

the product:

Take the worry out
of transitioning to
a lead-free process.

ALPHA EF-9301 Flux

product guide



Cookson Electronics

shared intelligence™

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EF-9301 Flux

EF-9301 Introduction

Comprehensive Technical
Development

EF-9301 Product Guide

Troubleshooting Guide

ALPHA Flux Product line

Global Availability

Welcome to the ALPHA EF-9301 Product Guide



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EF-9301 Introduction

Cookson Leadership

Over 40 years of flux chemistry development

Competitive Technical Development: Since our first wave soldering flux was formulated in 1960, Cookson Electronics has amassed extensive expertise in flux chemistry development. We have global R&D resources and a Technical Support Network that demonstrate our technical excellence and market relevance. We maintain this position by:

- Developing test methods that are directly relevant to the market
- Using a Lead-Free reference alloy proven to provide low defects on a consistent basis
- Incorporating soldering materials that challenge the product to differentiate performance
- Confirming performance through extensive customer evaluations

Shared Intelligence

Advancing flux technology through collaboration

ALPHA EF-Series fluxes are more than proven technology. They are a further example of Cookson Electronics' company-wide belief in the value of Shared Intelligence. By listening to customers needs and collaborating to find solutions, Shared Intelligence reflects Cookson Electronics' commitment to helping the electronics industry meet the challenges of a changing world.

ALPHA



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EF-9301 Flux

EF-9301 Introduction

The answer for today's realities

The ALPHA EF-Series is a line of wave soldering fluxes designed to help electronics assembly companies achieve their local and regional environmental care goals. All EF-Series fluxes are both Tin-Lead and Lead-Free capable providing our customers a "Worry-Free" transition while still maintaining excellent wave soldering performance.

ALPHA Series Water-Based Flux Line

Rosin-Free	Low Solids	Medium Solids
EF-2000 Series*	EF-3000 Series*	EF-4000 Series*
ALPHA EF-2202	ALPHA EF-3215 ALPHA EF-3001	ALPHA EF-4102

*The EF-2000, 3000 and 4000 series were developed to meet the additional criteria of Low VOC content.



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ALPHA EF-Series Product Line

Alcohol-Based Flux

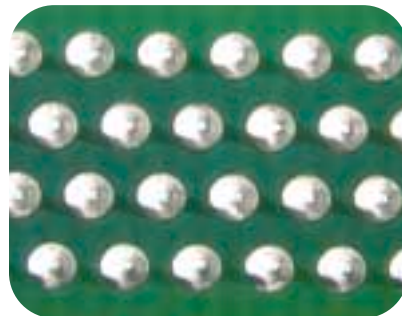
Medium Solids

EF-9000 Series

ALPHA EF-9301

Meets both tin-lead and lead-free process requirements

As part of our new line of EF-Series high performance fluxes, ALPHA EF-9301 is a rosin-bearing, alcohol based, dulling flux developed to meet both productivity requirements and environmental considerations. EF-Series fluxes are designed to be Lead-Free capable. ALPHA EF-9301 provides best-in-class performance, delivering high yields and throughput for the consumer electronics market. At the same time, its outstanding soldering performance for both Tin-Lead and Lead-Free processes assure you worry free compliance with new environmental regulations.



ALPHA EF-9301
Environmentally
friendly. Designed to
be Lead-Free
capable.



