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MacDermid Alpha ELECTRONICS SOLUTIONS

TECHNICAL DATA SHEET

ALPHA® EF-6103

Low Residue, High-Reliability, Alcohol-Based, No-Clean Liquid Flux Designed for Wave and Selective Soldering

DESCRIPTION

ALPHA EF-6103 is a high-performance, low-solids, no-clean, alcohol-based liquid flux formulated with a proprietary combination of activators and solvents. Its optimized activation package delivers rapid wetting and high soldering force, resulting in improved hole fill and reduced soldering defects compared with other fluxes in its class.

Designed to leave minimal, non-tacky residues, EF-6103 helps reduce false negatives during in-circuit testing (ICT). The well-balanced chemical formulation provides excellent soldering performance and high reliability, even on challenging OSP surface finishes. EF-6103 is compatible with both wave and selective soldering processes and is also suitable for low-temperature soldering applications.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

- **High performance activation system** ensures consistent soldering performance on difficult surface finishes such as OSP
- **High reliability performance** ensures long term reliability of final electrical assemblies
- **Compatible with wave and selective soldering** enables use of a single flux across multiple soldering processes
- **Wide application flux** enabling low-temperature to standard lead-free alloys
- **Minimal, non-tacky residues** reduces false failures during in-circuit testing (ICT)

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/in^2 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 cleaned. ALPHA AutoClean 40 cleaner is recommended for this process.

Flux Application: ALPHA EF-6103 can be applied by spray or foam. 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.

Residue Removal: ALPHA EF-6103 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 2110 saponifier cleaner and with other commercially available solvent cleaners and saponifier cleaners.

GENERAL GUIDELINES FOR MACHINE SETTINGS

General Guidelines for Machine Settings	
Operating Parameters	**Recommendation**
Flux Application	Spray or foam
Amount of Flux Applied	Single: 800 to 1200 ug/in^2 of solids Dual: 700 to 1000 ug/in^2 of solids
Top-side Preheat Temperature	95 to 125 °C (203 to 257 °F)
Bottom-side Preheat Temperature	0 to 25 °C (0 to 77 °F) greater than 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	1.0 to 2.0 meter/min (3.3 to 6.6 ft/min).
Contact Time	2 to 7.5 seconds (3 to 5 seconds most common) – Lead-Free Wave Soldering 1.5 to 4.0 seconds (2.5 to 3 seconds most common) - Leaded Wave Soldering 2.0 to 5.0 seconds – Selective Soldering

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General Guidelines for Machine Settings	
Operating Parameters	**Recommendation**
Solder Pot Temperature	255 to 265 °C (500 to 536 °F) – Lead-Free Wave Soldering 280 to 320 °C (536 to 608 °F) – Lead-Free Selective Soldering (Standard SnCu0.7 based, SAC based and SnAg based alloys) 240 to 250 °C (464 to 482 °F) - Leaded Wave Soldering (Sn63Pb37) ≥200 °C (SnBi, SnBiAg, HRL3 low temperature alloys)
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).	

TECHNICAL DATA

Item	Typical Value	Item	Typical Value
Appearance	Clear, Light Amber Liquid	pH, 5% v/v aqueous solution	3.3
Solids Content, wt/wt	3.6%	Recommended Thinner	ALPHA 425
Specific Gravity @ 25 °C (77 °C)	0.796 ± 0.004	Shelf Life	360 days
Acid Number (mg KOH/g)	22.4 ± 1.3	IPC J-STD-004B Designation	ORL0
Flash Point (T.C.C.)	12 °C		

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CORROSION & ELECTRICAL TESTING – SAC305 ALLOY

Corrosion Testing

Test	Requirement for ORL0	Results
Halide Test IPC-TM-650 2.3.28.1	< 500ppm in flux solids	PASS
Copper Mirror Test IPC-TM-650 2.3.32	No complete removal of copper	PASS
Copper Corrosion Test IPC-TM-650 2.6.15	No evidence of corrosion	No Evidence of Corrosion

IPC J-STD-004A Surface Insulation Resistance

Test	Conditions	Requirements	Results
"Comb-Down" Un-cleaned	85 °C/85% RH, 7 days	1.0×10^8 Ω minimum	6.6×10^9 Ω
"Comb-Up" Un-cleaned	85 °C/85% RH, 7 days	1.0×10^8 Ω minimum	2.1×10^{10} Ω
Control Boards	85 °C/85% RH, 7 days	1.0×10^9 Ω minimum	3.6×10^{10} Ω
IPC Test Condition (per J-STD-004A): -50V, measurement @ 100V/IPC B-24 board (0.4 mm lines, 0.5 mm spacing).			

IPC J-STD-004B Surface Insulation Resistance

Test	Requirements (<1.0×10^8 allowed during initial 24 hrs.)	Results (min. of all measurements recorded)		
		< 24 Hrs	24 to 168 Hrs	Visual
"Comb-Down" Un-cleaned	1.0×10^8 Ω minimum	1.6×10^8 Ω	8.6×10^8 Ω	PASS
"Comb-Up" Un-cleaned	1.0×10^8 Ω minimum	5.3×10^8 Ω	9.5×10^9 Ω	PASS
Control Boards	1.0×10^9 Ω minimum	2.7×10^9 Ω	9.4×10^9 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				

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JIS Standard Surface Insulation Resistance

Test	Conditions	Requirements	Controls	Results
Initial	Ambient	1.0×10^{11} Ω minimum	1.2×10^{12} Ω	3.5×10^{11} Ω
After 7 days	40 °C / 90% RH	1.0×10^{10} Ω minimum	3.5×10^{11} Ω	3.9×10^{10} Ω
Recovered	25 °C/75% RH, 7 days	1.0×10^{11} Ω minimum	2.2×10^{11} Ω	1.4×10^{11} Ω
All Measurements @ 100V, JIS Boards (0.32mm lines, 0.32 mm spacing, same as IPC B25 Boards).				

Bellcore Surface Insulation Resistance

Test	Conditions	Requirements	Results
"Comb-Down" Un-cleaned	35 °C/85% RH, 4 days	1.0×10^{11} Ω minimum	1.7×10^{11} Ω
"Comb-Up" Un-cleaned	35 °C/85% RH, 4 days	1.0×10^{11} Ω minimum	2.1×10^{11} Ω
Control Boards	35 °C/85% RH, 4 days	2.0×10^{11} Ω minimum	2.4×10^{11} Ω
Bellcore Test Condition (per GR 78-CORE, Issue 1: 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing.			

Bellcore Electromigration

Test	SIR (Initial)	SIR (Final)	Requirements	Results	Visual Results
"Comb-Up" Un-cleaned	5.5×10^{10} Ω	2.9×10^{11} Ω	SIR (Initial) / SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	5.9×10^{9} Ω	2.4×10^{10} Ω	SIR (Initial) / SIR (Final) <10	Pass	Pass
Control	2.8×10^{11} Ω	7.0×10^{11} Ω	Not applicable	N/A	N/A
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).					

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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..



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.**

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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