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TECHNICAL BULLETIN

ALPHA® SACX® PLUS 0807/SACX PLUS 0800

Lead Free Solder Alloy

DESCRIPTION

ALPHA SACX Plus 0807 is a low silver lead-free alloy specially designed with proprietary additives to deliver soldering and reliability performance similar to higher silver ALPHA SAC alloys (i.e., SAC305, 405, etc…). The **ALPHA SACX Plus 0800** 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 wave solder alloys, Alpha's proprietary Vaculoy® process is used to remove certain impurities, particularly oxides. **ALPHA SACX Plus 0807** can be used for the widest range of assemblies and under the widest range of operating conditions of any low silver or silver free alloy available today. **ALPHA SACX Plus 0807** is available in a variety of forms including solid wire for replenishment and rework requirements.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

Feature	Benefit
Low Silver Content	Lower material costs vs SAC305
Low Operating Temperature Requirement	Wide processing window and energy cost savings. Drop into most current lead free wave soldering machine temperature profiles
Low Dross Rate	Less dross means higher alloy utilization and less time spent on pot "maintenance"
Low Copper Erosion Rate	Less risk during high temperature, high exposure time processes (i.e., rework, selective soldering, etc...)
Low Surface Tension Alloy	Fast wetting with high wetting force delivering excellent hole fill and low SMD related defects
Strong, Ductile Joints	Lower warranty claims related to mechanical joint failures

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).

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APPLICATION GUIDELINES

ALPHA SACX Plus 0807 is suitable for wave soldering and selective soldering for electronic assemblers interested in implementing a lead-free process. It is suitable for nearly all types of boards (single & double-sided) and works particularly well on assemblies with OSP pad finishes that have been exposed to prior reflow excursions and where lower silver or silver free alloys have not worked. 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 Plus 0807 is also available in an Ultra-Low Lead (ULL) version which contains a maximum of 0.05% Pb. All alloy properties remain the same for SACX Plus 0807 ULL.

Material Property	SACX Plus 0807	Test Method
Solidus	216 °C	Differential Scanning Colorimeter (DSC)
Liquidus (peak)	225 °C	Cooling Curve
Density	7.4 g / cm³	Calculated
Resistivity	0.1399 µΩm	Measured resistance of solid wire at 22 °C
Coefficient of Thermal Expansion	19.5 x 10-6 / C	30 to 100 °C at 1 °C / minute
	20.2 x 10-6 / C	100 to 180 °C at 1 °C / minute
Spread Factor	> 75%	JIS Z 3197
Specific Heat	0.23 J/g/ °C	At 100 °C, Differential Scanning Colorimeter (DSC)
Hardness	16.4 HV	Vickers Hardness (as cast)
Tensile Strength	30.7 MPa	Strain rate 10^{-3} per second
Elongation	21.0 %	Strain rate 10^{-3} per second
Creep Strength	> 1000 Hours	400 g/mm^2 load @ 100 °C

RECOMMENDED WAVE SOLDER PROCESS SETTINGS

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Wave Configuration	Process Parameter	Suggested Process Settings
Single and Dual Wave	Pot temperature	255 to 270 °C (491 to 518 °F)
	Contact time	3 to 6 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, 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 0807 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 0800 to the wave solder pot. It may be the case that equilibrium can be attained by continuing with SACX Plus 0800 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.

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RECOMMENDATION 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 0807 is tolerant to copper levels up to 1.0%, SACX Plus 0800 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 0807 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.

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AVAILABILITY

ALPHA SACX Plus 0807is available in a variety of sizes including 1kg 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 or link here.



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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.**

CONTACT INFORMATION

To confirm this document is the most recent version, please contact Assembly@MacDermidAlpha.com

www.macdermidalpha.com

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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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