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EF-9301 Flux

EF-9301 Introduction

ALPHA EF-9301 Dulling Flux:

- Delivers best-in-class overall performance for both Tin-Lead and Lead-Free applications taking the hardship out of environmental compliance while maintaining value and functionality
- Minimizes bridging and skips on connectors and bottom side components reducing the need for post-process rework
- Provides smooth solder joints with full dulling properties easing eye strain while complying with automatic optical inspection methods
- Demonstrates excellent hole fill providing stronger solder joints, eliminating the need for top side fluxing
- Delivers minimal solderballing significantly reducing the time necessary for brushing or board handling
- Provides compatibility with both spray and foam flux delivery systems

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Comprehensive Technical Development

Prototype Evaluation

Board Types: FR4 and FR2 board types, single and double-sided, representative of the consumer electronics market

Board Finishes: CuOSP board finish provides a demanding level of evaluation for primary testing (Secondary testing performed on HASL and Rosin finishes)

Solder Masks: PSR4000 and Enthone LPI solder masks to highlight microsolderballing and board cosmetics

Components: 844 connector pins, 0.8 and 1.0 mm QFPs, 88 passives and 250 plated through holes per test board to differentiate performance

Placement: Components placed in different orientations to the wave to intentionally produce defects

Alloy Selection Study - Parameters

To ensure that a reliable alloy was selected for prototype evaluation, a detailed study was conducted to determine which Lead-Free alloy would demonstrate repeatability and the lowest level of defects while keeping all other process parameters the same.

Alloys Tested: 99.3 Sn/0.7 Cu, 100 Sn, 99 SACX0307 and SAC305

Flux: ALPHA EF-4102

Board and Components: FR4 CuOSP, double-sided mixed technology, one prior heat cycle (150°C, 5 min) with active and passive daisy-chained components

Equipment: Electrovert Astropak, single nozzle sprayer, 2 preheat zones, (convection and IR), dual wave

Process Parameters: 1.1 m/min conveyor speed, 260°C pot temperature, 110°C topside temperature, air atmosphere



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Technical Diligence

Alloy Selection Study - Results

Alloy Comparison of Defects on CuOSP Finish

Alloy	Defects*	Std. Dev	Ranking
SAC305	47	7.5	1
SACX0307	54	11.7	2
Sn 100	90	8.1	3
Sn 99.3/Cu 0.7	126	20.9	4

*Test board intentionally designed to create defects in order to distinguish materials performance.

As a result of this study, SAC305 was selected as the Lead-Free reference alloy due to its low level of defects and repeatability.



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Performance Summary

Process Benefit	ALPHA EF-9301 Attributes	Performance Capability	Customer Benefits
Soldering	Solderballing	Produces 40% less solderballs in a Tin-Lead process and 25% less solderballs in a Lead-Free process in comparison to the leading competition	Less brushing or board handling to remove solderballs
	Bridging	Fewer solder bridges on connectors than the leading competition using both Tin-Lead and Lead-Free processes	Less time and materials spent to manually touch-up boards
	Bridging on Bottom Side QFP's	Low bridging performance on bottom-side 1mm and 0.8mm components in both Tin-Lead and Lead-Free processes	Less time and materials spent to manually touch-up boards
	Hole Fill	Provides > 96% yield for 10 mil holes filled in both Tin-Lead and Lead-Free processes	Stronger solder joints while virtually eliminating top side fluxing
Cosmetics	Joint Cosmetics	Smooth solder joints with full dulling in both Lead-Free and Tin-Lead alloys	Easier on eyes during inspection and complies with automatic optical inspection methods
	Flux Residue Cosmetic	Clear to light amber in color, smoothly spread over the board and solder joint surface	Higher first pass yield for visual inspection
	Pin Testability	Yields 7% less false failures than Leading Competitor	Fewer false failures during inspection
Ease of Use	Flux Application	Designed for both spray and foam applications	No additional equipment investment required
	Compatibility	Delivers consistent soldering performance on rosin-coated and Entek plus finishes, FR4 and FR2 board types and Taiyo PSR4000 Enthone LPI solder masks	Maintains high yields regardless of soldering materials



