

ALPHA[®] EF-3001

VOC-Free No-Clean Flux

DESCRIPTION

ALPHA EF-3001, is a resin/rosin containing, VOC-free, low solids, no-clean flux which provides the highest activity of any VOC-free Bellcore compliant flux for defect-free soldering. It is formulated with a proprietary mixture of resin/rosin and organic activators. **ALPHA EF-3001** delivers excellent wetting and topside hole fill, even with OSP coated bare copper boards and superior reliability. Several proprietary additives are also formulated into **ALPHA EF-3001**, which act to reduce the surface tension between the solder mask and the solder; thereby, dramatically reducing the tendency of solderball generation. The formulation of **ALPHA EF-3001** is also designed to be more thermally stable; thereby, reducing the occurrence of solder bridging.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

- Contains resin/rosin, which encapsulates the activator residues to produce assemblies with high reliability.
- Bellcore compliant for assemblies requiring this standard.
- VOC-free to help meet air quality regulations.
- Exceptional wetting for excellent hole-fill even with organically coated bare copper boards.
- Thermally stable activators provide low solder bridging.
- Reduces the surface tension between solder mask and solder to provide low solderball frequency.
- Very low level of non-tacky residue to reduce interference with pin testing and good board cosmetics.
- Suitable for use with lead-free alloys such as 99.3Sn/0.7Cu and 96.5Sn/3.5Ag.
- VOC-free to help meet air quality regulations.

APPLICATION GUIDELINES

Preparation - 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/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.

Flux Changeover Procedure The flux system (spray head, storage tanks & lines) should be clean and dry of any solvents or residues from previously used product. If the changeover is from alcohol based product to ALPHA EF-3001 then the system should be purged first with IPA, followed by a DI water rinse to remove the IPA completely. Failure to comply with this recommendation will result in the clogging of the spray system and especially the spray head.

Flux Application – ALPHA EF-3001 is formulated to be applied by spray method. 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. **Preparation** - 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/in² maximum, as measured by an Omegameter with heated solution.

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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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General Guidelines for Machine Settings	
Operating Parameter	Typical Level
Amount of Flux Applied	Spray: <math>< 1200 \mu\text{g}/\text{in}^2</math> of solids
Top-Side Preheat Temperature	210 to 235 °F (99 to 113 °C)
Bottom-side Preheat Temperature	0 to 40 °F (0 to 22 °C) 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 to 8° (6° most common)
Conveyor Speed	3.5 to 6.5 feet/minute (1.0 to 1.8 meters/minute)
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 to 4.0 seconds (2 to 3 seconds most common)
Solder Pot Temperature:	
Sn63/Pb37 Alloy	465 to 500 °F (240 to 260 °C)
Lead-Free Alloys (99.3Sn/0.7Cu, 96.5/3.5Ag, 95.5Sn/4.0Ag/0.5Cu)	490 to 510 °F (255 to 265 °C)
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).	

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 16.8 and 18.8. 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 recirculating 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.

Residue Removal – ALPHA EF-3001 is a no-clean flux and the residues are designed to be left on the board. If desired, flux residues can be removed with Axarel 46, Bioact EC-7R, Bioact EC-15 cleaners.

Touch-Up/Rework - Use of the Cleanline Write Flux Applicator with NR205 flux and Telecore Plus cored solder is recommended for hand soldering applications.

TECHNICAL DATA

Parameters	Typical Values	Parameters / Test Method	Typical Values
Appearance	Milky-white Liquid	pH, typical	2.55
Solids Content, % wt/wt	4.2	Recommended Thinner	DI Water
Specific Gravity @ 25 °C (77 °C)	1.010 ± 0.003	Shelf Life	12 months
Acid Number (mg KOH/g)	17.8 ± 1.0	VOC Content, %	0.6
Flash Point (T.C.C.)	NONE	IPC J-STD-004 Designation	ORL0

CORROSION & ELECTRICAL TESTING

CORROSION TESTING

Test	Requirement for OrL0	Results
Silver Chromate Paper ¹ IPC-TM 650 Test Method 2.3.33	No detection of halide	Pass
Copper Mirror Tests ¹ (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-004 SURFACE INSULATION RESISTANCE

Test	Conditions	Requirements ²	Results ²
"Comb-Down" Uncleaned	85 °C/85% RH, 7 days	1.0 x 10 ⁸ minimum	2.1 x 10 ¹⁰
"Comb-Up" Uncleaned	85 °C/85% RH, 7 days	1.0 x 10 ⁸ minimum	1.4 x 10 ¹⁰
Control Boards	85 °C/85% RH, 7 days	1.0 x 10 ⁹ minimum	2.5 x 10 ¹⁰
IPC Test Condition (per J-STD-004A): -50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing).			

BELLCORE SURFACE INSULATION RESISTANCE

Test	Conditions	Requirements ²	Results ²
"Comb-Down" Uncleaned	35 °C/85% RH, 5 days	1.0 x 10 ¹¹ minimum	9.5 x 10 ¹¹
"Comb-Up" Uncleaned	35 °C/85% RH, 5 days	1.0 x 10 ¹¹ minimum	7.0 x 10 ¹¹
Control Boards	35 °C/85% RH, 5 days	2.0 x 10 ¹¹ minimum	3.0 x 10 ¹¹
Bellcore Test Condition (per GR 78-CORE, Issue 1): 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing.			

BELLCORE ELECTROMIGRATION

Test	SIR (Initial) ²	SIR (Final) ²	Requirement	Result	Visual Result
"Comb-Down" Uncleaned	1.2 x 10 ¹¹	1.4 x 10 ¹¹	SIR (Initial)/SIR (Final) <10	Pass	Pass
"Comb-Up" Uncleaned	3.2 x 10 ¹⁰	1.1 x 10 ¹¹	SIR (Initial)/SIR (Final) <10	Pass	Pass
Bellcore Test Condition (per GR 78-CORE, Issue 1): 65°C/85% RH/500 Hours/10V, measurement @ 100V/IPC B-25B Pattern (12.5 mil lines, 12.5 mil spacing).					

¹ **Copper Mirror** and **Silver Chromate Paper** tests were performed using flux sample prepared by reconstituting with appropriate solvent after evaporation of its water vehicle at 100 °C for one hour.

² All values shown are in ohms.

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](#).



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

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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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