

# ALPHA<sup>®</sup> SACX<sup>®</sup> 0307, 0300

## Lead-Free Wave Solder Alloy

### DESCRIPTION

**ALPHA SACX 0307** is a lead-free alloy suitable for use as a replacement for Sn63 alloy in the wave solder process. The **ALPHA SACX 0300** variant is used to stabilize / reduce the copper content in the wave solder bath, this requirement will depend on process conditions. As with all Alpha bar solder, Alpha's proprietary Vaculoy<sup>®</sup> alloying process is used to remove certain impurities, particularly oxides. The product is further enhanced with the addition of 2 minor elements to reduce dross formation and improve the joint cosmetics.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

### FEATURES & BENEFITS

#### Features:

- Yield – Comparable to SAC305, superior performance for bridging compared to Sn99.3/Cu0.7 based alloys.
- Wetting Speed – 0.75 seconds typical wetting speed compares to SAC305 at 0.65 second and superior to Sn99.3/Cu0.7 based alloys at 1.0 second.
- 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.
- Gives very good solderability due to the fast wetting speed.
- Gives very good drainage and hence lower levels of bridges due to the formulation containing Silver.
- 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 GUIDELINES**

ALPHA SACX 0307 is suitable for wave soldering and surface mount applications for electronic assemblers interested in implementing a lead-free process. It is suited to single side and mixed technology boards. A solder pot temperature of 255 to 265 °C (491 to 509 °F) is recommended with a contact time 2.3 to 3.5 seconds. For suitable wave solder fluxes, contact your local sales representative. Lead-free reclaim services including dedicated lead-free containers are also available, please consult your local sales office.

**TECHNICAL DATA**

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 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 0307 ULL.

Material Property	Units	Vaculoy SACX0307
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 <sup>2</sup> )	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 <sup>-5</sup>	1.79
	(100 – 150C)/C x 10 <sup>-5</sup>	2.30
Silver Content	%	0.3 +0.15/-0.05
Copper Content	%	0.70 +/-0.1
Lead Content	%	Max 0.07%

**RECOMMENDED WAVE SOLDER PROCESSING SETTINGS**

Wave Configuration	Process Parameter	Suggested Process Settings
<b>Single Wave</b>	Pot temperature	255 to 265 °C (491 to 509 °F)
	Conveyor speed	1.0 to 1.5 m/min (3.3 to 5 ft/min)
	Contact time	2.3 to 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
<b>Dual Wave</b>	Pot temperature	255 to 265 °C (491 to 509 °F)
	Conveyor speed	1.0 to 1.5 m/min (3.3 to 5 ft/min)
	Contact time	3.0 to 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

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. 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..).

**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 of the SACX 0307 materials to increase due to the leaching effect of the solder wave on the board and components. This effect is at its most severe when using an OSP Copper finish on the PCB.

Studies have shown a typical leaching rate of 0.01% Cu per 1000 boards. Each process is unique this is an indication only of the leaching rate (based on actual data). It is recommended that the copper is controlled at between 0.7% and max 1.0% for SACX 0307 alloy. If the copper levels are higher than 1.0% then this will increase the liquidous temperature which in turn may mean that the solder bath temperature must be increased to maintain the process yields.

The copper levels in the bath can be controlled by means of adding SACX 0300 to the wave solder pot. It may be the case that equilibrium can be attained by continuing with SACX 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. Please 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	<b>0.07</b>	RoHS Directive 2011/65/EU states a maximum Lead content of 0.07%.
As	<b>0.03</b>	Levels greater than 0.03% can cause de-wetting.
Cu	<b>1.0</b>	SACX 0307 is tolerant to copper levels up to 1.0%, SACX 0300 copper free should be added to maintain copper levels. Levels above 1.0% may cause more bridging.
Bi	<b>0.20</b>	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	<b>0.003</b>	Levels greater than 0.003% may cause increased bridging and icicling, as well as increased crossing rates in the solder bath.
Fe	<b>0.02</b>	Greater than 0.02% Iron can be an indicator of pot erosion and may cause gritty joints and the formation of FeSn <sub>2</sub> IMC needles that can cause bridging.
Ag	<b>1.0</b>	Silver levels of 4% are used in some SAC alloys, however if the levels in SACX 0307 rise above 1.0% then some investigations should be held to establish the cause.
Sb	<b>0.20</b>	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	<b>0.05</b>	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.

Element	Action Levels %	Notes
Cd	<b>0.003</b>	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	<b>0.002</b>	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	<b>0.1</b>	At levels above 0.1% there may be some problems with joint strength.

**AVAILABILITY**

ALPHA SACX 0307/0300 is available in 1kg (2.2lb) bar, chunks, feeder ingots and Autofeed wire.

**RECYCLING SERVICES**

We provide safe and efficient recycling services to help companies meet their environmental and legislative requirements and at the same time, maximize the value of their waste streams.

Our service collects solder dross, solder scrap, and various forms of solder paste waste. Please contact your local sales representative for recycling capabilities in your area or [link here](#).



**SAFETY & WARNING**

It is recommended that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use. **Safety Data Sheets are available at [MacdermidAlpha.com/assembly-solutions/knowledge-base](http://MacdermidAlpha.com/assembly-solutions/knowledge-base).**

**CONTACT INFORMATION**

**To confirm this document is the most recent version, please contact  
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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE . Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588

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