

# ALPHA<sup>®</sup> SLS-65C

## NO-CLEAN FLUX

### DESCRIPTION

**ALPHA SLS-65C** was specifically developed to eliminate the tendency for solder balling and solder bridging-two defects which are normally associated with the use of the chip wave. Of all low solids (< 4% solids), no-clean fluxes, SLS 65C exhibits the lowest tendency for solder ball generation over a wide variety of solder masks. SLS 65C should be considered for use by any assembler who has board designs which are sensitive to solder bridging, performs pin testing, and whose specification requires an extremely low frequency of solder balls.

**ALPHA SLS-65C** is an active, low solids, no-clean flux. It is formulated with a proprietary mixture of organic activators. Several proprietary additives are formulated into SLS-65C which acts to reduce the surface tension between the solder mask and the solder; thereby, dramatically reducing the tendency of solder ball generation. The formulation of SLS-65C is also designed to be more thermally stable; thereby, reducing the occurrence of solder bridging.

### FEATURES & BENEFITS

- Thermally stable activators provide the lowest solder bridging in a low solids, no-clean flux.
- Reduces the surface tension between solder mask and solder to provide the lowest solder ball frequency of any low solids, no-clean flux.
- Very low level of non-tacky residue to reduce interference with pin testing and exhibit no visible residue.
- Cleaning is not required which reduces operating costs.
- Bellcore Compliant for long term electrical reliability.

### APPLICATION

**PREPARATION** - In order to maintain consistent soldering performance and electrical reliability, it is important to begin the process with circuit boards and components that meet established requirements for solderability and ionic cleanliness. It is suggested that assemblers establish specifications on these items with their suppliers and that suppliers provide Certificates of Analysis with shipments and/or assemblers perform incoming inspection. A common specification for the ionic cleanliness of incoming boards and components is 5µg/in<sup>2</sup> maximum, as measured by an Omegameter with heated solution.

Care should be taken in handling the circuit boards throughout the process. Boards should always be held at the edges. The use of clean, lint-free gloves is also recommended. When switching from one flux to another, the use of a new foam stone is recommended (for foam fluxing).

Conveyors, fingers and pallets should be cleaned. Bioact SC-10 Solvent Cleaner has been found to be very useful for these cleaning applications. When foam fluxing, do not use hot fixtures or pallets. Hot fixtures/pallets will deteriorate the foam head.

**FLUX APPLICATION – ALPHA SLS 65C** is formulated to be applied by foam, wave or spray methods. When foam fluxing, the foam fluxer should be supplied with compressed air which is free of oil and water. Keep the flux tank full at all times. The flux level should be maintained 1 inch to 1-½ inches above the top of the stone. Adjust the air pressure to produce the optimum foam height with a fine, uniform foam head.

A uniform coating of flux is essential to successful soldering. When using the foam or wave method of application, an air knife is recommended after the fluxing operation. An air knife will help ensure that the flux is uniformly distributed across the board and will remove the excess flux. When spray fluxing, the uniformity of the coating can be visually checked by running a piece of cardboard over the spray fluxer or by processing a board-sized piece of tempered glass through the spray and then through the preheat section.

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## NO-CLEAN FLUX

### GENERAL GUIDELINES FOR MACHINE SETTINGS

OPERATING PARAMETER	TYPICAL LEVEL
Amount of Flux Applied	Foam, Wave: 300 - 450 $\mu\text{g}/\text{cm}^2$ of solids Spray: 200 - 300 $\mu\text{g}/\text{cm}^2$ of solids
When foam fluxing ..... Foam Stone Pore Size	20 - 50 $\mu\text{m}$
Distance that top of stone is submerged below flux	1 - 1½ inches (25 - 40 mm)
Foam Fluxer Chimney Opening	3/8 - 1/2 inch (10 -13 mm)
When foam fluxing, use an Air Knife ..... Air Knife Hole Diameter	1 - 1.5 mm
Distance Between Holes	4 - 5 mm
Distance from Fluxer to Air Knife	4 - 6 inches (10 -15 cm)
Air Knife Angle Back toward Fluxer from Perpendicular	3° - 5°
Topside Preheat Temperature	210°F - 250°F (100 to 120°C)
Bottomside Preheat Temperature	0 to 71.6°F (0 to 22°C) higher than topside
Maximum Ramp Rate of Topside Temperature (to avoid component damage)	2°C/second (3.5°F/second) maximum
Conveyor Angle	5° - 8° (6° most common)
Conveyor Speed	1.3 - 6.0 feet/min (0.4 - 1.8 meters/min)
Contact Time in the Solder (includes Chip Wave & Primary Wave)	3 - 10 seconds (5 - 7 seconds most common)
Solder Pot Temperature	460 - 500°F (235 - 260°C) for 63Sn/37Pb 491 - 518°F (255 - 270°C) for Lead-free

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. In order to optimize your process, it is recommended to perform a designed experiment, optimizing the most important variables (amount of flux applied, conveyor speed, topside preheat temperature, solder pot temperature and board orientation).

