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TECHNICAL BULLETIN

ALPHA® EF-2210

VOC-Free, Bellcore Compliant No-Clean Flux

DESCRIPTION

ALPHA EF-2210 is VOC-Free, halide-free, rosin/resin-free, low solids no-clean flux which provides the highest activity of any VOC-free Bellcore SIR compliant flux for defect-free soldering. It is formulated with a proprietary mixture of organic activators which deliver excellent wetting and top-side hole fill, even with OSP coated bare copper boards which have undergone prior thermal excursions. Several proprietary additives are also formulated into **ALPHA EF-2210** 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-2210** 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 AND BENEFITS

- J-STD-004B and 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 solderball frequency.
- Suitable for selective soldering process.
- Excellent cosmetics. Very low level non-tacky residue to reduce interference with pin testing and good board cosmetics.
- Performs well in either tin lead or lead-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 incoming inspection. A common specification for the ionic cleanliness of incoming boards and components is 5µg/in2 maximum, as measured by an ionic contamination tester.

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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-2210 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.

Operating Parameter	Recommendation
Flux application	Spray
Amount of Flux Applied	<2000 µg/in^2 of solids
Top-Side Preheat Temperature	95 to 115 °C (203 to 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 Speed	1.0 to 6.5 feet/minute
Contact Angle	5 to 8° (6° most common)
Contact Time in the Solder (includes Chip Wave and Primary Wave)	2 to 7 seconds (3 to 5 seconds most common)
Solder Pot Temperature	Sn63/Pb37 Alloy: 235 to 260 °C (460 to 500 °F)
	Lead-Free Alloys (99.3Sn/0.7Cu, 96.5/3.5Ag, SAC305,SAC405 & SACX): 260 to 270 °C (500 to 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. 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).	

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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 28.5 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 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-2210 is a no-clean flux and the residues are designed to be left on the board. If desired, flux residues can be removed with hot water.

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

TECHNICAL DATA

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

CORROSION & ELECTRICAL TESTING

Corrosion Testing

Test	Requirements 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

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Test	Requirements for ORL0	Results
Copper Corrosion Test IPC-TM 650 Test Method 2.6.15	No evidence of corrosion	Pass

[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-004 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).			

IPC-STD-004 Surface Insulation Resistance

Test	Requirements	Results (min. all measurements recorded)		
	<1.0 x 108 allowed during initial 24 hrs.	<24 Hrs.	24 to 168 Hrs.	Visual
"Comb-Down" Un-cleaned	1.0 x 10^8 Ω minimum	9.3 x 10^7 Ω	1.3x 10^8 Ω	PASS
"Comb-Up" Un-cleaned	1.0 x 10^8 Ω minimum	1.5 x 10^9 Ω	9.8 x 10^9 Ω	PASS
Control Boards	1.0 x 10^9 Ω minimum	4.7 x 10^{10} Ω	3.9 x 10^{10} Ω	NA
IPC Test Condition (per J-STD-004B TM2.6.3.7): IPC B-24 coupons, 12V, 40ºC, 90% RH, measurements recorded @ 20min intervals				

Bellcore Surface Insulation Resistance

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	35 °C/85% RH, 5 days	> 1.0 x 10^{11} Ω	2.1 x 10^{11} Ω
"Comb-Up" Uncleaned	35 °C/85% RH, 5 days	> 1.0 x 10^{11} Ω	2.3 x 10^{11} Ω

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Test	Conditions	Requirements	Results
Control Boards	35 °C/85% RH, 5 days	> 2.0 x 10^{11} Ω	5.7 x 10^{11} Ω
Bellcore Test Condition (per GR 78-CORE, Issue 1): 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing.			

Bellcore Electromigration

Test Condition	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Results
"Comb-Up" Uncleaned	3.0 x 10^{8} Ω	1.9 x 10^{9} Ω	SIR (Initial)/SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	3.0 x 10^{8} Ω	5.2 x 10^{8} Ω	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).					

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.



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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.**

STORAGE

Keep from freezing, store between 0 to 25°C.

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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