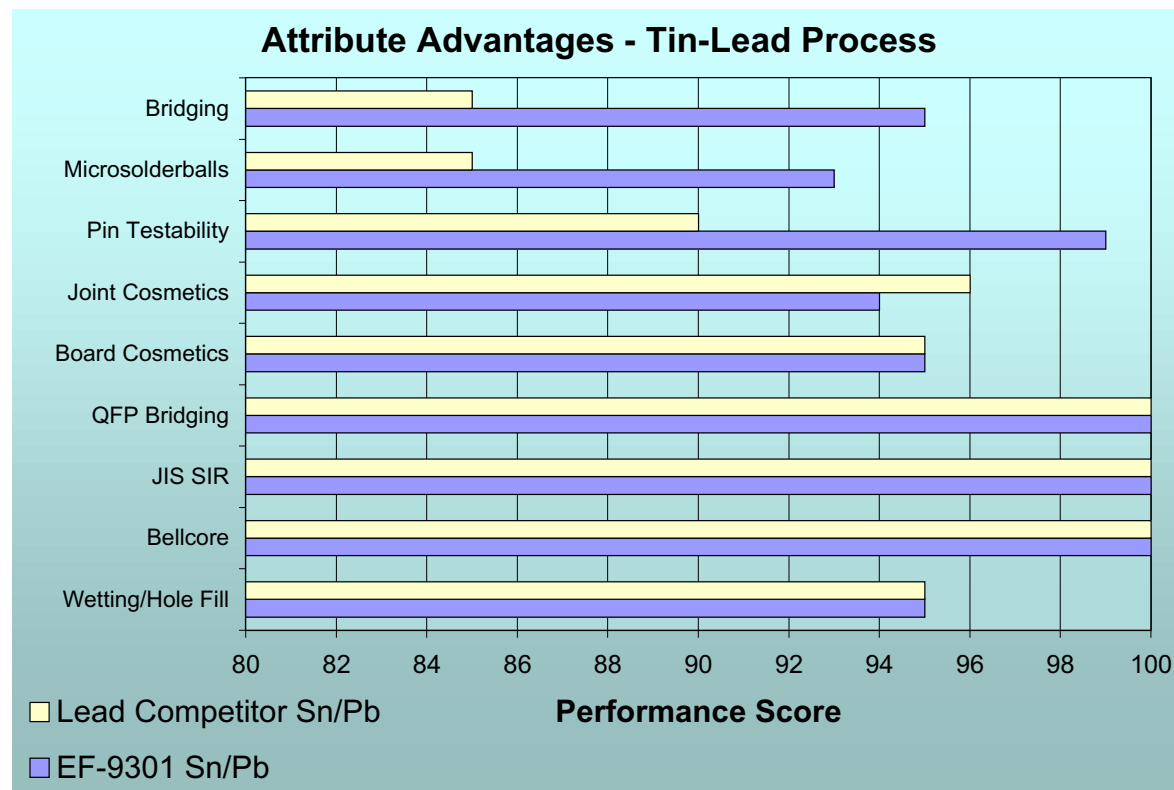
EF-9301 Flux

Attribute Advantages – Tin-Lead Process

Overall, EF-9301 outperforms the leading competitor.

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Cookson Electronics provides a complete product performance characterization for all attributes.