**FLUX SOLIDS CONTROL** - If foam, wave, or rotary drum spray fluxing, the flux solids will need to be controlled via thinner addition to replace evaporative losses of the flux solvent. As with any flux with less than 5% solids content, specific gravity is **not** an effective measurement for assessing and controlling the solids content. Monitoring and controlling the acid number is recommended for maintaining the solids content. The acid number should be controlled to between 17 and 19. Alpha's Flux Solids Control Kit #3, a digital titrator, is suggested. Request Alpha's Technical Bulletin SM-458 for details on the kit and titration procedure.

When operating the foam fluxer continuously, the acid number should be checked every two to four hours. Over time, debris and contaminants will accumulate in recirculating type flux applicators. For consistent soldering performance, dispose of spent flux every 40 hours of operation. After emptying the flux, the reservoir and foam stone should be thoroughly cleaned with flux thinner.

**RESIDUE REMOVAL** – ALPHA SLS-65C is a no-clean flux and the residues are designed to be left on the board. However, if desired, ALPHA SLS-65C residues can be removed with Alpha 2110 Saponifier.

**TOUCH-UP/REWORK** - Use of the Cleanline Write Flux Applicator with NR205 flux and Telecore Plus cored solder is recommended for hand soldering applications.

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Parameters	Typical Values	Parameters/Test Method	Typical Values
Appearance	Clear, colorless liquid	pH (5% aqueous solution)	3.4
Solids Content, wt/wt	2.2%	Recommended Thinner	425 Thinner
Acid Number (mg KOH/g)	18	Shelf Life	12 Months
Specific Gravity @ 25°C (77°F)	0.799 ± 0.003	Container Size Availability	1, 5, and 55 Gal.
Pounds Per Gallon	6.65	Bellcore GR 78-CORE, Issue 1 Compliant	Yes
Flash Point (TCC)	53°F (12°C)	IPC J-STD-004 Designation	ORL0

<u>Corrosion Testing</u>	<u>Requirements</u>	<u>Results</u>
Silver Chromate Paper Test	No Detection of Halide	Pass
Copper Mirror Test	No Complete Removal of Copper	Pass
IPC Copper Corrosion Test	No evidence of corrosion	Pass

<b>SURFACE INSULATION RESISTANCE (all values in ohms)</b>		
<u>Test Condition</u>	<u>Requirements</u>	<u>Results</u>
Bellcore "Comb-Down" – Uncleaned	> 1.0 x 10 <sup>11</sup>	8.8 x 10 <sup>12</sup>
Bellcore "Comb-Up" – Uncleaned	> 1.0 x 10 <sup>11</sup>	1.4 x 10 <sup>12</sup>
Bellcore Control Board	> 2.0 x 10 <sup>11</sup>	2.8 x 10 <sup>13</sup>
IPC J-STD-004 Comb-Down – Uncleaned	> 1.0 x 10 <sup>8</sup>	5.6 x 10 <sup>9</sup>
IPC-J-STD-004 Comb-Up – Uncleaned	> 1.0 x 10 <sup>8</sup>	2.3 x 10 <sup>9</sup>
IPC J-STD-004 Control Board	> 1.0 x 10 <sup>9</sup>	2.2 x 10 <sup>10</sup>
Bellcore Test Condition (per GR78-CORE, Issue 1): 35°C/85%RH/ 5 days /-48 volts, measurement @ 100V/25 mil lines/ 50 mil spacing. IPC Test Condition (per J-STD-004): 85°C/85%RH/ 7 days/-50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing).		

<b>ELECTROMIGRATION (all values in ohms)</b>					
<u>Test Condition</u>	<u>SIR (Initial)</u>	<u>SIR (Final)</u>	<u>Requirement</u>	<u>Result</u>	<u>Visual Result</u>
Bellcore "Comb-Up" Uncleaned	3.4 x 10 <sup>9</sup>	1.2 x 10 <sup>11</sup>	SIR (Initial)/SIR (Final) < 10	Pass	Pass
Bellcore "Comb-Down" Uncleaned	2.1 x 10 <sup>9</sup>	1.3 x 10 <sup>11</sup>	SIR (Initial)/SIR (Final) < 10	Pass	Pass
Bellcore Test Condition (per GR78-CORE, Issue-1): 65°C/85%RH/500 Hours/10V, measurement @ 100V/IPC B-25 B Pattern (12.5 mil lines, 12.5 mil spacing).					

### SAFETY

Please refer to the Material Safety Data Sheet as the primary source of health and safety information. Inhalation of the flux solvent and volatilized activator fumes that are generated at soldering temperatures may cause headaches, dizziness and nausea. Suitable fume extraction equipment should be used to remove the flux from the work area. An exhaust at the exit end of the wave solder machine may also be needed to completely capture the fumes. Observe precautions during handling and use. Suitable protective clothing should be worn to prevent the material from coming in contact with skin and eyes. ALPHA SLS-65C flux contains highly flammable solvent with a flash point of 53°F (12°C). The flux must not be used near open flame or near non-flameproof electrical equipment.