

ALPHA[®] EF-6000-TF

No-Clean Flux for Lead-Free & Sn-Pb Wave Soldering

DESCRIPTION

ALPHA EF-6000-TF is an active, low solids, no-clean flux, designed to be a drop-in replacement for **ALPHA EF-6000** for any user wishing to use an NPE/OPE-free formulation. It has been designed with a wide thermal process window enabling best-in-class productivity with Lead-Free wave soldering applications and is an excellent choice for remaining Tin-Lead production lines. Formulated with a proprietary mixture of organic activators, **ALPHA EF-6000-TF** exhibits the lowest tendency for solder ball generation over a wide variety of solder masks of all low solids (< 4% solids) no-clean fluxes. The formulation of **ALPHA EF-6000-TF** is also more thermally stable, thereby, reducing the occurrence of solder bridging during lead-free dual wave soldering.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES AND BENEFITS

- Thermally stable activators provide the lowest solder bridging in a low-solids, no-clean flux for wave soldering and Selective Soldering in tin-lead and lead-free applications
- Reduces the surface tension between solder mask and solder to provide the lowest solder ball frequency of any low solids, no-clean flux
- Very low level of non-tacky residue to reduce interference with pin testing and exhibit no visible residue
- Cleaning is not required which reduces operating costs
- IPC-J-STD-004 compliant for long term electrical reliability

APPLICATION GUIDELINES

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 µg/in² (0.77 µg/cm²) maximum, as measured by an ionic contamination tester.

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. When switching from one flux to another, the flux reservoir, flux tank and lines of the spray fluxer assembly should be purged with IPA. Conveyors, fingers and pallets should be cleaned periodically with DI Water, IPA or other commercial Solvent Cleaners to eliminate residues on the assembly edges.

FLUX APPLICATION: ALPHA EF-6000-TF is formulated to be applied by spray methods. A uniform coating of flux is essential to successful soldering. 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 for SAC305 / SACX0307	Recommendation for 63/37 SnPb
Amount of Flux Applied by Spray	Single Wave: 500 to 800 $\mu\text{g}/\text{in}^2$ (78 to 124 $\mu\text{g}/\text{cm}^2$) of solids Dual Wave: 850 to 1400 $\mu\text{g}/\text{in}^2$ (132 to 217 $\mu\text{g}/\text{cm}^2$) of solids	Single Wave: 200 to 600 $\mu\text{g}/\text{in}^2$ (31 to 93 $\mu\text{g}/\text{cm}^2$) of solids Dual Wave: 600 to 1000 $\mu\text{g}/\text{in}^2$ (93 to 155 $\mu\text{g}/\text{cm}^2$) of solids
Topside Preheat Temperature	105 to 120°C (221 to 248 °F)	75 to 100 °C (167 to 212 °F)
Bottom side Preheat Temperature	about 35 °C (95 °F) higher than Top-Side Temp.	about 35°C (95 °F) higher than Top-Side Temp.
Maximum Ramp Rate of Topside Temperature (to avoid component damage)	2 °C/second max.	2 °C/second max.
Conveyor Angle	4° to 7° (6° typical)	4° to 7° (6° typical)
Conveyor Speed	3 to 6 ft/min (0.9 to 1.8 m/min)	3 to 6 ft/min (0.9 to 1.8 m/min)
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 to 3.5 seconds (2.5 to 3 seconds most common)	1.5 to 3.5 seconds (2.5 to 3 seconds most common)
Solder Pot Temperature	255 to 265 °C (491 to 509 °F)	240 to 250 °C (464 to 482 °F)
<i>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).</i>		

FLUX SOLIDS CONTROL: As with any flux with less than 5% solids content, specific gravity is not an effective measurement for assessing and controlling the solids content. Monitoring and controlling the acid number is recommended for maintaining the solids content. The acid number should be controlled to between 16.5 and 18.5. Alpha's Flux Solids Control Kit #3, a digital titrator, is suggested.

RESIDUE REMOVAL: ALPHA EF-6000-TF is a no-clean flux and the residues are designed to be left on the board. However, if desired, **ALPHA EF-6000-TF** residues can be removed with hot DI Water, **ALPHA 2110** Saponifier or commercial solvent cleaners.

TOUCH-UP/REWORK: Use of the ALPHA Cleanline Write Flux Applicator with **ALPHA NR-205** flux and ALPHA cored solder is recommended for hand soldering applications.

TECHNICAL DATA

Item	Typical Values	Item	Typical Values
Appearance	Clear, Colorless Liquid	Pounds Per Gallon	6.8
Solids Content, wt/wt%	2.2	Recommended Thinner	ALPHA 425
Specific Gravity @ 25 °C (77 °F)	0.791 ± 0.003	Shelf Life (from Date of Mfg.)	360 days
Acid Number (mg KOH/g)	17.5 ± 1.0	IPC J-STD-004 Designation	ORL0
pH (5% aqueous solution)	~3.3	Flash Point (T.C.C.)	11.67 °C

CORROSION & ELECTRICAL TESTING

Corrosion Testing

Test	Requirements	Results
Copper Mirror Tests IPC J-STD-004; TM-650 2.3.32	No evidence of mirror breakthrough for L Classification	PASS
Copper Corrosion Test IPC J-STD-004; TM-650 2.6.15	No evidence of corrosion	PASS

IPC J-STD-004 Surface Insulation Resistance (All values in ohms)

Test	Condition	Requirement	Result
"Comb-Up" Uncleaned	85 °C/85% RH, 7 days	> 1.0 x 10 ⁸	2.27 x 10 ¹⁰
"Comb-Down" Uncleaned	85 °C/85% RH, 7 days	> 1.0 x 10 ⁸	3.21 x 10 ⁹
Control Boards	85 °C/85% RH, 7 days	> 1.0 x 10 ⁹	9.94 x 10 ¹⁰
IPC Test Condition (per IPC-TM-650 2.6.3.3): -48 V, measurement @ 100V/IPC B-24 board (0.4 mm lines, 0.5 mm spacing).			

IPC J-STD-004B Electrochemical Migration Resistance (All values in ohms)

Test Condition	SIR (Initial)	SIR (Final)	Requirement	Result
"Comb-Up" Un-cleaned	3.40×10^{10}	5.28×10^{11}	$SIR(\text{Final}) > SIR(\text{Initial}) / 10$	PASS
Comb-Down" Uncleaned	5.01×10^8	2.22×10^9	$SIR(\text{Final}) > SIR(\text{Initial}) / 10$	PASS
<i>IPC Test Condition (per IPC-TM-650 2.6.14.1): 65 °C/85% RH/596 hours/10 V, measurement @ 100 V/IPC B-25B Pattern (12.5 mil lines, 12.5 mil spacing).</i>				

SAFETY & WARNING

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

ALPHA EF-6000-TF flux contains a highly flammable solvent with a flash point of 11.67 °C. The flux must not be used near open flames or near non-flameproof electrical equipment. 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 AlphaAssembly.com.**

CONTACT INFORMATION

To confirm this document is the most recent version, please contact
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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 directory assistance: Chemtrec 1 - 800 - 424 - 9300.

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