

# KESTER® SAC305

## High Silver Alloy for Wave and Selective Soldering

### DESCRIPTION

Kester SAC305 alloy is a lead-free alloy suitable for use as a replacement for the Sn63Pb37 alloy. The replenishment alloys are sometimes used to stabilize and reduce the copper content in the wave solder bath, although, this requirement will depend on process conditions.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

### FEATURES & BENEFITS

- Yield – Best-in-class yield, outperforms all SnCu-based materials
- Wetting speed - fast wetting, in back-to-back tests 0.65 s compared to 1.00 s, for SnCu-based materials
- Dross generation - Low dross generation
- Excellent solderability due to fast wetting speed
- Very good drainage - has lower levels of bridging compared to SnCu alloys
- Delivers excellent performance across a wide range of flux technologies

### ROHS COMPLIANCE

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%. SAC alloy is also available in Ultra Low Lead (ULL) version which contains a maximum of 0.05% Pb.

Specification %			
Sn	Balance	As	0.03 max
Ag	3.0 ± 0.2	Ni	0.01 max
Cu	0.5 ± 0.1	Bi	0.10 max
Pb	0.07 max	Cd	0.001 max
Sb	0.10 max	Al	0.001 max
Zn	0.001 max	In	0.05 max

Specification %		
Fe	0.02 max	

All figures are in % for impurity limits per alloy in relation to J-STD-006C.

## TECHNICAL DATA

Characteristic	Data
	SAC305
Melting Point	217 to 219 °C (423 to 426 °F)
Density	7.37 g/cm <sup>3</sup>
TCE (Range 20 to 100 °C) micrometers / M / °C	21.9
Specific Heat Capacity	0.232 J/g K
Hardness	14.1 HV

## APPLICATION

SAC305 is suitable for lead-free wave and selective soldering. A solder pot temperature of 255 to 265 °C (491 to 509 °F) is recommended for wave soldering application. If used for selective soldering, a solder pot temperature of 280 to 320 °C (536 to 608 °F) is recommended. N<sub>2</sub> environment (<1000ppm O<sub>2</sub>) can be considered for further oxidation reduction.

For suitable solder fluxes, please see our selector guide. Lead-free Reclaim Services including dedicated lead-free containers are also available. Please consult your local sales office.

## AVAILABILITY

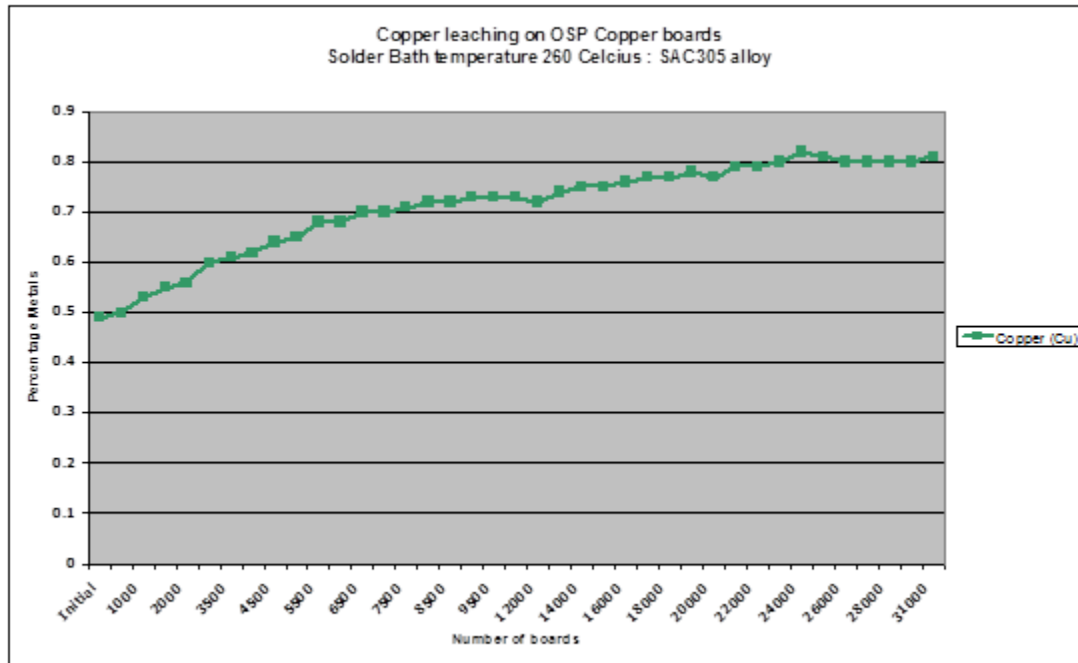
Kester SAC305 is available in 1 kg (2.2 lb) & 20Kg (44 lb) bars. Most products are shipped strapped and palletized or packed in corrugated cardboard box. Inspect shipment to make ensure there is no apparent significant damage to shipping materials.

