

# 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 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 EF-2210 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 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

**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  $5\mu\text{g}/\text{in}^2$  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.

**FLUX APPLICATION** - 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.

### SAFETY

Please refer to the Material Safety Data Sheet as the primary source of health and safety information. 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

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precautions during handling and use. Suitable protective clothing should be worn to prevent the material from coming in contact with skin and eyes.

### GENERAL GUIDELINES FOR MACHINE SETTINGS

OPERATING PARAMETER	TYPICAL LEVEL
Amount of Flux Applied	Spray: <2000 µg/in <sup>2</sup> of solids
Top-Side Preheat Temperature	95 - 115°C (203 - 240°F)
Bottomside 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 and Primary Wave)	2 - 7 seconds (3 - 5 seconds most common)
Solder Pot Temperature:	
Sn63/Pb37 Alloy	235 - 260°C (460 - 500°F)
Lead-Free Alloys (99.3Sn/0.7Cu, 96.5/3.5Ag, SAC305, SAC405 & SACX)	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).	

**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** - 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 Cleanline Write Flux Applicator with NR205 flux and Telecore Plus cored solder is recommended for hand soldering applications.

### STORAGE

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

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## CORROSION AND ELECTRICAL TESTING

### CORROSION TESTING

Test	Requirement for ORL0	Results
Silver Chromate Paper <sup>2</sup> IPC-TM 650 Test Method 2.3.33	No detection of halide	Pass
Copper Mirror Tests <sup>2</sup> (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	Results
"Comb-Down" Uncleaned	85°C/85% RH, 7 days	$> 1.0 \times 10^8 \Omega$	$3.6 \times 10^9 \Omega$
"Comb-Up" Uncleaned	85°C/85% RH, 7 days	$> 1.0 \times 10^8 \Omega$	$4.4 \times 10^9 \Omega$
Control Boards	85°C/85% RH, 7 days	$> 1.0 \times 10^9 \Omega$	$2.1 \times 10^9 \Omega$
IPC Test Condition (per J-STD-004): -50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing).			

### BELLCORE SURFACE INSULATION RESISTANCE

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	35°C/85% RH, 5 days	$> 1.0 \times 10^{11} \Omega$	$2.1 \times 10^{11} \Omega$
"Comb-Up" Uncleaned	35°C/85% RH, 5 days	$> 1.0 \times 10^{11} \Omega$	$2.3 \times 10^{11} \Omega$
Control Boards	35°C/85% RH, 5 days	$> 2.0 \times 10^{11} \Omega$	$5.7 \times 10^{11} \Omega$
Bellcore Test Condition (per GR 78-CORE, Issue 1): 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing.			

### BELLCORE ELECTROMIGRATION

Test	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
"Comb-Up" Uncleaned	$3.0 \times 10^8 \Omega$	$1.9 \times 10^9 \Omega$	SIR (Initial)/SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	$3.0 \times 10^8 \Omega$	$5.2 \times 10^8 \Omega$	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).					

<sup>2</sup> **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.