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TECHNICAL BULLETIN

alpha ASSEMBLY SOLUTIONS™

ALPHA® EF-2100

VOC-Free No Clean Flux

DESCRIPTION

ALPHA EF-2100 is VOC-Free, halide-free, rosin/resin-free, non-toxic, low solids no-clean flux which provides the highest activity of any VOC-free Bellcore SIR compliant flux for defect-free soldering. **ALPHA EF-2100** is formulated as a drop in replacement for **ALPHA EF-2210, ALPHA EF-2202, ALPHA WB-400 & ALPHA NR-300**. Several proprietary organic activators deliver excellent wetting and top-side hole-fill, even with OSP coated bare copper boards which have undergone prior thermal excursions. They also act to reduce the surface tension between the solder mask and the solder; thereby, dramatically reducing the tendency of solder ball generation. The formulation of **ALPHA EF-2100** is also designed to be more thermally stable; thereby, reducing the occurrence of solder bridging.

FEATURES & BENEFITS

- Bellcore SIR compliant for assemblies requiring this standard.
- VOC-Free to help meet air quality regulations.
- Exceptional wetting for excellent hole-fill even with OSP coated bare copper boards, with prior reflows.
- Thermally stable activators provide low solder bridging.
- Reduces the surface tension between solder mask and solder to provide low solder ball frequency.
- Suitable for selective soldering process.
- Excellent cosmetics. Very low level non-tacky residue to reduce interference with pin testing and good board cosmetics.

APPLICATION

FLUX SOLIDS CONTROL: If rotary drum spray fluxing, the flux solids will need to be controlled via thinner addition, in this case DI water, 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. The acid number should be controlled to between 29.5 and 33.5. 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 a rotary drum fluxer continuously, the acid number should be checked every eight hours. Over time, debris and contaminants will accumulate in re-circulating type flux applicators. For consistent soldering performance, dispose of spent flux every 40 hours of operation. After emptying the flux, the reservoir should be thoroughly cleaned with DI water.

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 5g/in2 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.

Conveyors, fingers and pallets should be regularly cleaned. DI Water can be used alone or, for more difficult conditions, IPA and **ALPHA SM-110** Solvent Cleaners have been found to be very useful.

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RESIDUE REMOVAL: ALPHA EF-2100 is a no-clean flux and the residues are designed to be left on the board. If desired, flux residues can be removed with semi-aqueous cleaner or with other commercially available solvent cleaners.

TOUCH-UP/REWORK: Use of the ALPHA Cleanline Write Flux Applicator with **ALPHA NR205** flux and **ALPHA Telecore HF-850** cored solder is recommended for hand soldering applications.

GENERAL GUIDELINES FOR MACHINE SETTINGS

OPERATING PARAMETER	TYPICAL LEVEL
Amount of Flux Applied	Spray: <2000 μg/in^2 of solids
Top-Side Preheat Temperature	95 - 115°C (203 - 240°F)
Bottom-Side Preheat Temperature	0 to +22°C (0 to +70°F) vs. Top-Side
Recommended Preheat Profile	Straight ramp to desired top-side temperature
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	1.0 - 6.5 feet/minute
Contact Time in the Solder (includes Chip Wave & Primary Wave)	2 - 7 seconds (3 - 5 seconds most common)
Solder Pot Temperature:	
Lead-Free Alloys (99.3Sn/0.7Cu, 96.5/3.5Ag, SAC305,SAC405, **ALPHA SnCX® Plus** & **ALPHA SACX Plus™**)	260 - 270°C (500 - 520°F)

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 design experiment, optimizing the most important variables (amount of flux applied, conveyor speed, topside preheat temperature, solder pot temperature and board orientation).