## PROCESS CONSIDERATIONS / RECOMMENDATIONS

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 s
	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 s
	Wave Height	1/2 to 2/3 of board thickness
	Dross Removal	Once per 8 hour run time
<p>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.).</p>		

## MANAGEMENT OF COPPER LEVELS IN THE SOLDER BATH

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 SAC305 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. A typical copper level increase is shown on the chart below:



This shows an average leaching rate of 0.01% Cu per 1,000 boards. Each process is unique, and this is an indication only of the leaching rate (based on actual data).

It is recommended that the copper is controlled at between 0.5% and max 0.95% for SAC305 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 the relevant replenishment alloy to the wave solder pot. It may be the case that equilibrium can be attained by continuing with replenishment alloy additions as the only means of solder top up. However, each process is unique, and we recommend regular analysis of the solder bath so that good control of copper can be maintained.

Kester offers solder pot analysis services. Contact your local 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.

**Aluminum\*:** As little as 0.005% may increase dross rate without affecting joint formation.

**Arsenic:** Above 0.03% can cause dewetting.

**Bismuth:** Levels of 1.0% are added to some wave-solder alloys to improve wetting, joint cosmetics and thermal fatigue resistance. At this level care should be taken over lead contamination as there is some evidence that this may increase the chances of fillet lifting. Lead at <0.1% (RoHS) should not cause any problems.

**Cadmium\*:** At levels of 0.002% joint formation will be noticeably affected. At 0.005% there will be a high incidence of bridging and icicling, together with a reduction in joint strength.

**Copper:** Copper levels will increase in many cases due to pick up from board surfaces. This causes the liquidus of the bath material to increase slightly. Generally, systems are tolerant to levels up to 0.95% Cu, but in some cases, it may be necessary to increase bath temperatures by a few degrees, or to correct the bath composition at an earlier stage.

**Gold:** At levels of 0.1% and quite often less, the solder becomes sluggish and dull joints are formed.

**Iron:** 0.02% of iron can make joint formation gritty.

**Lead:** The current RoHS directive (restriction of certain hazardous substances) states a maximum of 0.1% Pb in the solder joints. The lead contamination level should be kept below this level to comply with legislation. If this level is exceeded, please consult with your local Customer Technical Service Engineer for advice on how to rectify this problem.

**Silver:** Silver is used as an alloying element in lead-free solders that enhances wetting speed and thermal fatigue resistance.

**Zinc\*:** The presence of zinc can cause dulling and create bridging and icicling. 0.005% can also cause lack of adhesion and grittiness.

**\*Note:** The effects of Al, Cd and Zn are cumulative. If more than one element is present, the following lower maxima are suggested: 0.0005%, 0.002% and 0.001%.

## 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.



## STORAGE, HANDLING, AND SHELF LIFE

See ALPHA and Kester Solid Solder Storage, Handling and Shelf Life reference bulletin document for more information.

## 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](http://www.macdermidalpha.com)

<b>North America</b> 140 Centennial Avenue Piscataway, NJ 08854 1.800.367.5460	<b>Europe</b> Unit 2, Genesis Business Park Albert Drive Woking, Surrey, GU21 5RW, UK 44.01483.758400	<b>Asia</b> 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.