chanhvinh.com

MacDermid Alpha ELECTRONICS SOLUTIONS

TECHNICAL DATA SHEET

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.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

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.

chanhvinh.com

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 Plus 0307 is suitable for wave soldering, lead tinning and reworking 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 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 is also available, consult your local Alpha sales office.

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 is 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%

chanhvinh.com

RECOMMENDED WAVE SOLDER PROCESSING SETTING

Wave Configuration	Process Parameter	Suggested Process Settings
Single Wave	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
Dual Wave	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
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, 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 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 must 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

chanhvinh.com

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 specific action plans to bring your solder bath back to an acceptable condition please Alpha.

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 drossing 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.

chanhvinh.com

AVAILABILITY

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



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.**

CONTACT INFORMATION

www.macdermidalpha.com

North America 140 Centennial Avenue Piscataway, NJ 08854 1.800.367.5460	**Europe** Unit 2, Genesis Business Park Albert Drive Woking, Surrey, GU21 5RW, UK 44.01483.758400	**Asia** 8/F., Two Sky Parc 51 Hung To Road Kwun Tong, Kowloon, Hong Kong, SAR China 852.2500.5365

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

DISCLAIMER: All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. No statement or recommendation shall constitute a representation unless set forth in an agreement signed by officers of seller and manufacturer. NO WARRANTY OF MERCHANTABILITY, WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY IS MADE. The following warranty is made in lieu of such warranties and all other warranties, express, implied, or statutory. Products are warranted to be free from defects in material and workmanship at the time sold. The sole obligation of seller and manufacturer under this warranty shall be to replace any noncompliant product at the time sold. Under no circumstances shall manufacturer or seller be liable for any loss, damage or expense, direct, indirect, incidental or consequential, arising out of the inability to use the product. Notwithstanding the foregoing, if products are supplied in response to a customer request that specifies operating parameters beyond those stated above, or if products are used under conditions exceeding said parameters, the customer by acceptance or use thereof assumes all risk of product failure and of all direct, indirect, incidental and consequential damages that may result from use of the products under such conditions, and agrees to exonerate, indemnify, defend and hold harmless MacDermid, Incorporated and its affiliates therefrom. No suggestion for product use nor anything contained herein shall be construed as a recommendation to use any product in a manner that infringes any patent or other intellectual property rights, and seller and manufacturer assume no responsibility or liability for any such infringement.

© 2019 MacDermid, Inc. and its group of companies. All rights reserved. "(R)" and "TM" are registered trademarks or trademarks of MacDermid, Inc. and its group of companies in the United States and/or other countries.