TECHNICAL DATA

Item	Typical Values	Item	Typical Values
Appearance	Clear Colorless Liquid	pH, as is	2.2
Solids Content, wt/wt	4.0	Recommended Thinner	DI Water
Specific Gravity @ 25°C (77°C)	1.015 ± 0.003	Shelf Life (from Date of Mfg)	540 days
Acid Number (mg KOH/g)	31.5 ± 2.0	VOC content	<1%
Flash Point (T.C.C.)	None	IPC J-STD-004 Designation	ORL0

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CORROSION & ELECTRICAL TESTING

CORROSION TESTING

Test	Requirement for ORL0	Results
Silver Chromate Paper[2] IPC-TM 650 Test Method 2.3.33	No detection of halide	Pass
Copper Mirror Tests[2] (Modified IPC/Bellcore Method)	No complete removal of copper	Pass
Copper Corrosion Test IPC-TM 650 Test Method 2.6.15	No evidence of corrosion	Pass

J-STD-004A SURFACE INSULATION RESISTANCE

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	85°C/85% RH, 7 days	> 1.0 x 10^8 Ω	3.6 x 10^9 Ω
"Comb-Up" Uncleaned	85°C/85% RH, 7 days	> 1.0 x 10^8 Ω	4.4 x 10^9 Ω
Control Boards	85°C/85% RH, 7 days	> 1.0 x 10^9 Ω	2.1 x 10^9 Ω
IPC Test Condition (per J-STD-004): -50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing).			

[2] **Copper Mirror** and **Silver Chromate Paper** tests were performed using flux sample prepared by reconstituting with isopropyl alcohol after evaporation of its water vehicle at 80°C for one hour as per footnote 1 of table 5, page 8 of J-STD-004.

J-STD-004B SURFACE INSULATION RESISTANCE

Test	Requirements *(< 1.0x10^8 allowed during initial 24 hours)*	Results *(min. of all measurements recorded)*		
		< 24 Hrs	24 – 168 Hrs	Visual
"Comb-Down" Uncleaned	> 1.0 x 10^8 Ω	1.10 x 10^9 Ω	2.59 x 10^{10} Ω	PASS
"Comb-Up" Uncleaned	> 1.0 x 10^8 Ω	1.66 x 10^{10} Ω	5.89 x 10^{10} Ω	PASS
Control Boards	> 2.0 x 10^8 Ω	7.94 x 10^9 Ω	1.58 x 10^{11} Ω	NA
IPC Test Condition (per J-STD-004B TM 2.6.3.7): IPC B-24, 40ºC, 90%RH measurements recorded at 20 min intervals				

BELLCORE SURFACE INSULATION RESISTANCE

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	35°C/85% RH, 5 days	> 2.0 x 10^{11} Ω	5.31 x 10^{12} Ω
"Comb-Up" Uncleaned	35°C/85% RH, 5 days	> 1.0 x 10^{11} Ω	1.03 x 10^{13} Ω
Control Boards	35°C/85% RH, 5 days	> 1.0 x 10^{11} Ω	6.66 x 10^{12} Ω
Bellcore Test Condition (per GR 78-CORE, Issue 1): 48 volts, measurements @ 100V/25 mil lines 50mil spacing.			

BELLCORE ELECTROMIGRATION

Test	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
"Comb-Up" Uncleaned	6.8 x 10^9 Ω	2.1 x 10^9 Ω	SIR(Initial) /SIR(Final) <10	Pass	Pass
"Comb-Down" Uncleaned	1.0 x 10^{11} Ω	3.2 x 10^{11} Ω	SIR(Initial) /SIR(Final) <10	Pass	Pass
Bellcore Test Condition (per GR 78-CORE, Issue1): 65ºC/85% RH/500 Hours/10V, measurement @ 100V/IPC B-25B Pattern (12.5 mil lines, 12.5 mil spacing).					

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SAFETY

Please refer to the Safety Data Sheet as the primary source of health and safety information. The most recent version of the SDS is available from AlphaAssembly.com.

Inhalation of the volatilized flux activator fumes which 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.

STORAGE

Keep from freezing. Store between 0-25°C. Do not remove from original container and store materials with sealed lids.

CONTACT INFORMATION

To confirm this is the most recent issue, please contact Alpha Assembly Solutions

AlphaAssembly.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 directory assistance Chemtrec 1 - 800 - 424 - 9300.

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