

# ALPHA<sup>®</sup> EF-9301-10

## Wave Soldering Flux for Tin-Lead and Lead-Free Applications

### DESCRIPTION

**ALPHA EF-9301-10** is a rosin-containing full dulling flux that provides the unique attributes of excellent solderability and reliability in both Lead-Free and Tin-Lead processes.

It is designed to have best-in-class bridging on bottom side SMT components, as well as superior performances in hole fill and solderballing. Additionally, it provides dull joints with an evenly spread, low-tack flux.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

### FEATURES & BENEFITS

#### Best-In-Class Features for Lead-Free and Tin-Lead Processes:

- Low bridging performance on connectors and bottom side SMT components
- Excellent hole fill demonstrated by >95% yield on 10-mil holes
- Low solderballing performance
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#### Benefits:

- Smooth solder joints with full dulling
- Evenly spread, low tack flux residue
- Capable of for Tin-Lead and Lead-Free processes
- Can be applied via spraying or foaming

### 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 5µg/in<sup>2</sup> maximum, as measure 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 cleaned regularly to reduce the build-up of flux residues. ALPHA SM-110 Cleaner has been found to be very useful for these cleaning applications.

**Flux Application:** ALPHA EF-9301-10 can be applied by spraying and foaming. When spray fluxing, the uniformity of the coating can be visually checked by running a piece of cardboard over the spray fluxes 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, Foam
Amount of Flux Applied	Spray: <1500 µg/in <sup>2</sup> of solids/in <sup>2</sup> dual wave; <1200 µg/in <sup>2</sup> of solids/in <sup>2</sup> single wave
Top-Side Preheat Temperature	Tin-Lead: 75 to 110 °C; Lead-Free: 100 to 130 °C
Bottom side Preheat Temperature	0 to 22 °C (0 to 22 °C) vs Top-Side
Maximum Ramp Rate of Topside Temperature (to avoid component damage)	2 °C/second (3.5 °F/second) maximum
Conveyor Speed	Tin-Lead: 1.5 to 2.2 m/min; Lead- Free: 0.8 to 2.0 m/min * ALPHA EF-9301-10 is capable of running at slower conveyor speeds to accommodate certain types of Lead-Free wave soldering processes.
Contact Angle	5 to 8° (6° most commonly recommended by equipment manufacturers)
Contact Time	1.5 to 4.0 seconds (2.5 to 3 seconds most common)
Solder Pot Temperature	Tin-Lead: 235 to 260 °C; Lead-Free: 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>	

**Control:** The solids content of ALPHA EF-9301-10 should be maintained by the addition of thinner to compensate for evaporation losses. In general, it is recommended that the solids content not be allowed to increase by more than 5% before the addition of the thinner.

Only ALPHA 425 Thinner should be used for this purpose, to ensure consistency of flux foaming and soldering characteristics. Flux solids content is readily controlled by simple hydrometer measurement.

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-9301-10 is a no-clean flux and the residues are designed to be left on the board. If their removal is required, ALPHA 2110 and Armakleen saponifiers or ALPHA SM-110 Series of solvent defluxers are recommended.

#### TECHNICAL DATA

Item	Typical Values	Item	Typical Values
Appearance	Clear, colorless to pale yellow liquid	Flash Point (T.C.C.)	12 °C
Solids Content, wt/wt (%)	10 to 11	Recommended Thinner	ALPHA 425
Specific Gravity @ 25 °C (77 °F)	0.805 ± 0.005	Shelf Life (from Date of Mfg.)	360 days
Acid Number (mg KOH/g)	22.0 ± 3.0	IPC J-STD-004 Designation	ROM1
pH (Reference)	3.7		

#### CORROSION & ELECTRICAL TESTING

##### Corrosion Testing

Test	Requirement for ROM1	Results
Silver Chromate Paper IPC-TM 650 Test Method 2.3.33	No detection of halide	Halides detected. Classified as M1
Copper Mirror Tests (IPC/Bellcore Method)	Breakthrough in <50% of test area	Breakthrough in <50% of test area. Classified as M
Copper Corrosion Test IPC-TM 650 Test Method 2.6.15B	Minor corrosion acceptable	Minor corrosion without pitting was observed. Classified as L

**IPC-J-STD-004A Surface Insulation Resistance** (All values shown are in ohms)

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	85 °C/85% RH, 7 days	$> 1.0 \times 10^8$	$6.5 \times 10^9$
"Comb-Up" Uncleaned	85 °C/85% RH, 7 days	$> 1.0 \times 10^8$	$2.6 \times 10^{10}$
Control Boards	85 °C/85% RH, 7 days	$> 1.0 \times 10^9$	$1.3 \times 10^{10}$
IPC Test Condition (per J-STD-004A): -50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing).			

**JIS Standard Surface Insulation Resistance** (All values shown are in ohms)

Test	Conditions	Requirements	Controls	Results
Initial	Ambient	$> 1.0 \times 10^{11}$	$1.0 \times 10^{11}$	$3.0 \times 10^{11}$
After 96 Hours	40 °C / 90% RH	$> 1.0 \times 10^{10}$	$1.0 \times 10^{11}$	$2.2 \times 10^{12}$
Recovered	35 °C/85% RH, 5 days	$> 1.0 \times 10^{11}$	$1.0 \times 10^{11}$	$1.1 \times 10^{12}$
All Measurements @ 100V, JIS Boards (0.32mm lines, 0.32 mm spacing, same as IPC B25 Boards)				

**Bellcore Surface Insulation Resistance** (All values shown are in ohms)

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	35 °C/85% RH, 5 days	$> 1.0 \times 10^{11}$	$1.0 \times 10^{12}$
"Comb-Up" Uncleaned	35 °C/85% RH, 5 days	$> 1.0 \times 10^{11}$	$2.3 \times 10^{11}$
Control Boards	35 °C/85% RH, 5 days	$> 2.0 \times 10^{11}$	$2.2 \times 10^{12}$
Bellcore Test Condition (per GR 78-CORE, Issue 1): 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing.			

**Bellcore Electromigration** (All values shown are in ohms)

Test	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
"Comb-Up" Uncleaned	$6.1 \times 10^{10}$	$1.4 \times 10^{11}$	SIR (Initial)/SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	$4.5 \times 10^{11}$	$7.3 \times 10^{11}$	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).					

**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](http://MacdermidAlpha.com/assembly-solutions/knowledge-base)**

**CONTACT INFORMATION**

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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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