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MacDermid Alpha ELECTRONICS SOLUTIONS

TECHNICAL DATA SHEET

ALPHA® SnCX Plus® 07, SnCX Plus® 00

Silver Free Alloy for Wave and Selective Soldering

DESCRIPTION

ALPHA SnCX Plus 07 is a 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. **ALPHA SnCX Plus 07** has been engineered to minimize copper dissolution as compared to silver-bearing alloys and to improve total cost of ownership. The **ALPHA SnCX Plus 00** variant is used as a replenishment alloy in solder baths with elevated copper levels. As with all Alpha bar solder, Alpha's proprietary Vaculoy® manufacturing process is used to remove certain impurities, particularly oxides. The product is 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.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES AND 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 improves 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 the solder. This is extremely important because included oxides generate excessive drossing

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and increases the viscosity of the solder. Solder with higher viscosity can result in increased soldering defects (i.e., solder bridging).

APPLICATION GUIDELINES

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 to 270 °C (491 to 518 °F) is recommended with a contact time 2.3 to 3.5 seconds. For suitable wave solder fluxes, contact your local sales representative. Solder debris reclaim services including dedicated lead-free containers is also available. Please consult your local Alpha sales office.

TECHNICAL DATA

Complies with all requirements of RoHS Directive (Article 4.1 of the European Directive 2015/863/EU). Alloy specification for Maximum Lead (Pb) Content = **0.05%.**

Material Property	Units	ALPHA SnCX Plus 07
Melting Temperature	°C	~ 227
Hardness	HV	9.4
Density	g/cc	7.30
Specific Heat Capacity	(@ 100 °C) J/g/°C	0.198
Thermal Expansion Coefficient	(30 to 100 °C) µm/m °C	23.8
	(100 to 180 °C) µm/m °C	24.3
Toughness	J	51.2
Tensile Stress	MPa	42.0
Tensile Strain	%	7.6
Yield Stress	MPa	33.4
Elongation	%	33.1

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RECOMMENDED WAVE SOLDER PROCESS SETTINGS

Wave Configuration	Process Parameter	Suggested Process Settings
Single Wave	Pot Temperature	255 to 270 °C (491 to 518 °F)
	Conveyor Speed	1.0 to 1.5 m/min (3.3 to 5 ft/min)
	Contact Time	2.3 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
Dual Wave	Pot Temperature	255 to 270 °C (491 to 518 °F)
	Conveyor Speed	1.0 to 1.5 m/min (3.3 to 5 ft/min)
	Contact Time	3.0 to 4.5 seconds
	Wave Height	1/2 to 2/3 of board thickness
	Dross Removal	Once per 8 hour run time

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 ALPHA 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 must be increased to maintain the process yields.

The copper levels in the bath can be controlled by means of adding ALPHA SnCX Plus 00 to the wave solder pot. It may be the case that equilibrium can be attained by continuing with ALPHA SnCX Plus 00 additions as the only means of solder top up. However, each process is unique, and we recommend regular analysis of the solder bath to maintain good control of copper levels. This analysis service is available from Alpha. Contact your local sales office for details.

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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 2015/863/EU states a maximum lead content of 0.1%.
As	**0.03**	Levels greater than 0.03% can cause de-wetting.
Cu	**1.00**	ALPHA SnCX Plus 07 is tolerant to copper levels up to 1.0%. Copper-free ALPHA SnCX Plus 00 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 possible contamination issues that should be investigated.
Zn	**0.003**	Levels greater than 0.003% may cause higher levels of bridging and icicling, as well as 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 ALPHA SnCX Plus 07 rise above 0.5%, then an investigation 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 probable 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 acceptable then levels up to 0.05% are OK.
Cd	**0.003**	RoHS Directive 2015/863/EU states a maximum cadmium content of 0.01%. Levels of 0.003% may cause higher levels of bridging and icicling.
Al	**0.002**	Levels greater than 0.002% may cause higher levels of bridging and icicling, as well as a greater level of surface oxidation in the solder bath.
Au	**0.10**	At levels above 0.1%, there may be some problems with joint strength.

AVAILABILITY

ALPHA SnCX Plus 07 is available in 1kg (2.2lb) bar, chunks, feeder ingots and Autofeed wire.

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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.**

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 the environment.

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

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