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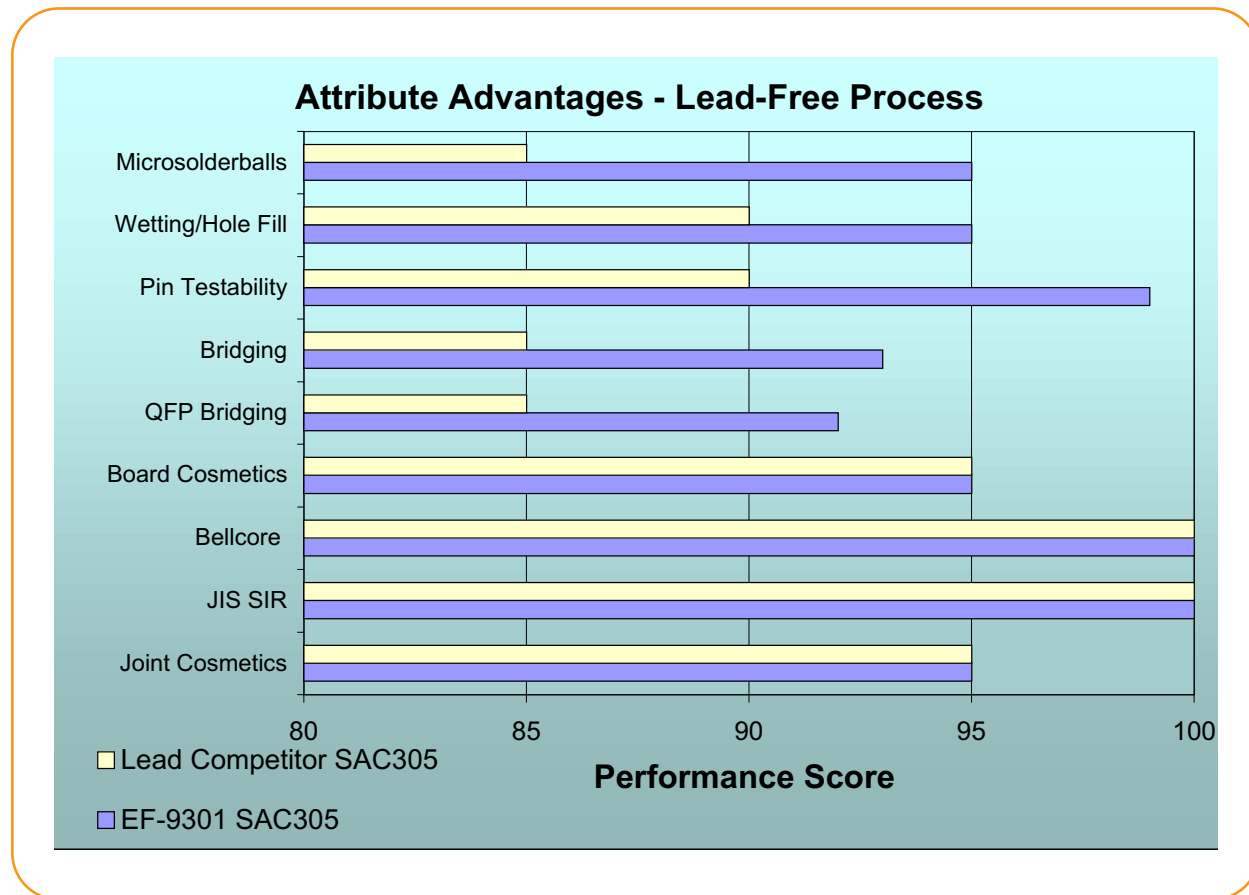
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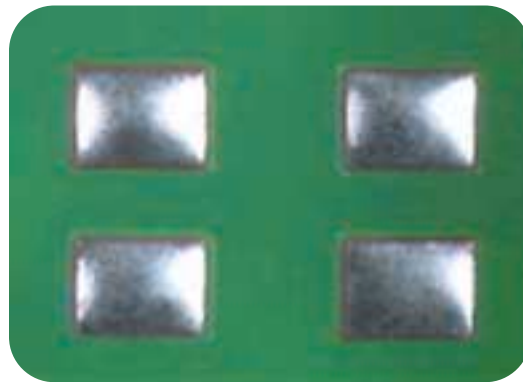
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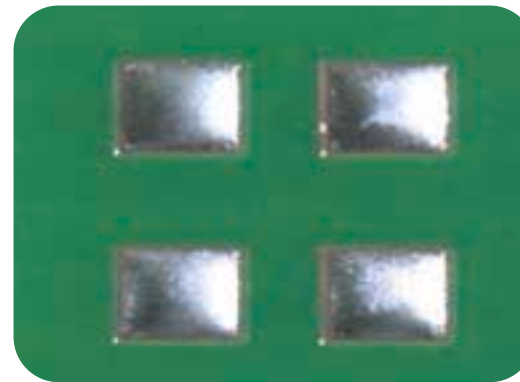
Solder Joint Cosmetics

Result:

Smooth solder joints with full dulling properties for both Lead-Free and Tin-Lead applications



Lead-Free



Tin-Lead

Take the worry out of visual inspection:

Excellent solder joint cosmetics ease eye strain during inspection and is compatible with automatic optical inspection methods.



