicling, as well as, increased crossing rates in the solder bath.
Fe	0.02	Greater than 0.02% Iron can be an indicator of pot erosion and may cause gritty joints and the formation of FeSn ₂ IMC needles that can cause bridging.
Ag	1.0	Silver levels of 4% are used in some SAC alloys, however if the levels in SACX 0307 rise above 1% then some investigations should be held to establish the cause.
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 0.05% may start to slow wetting and may reduce hole fill. Evaluate soldering performance if levels exceed 0.05%. Locate and eliminate source of high Ni levels.
Cd	0.003	RoHS Directive 2011/65/EU 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.