

ALPHA[®] EF-5601

High Performance, High Reliability, Reduced VOC, No-Clean Flux

DESCRIPTION

ALPHA EF-5601 is a resin/rosin containing, reduced VOC, low solids, and no-clean flux designed for delivering comparable all-around performance as similar category 100% alcohol fluxes. Benchmarked against ALPHA RF-800, one of the most popular alcohol-based fluxes, **ALPHA EF-5601** complies with the industry's most stringent reliability requirements while delivering excellent hole fill and minimal SMT device related defects on most standard assemblies – even those with OSP pad finishes and prior reflows. With its unique formulation, included solids remain completely in solution resulting in consistent flux deposits, excellent post soldering cosmetics, and no clogging or buildup around fluxer spray nozzles. **ALPHA EF-5601** is also pin testable. **ALPHA EF-5601** contains over 30% less VOCs than similar category alcohol fluxes making it much better for the environment and safer to use.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

- Reduced VOC content results in lower VOC emissions.
- High flash point relative to 100% alcohol fluxes making ALPHA EF-5601 safer to use.
- Engineered for alcohol flux like performance on features requiring the high penetration behavior of low surface tension fluids.
- Specially designed rosin/activator package producing highly reliable assemblies with excellent cosmetics and pin testability.
- Thermally stable formulation for use in both SnPb and Pb-Free processes.

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 an incoming inspection. A common specification for the ionic cleanliness of incoming boards and components is 5µg/in² maximum, as measured by an Omegameter with a 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.

Flux Application - ALPHA EF-5601 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.

General Guidelines for Machine Settings	
Operating Parameter	Typical Level
Amount of Flux Applied	Spray: 1300 to 2500 µg/in ² of solids
Top-Side Preheat Temperature	185 to 212 °F (85 to 100 °C)
Bottom-side Preheat Temperature	50 to 60 °F (10 to 15 °C) vs. Top-Side
Recommended Preheat Profile	60 to 90 seconds with 15 to 25 seconds at peak
Conveyor Angle	5 to 8° (6° most common)
Conveyor Speed	Set to allow the recommended pre-heat and contact times to be achieved. Review component manufacturers' requirements to avoid damage.
Contact Time in the Solder (includes Chip Wave and Primary Wave)	4 to 8.0 seconds (depending on board thickness and pad finish)
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)
<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. 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).</p>	

Flux Solids Control - If rotary drum spray fluxing, the flux solids will need to be controlled via thinner addition, In this case, IPA, to replace evaporative losses of the flux solvent. As with any flux with low solids content, specific gravity is not an effective measurement for assessing and controlling the solids content. The acid number should be controlled to between 24.8 and 27.8. Alpha's Flux Solids Control Kit #3, a digital titrator, is suggested. Request our 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 IPA.

Residue Removal – ALPHA EF-5601 is a no-clean flux and the residues are designed to be left on the board. If desired, flux residues can be removed with ALPHA Autoclean 40 (aqueous) or ALPHA SM-110 (alcohol).

Touch-Up/Rework - Use of the ALPHA Write Flux Applicator with ALPHA NR205 or ALPHA EF-6100R flux and ALPHA Telecore Plus cored solder is recommended for hand soldering applications.

TECHNICAL DATA

Item	Typical Values	Item	Typical Values
Appearance	Clear pale yellow liquid	pH, Typical	3.3
Solids Content, % wt/wt	4.0	Recommended Thinner	n-Propanol
Specific Gravity @ 25 °C (77 °C)	0.880 ± 0.003	Shelf Life	12 months
Acid Number (mg KOH/g)	26.3 ± 1.5	VOC Content, %	< 70%
Flash Point (T.O.C.)	40 °C (104 °F)	IPC J-STD-004 Designation	ORL0

CORROSION & ELECTRICAL TESTING
Corrosion Testing

Test	Requirements 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

JIS Standard Surface Insulation Resistance

Test	Conditions	Requirements	Controls	Results ²
Initial	Ambient	$1.0 \times 10^{11} \Omega$ minimum	$2.4 \times 10^{13} \Omega$ minimum	$7.8 \times 10^{11} \Omega$
After 7 days	40 °C / 90% RH	$1.0 \times 10^{10} \Omega$ minimum	$4.1 \times 10^{12} \Omega$ minimum	$3.4 \times 10^{10} \Omega$
Recovered	25 °C/75% RH, 7 days	$1.0 \times 10^{11} \Omega$ minimum	$9.0 \times 10^{12} \Omega$ minimum	$3.7 \times 10^{11} \Omega$

All Measurements @ 100V, JIS Boards (0.32 mm lines, 0.32 mm spacing, same as IPC B25 Boards)

Bellcore Surface Insulation Resistance

Test	Conditions	Requirements	Results ²
"Comb-Down" Un-cleaned	35 °C/85% RH, 5 days	$1.0 \times 10^{11} \Omega$ minimum	$4.5 \times 10^{12} \Omega$
"Comb-Up" Un-cleaned	35 °C/85% RH, 5 days	$1.0 \times 10^{11} \Omega$ minimum	$4.8 \times 10^{11} \Omega$
Control Boards	35 °C/85% RH, 5 days	$2.0 \times 10^{11} \Omega$ minimum	$2.7 \times 10^{12} \Omega$

Bellcore Test Condition (per GR 78-CORE, Issue 1: 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing).

J-STD-004 Surface Insulation Resistance

Test	Conditions	Requirements	Results ²
"Comb-Down" Uncleaned	85 °C/85% RH, 7 days	1.0 x 10 ⁸ Ω minimum	1.1 x 10 ¹⁰ Ω
"Comb-Up" Uncleaned	85 °C/85% RH, 7 days	1.0 x 10 ⁸ Ω minimum	1.9 x 10 ¹⁰ Ω
Control Boards	85 °C/85% RH, 7 days	2.0 x 10 ⁸ Ω minimum	2.5 x 10 ¹⁰ Ω
IPC Test Condition (per J-STD-004): -50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing).			

¹ Copper Mirror and Silver Chromate **Paper** tests were performed using a flux sample prepared by reconstituting with an 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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