EF-9301 Flux

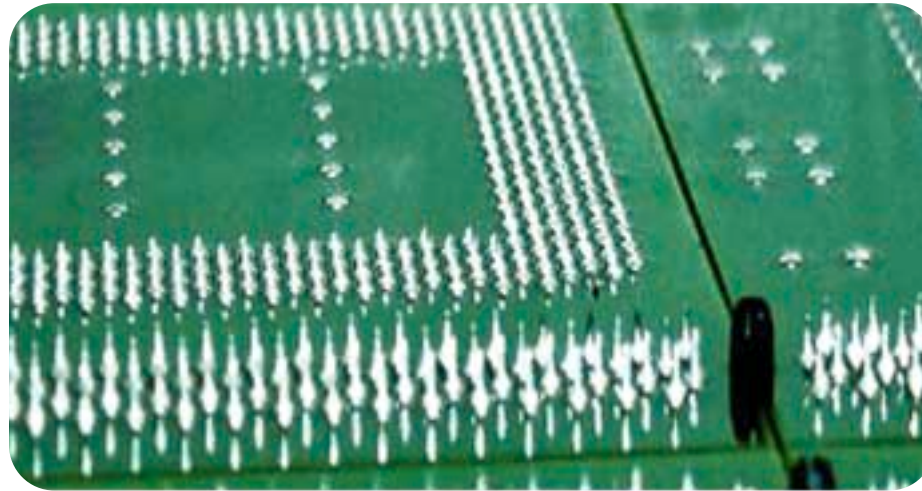
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Flux Residue Cosmetics

Result:

Flux residue cosmetics which are clear to light amber in color and smoothly spread across the board surface



Take the worry out of flux application.

Designed for both spray and foam applications. No additional equipment investment required.

EF-9301 Flux

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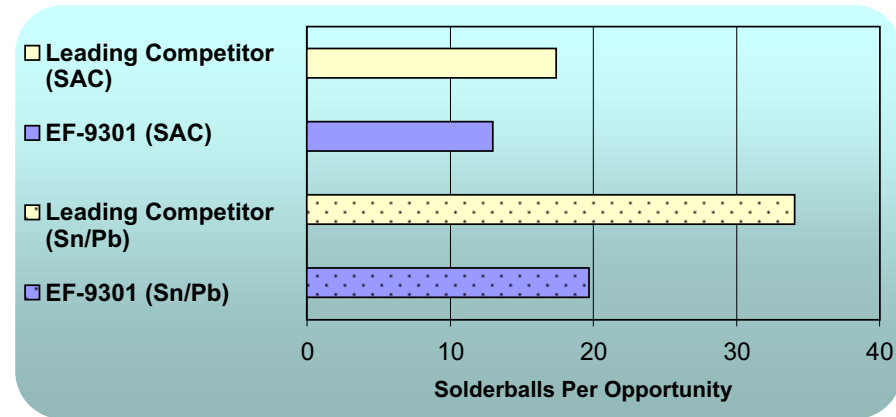
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Soldering Performance

Solderballing

Result:

- Produces 40% less solderballs in a Tin-Lead process versus the leading competition
- Produces 25% less solderballs versus the leading competition in a Lead-Free process



Test conditions: PSR4000, Entek Plus, OSP, Dual Wave

Take the worry out of rework:

Resistance to microsolderballing in both Tin-Lead and Lead-Free applications reduces post-process brushing and board handling.

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EF-9301 Flux

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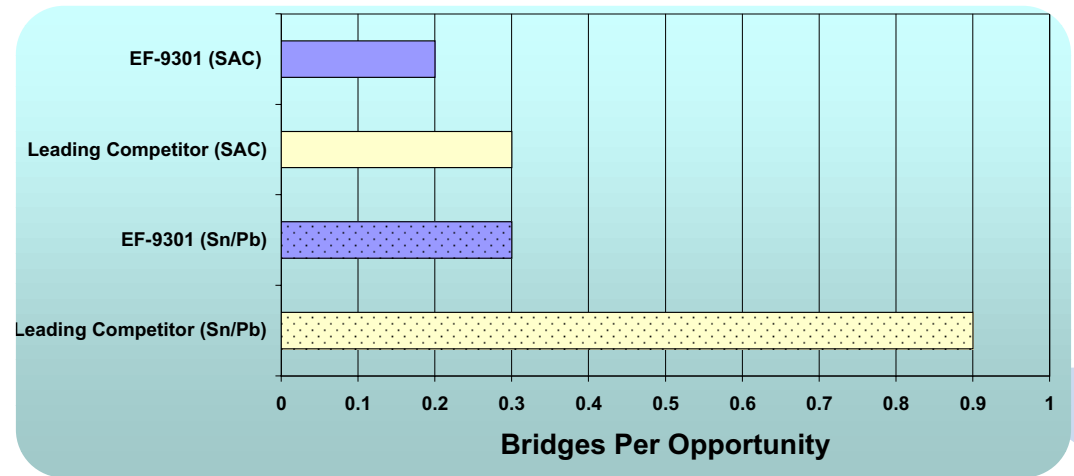
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Soldering Performance

Bridging on Components

Result:

- 60% fewer bridges per opportunity than leading competitor in a Tin-Lead process
- 30% fewer bridges per opportunity than leading competitor in a Lead-Free process



Test conditions: PSR4000, Entek Plus, OSP, Dual Wave

Take the worry out of touch-up:

Low occurrence of solder bridging in both Tin-Lead and Lead-Free applications will reduce the need for post-process rework to touch-up boards.

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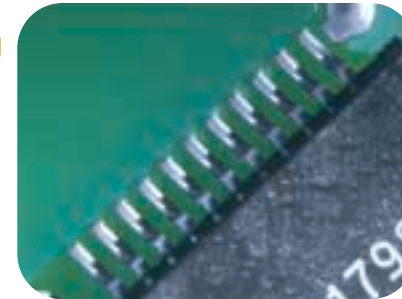
Soldering Performance

Bridging Performance on Bottom-Side SMT Components

QFP Pitch	Lead-Free Process (SAC305)	Tin-Lead Process (Sn/Pb)
1.0 mm	No Bridging Observed	No Bridging Observed
0.8 mm	No Bridging Observed	Minimal Bridging < .055 bridges/opportunity

Take the worry out of touch-up:

Very low occurrence of bridging on bottom-side SMT components in both Tin-Lead and Lead-Free applications reduce the need for post-process touch-up.



Test conditions: Enthone LPI, Entek Plus, OSP, Dual Wave, in nitrogen

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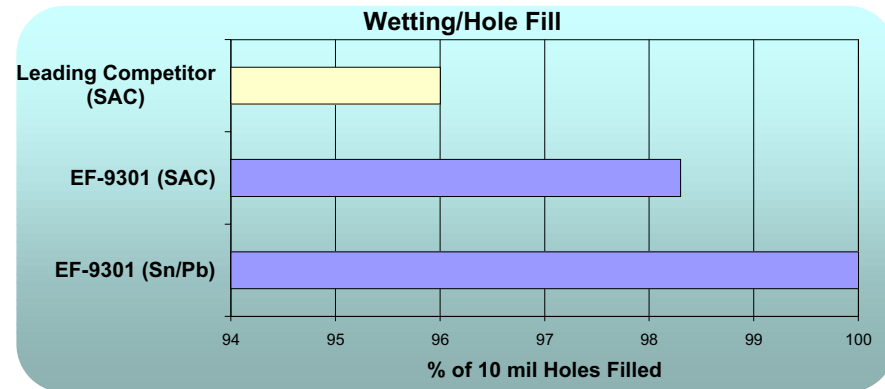
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Soldering Performance

Hole Fill

Result:

- 100% of 10 mil holes filled with Tin-Lead process
- Outperforms leading competition for 10 mil holes filled in Lead-Free process



Test conditions: Enthone LPI, double-sided boards, Dual Wave

Take the worry out of soldering yields:

Best in class hole fill for both Tin-Lead and Lead-Free applications provide stronger solder joints while eliminating the need for top side fluxing.

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In-Circuit Test Data

Result:

- 99.9% contact resistance <1 ohm vs. 93.1% for Leading Competitor
- Less residue pickup on the probe than Leading Competitor

ALPHA EF-9301



193 μ g m/sq. cm
100°C Preheat
SAC305 Dual Wave 260°C
100 gms Sharp Chisel
12,000 Contacts

Leading Competitor



205 μ g/sq. cm
100°C Preheat
SAC305 Dual Wave 260°C
100 gms Sharp Chisel
12,000 Contacts

Take the worry out of in-circuit testing:

Excellent pin-testability delivers fewer false failures during inspection.



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Electrical Reliability

Industry Standard Test

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

Test	Conditions	Requirements	Controls	Results
Initial	Ambient	1.0×10^{11}	1.0×10^{11}	3.0×10^{11}
After 96 Hours	40°C/90% RH	1.0×10^{10}	1.0×10^{11}	2.2×10^{12}
Recovered	35°C/85% RH, 5 Days	1.0×10^{11}	2.0×10^{11}	1.1×10^{12}

All Measurements @ 100V, JIS Boards (0.32 mm spacing, same as IPC B25 Boards)

Bellcore Surface Insulation Resistance (All values shown in ohms)

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	35°C/85% RH, 5 Days	1.0×10^{11}	1.0×10^{12}
"Comp-Up" Uncleaned	35°C/85% RH, 5 Days	1.0×10^{11}	2.3×10^{11}
Control Boards	35°C/85% RH, 5 Days	2.0×10^{11}	2.2×10^{12}

Bellcore Test Condition (per GR78-CORE, Issue 1) 48 volts, measurement @ 100V/25 mil lines/50 mil spacing

Bellcore Electromigration (All values shown in ohms)

Test	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
"Comb-Up" Uncleaned	6.1×10^{10}	1.1×10^{11}	SIR (Initial)/SIR (Final) < 10	Pass	Pass
"Comb-Down" Uncleaned	1.2×10^{11}	1.4×10^{11}	SIR (Initial)/SIR (Final) < 10	Pass	Pass

Bellcore Test Condition (per GR-78 CORE, Issue 1): 68° C/85% RH/500 Hours/10V, measurement @ 100V/IPC B-25B Pattern (12.5 mil lines, 12.5 mil spacing)

Take the worry out of electrical reliability:

Exceeds IPC, Bellcore and JIS requirements for SIR, electromigration, silver chromate, copper mirror and copper corrosion.

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For complete Technical Bulletin, see appendix A.



ALPHA EF-9301

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

GENERAL DESCRIPTION

ALPHA EF-9301 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 performance in hole fill and solderballing. Additionally, it provides dull joints with an evenly spread, low-tack flux.

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

Benefits:

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

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 50g/in² 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 cleaned. Bioact SC-10 Solvent Cleaner has been found to be very useful for these cleaning applications.

FLUX APPLICATION - ALPHA EF-9301 can be applied by spraying or foaming. 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.

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

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MSDS

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For complete MSDS, see appendix B.



Conforms to 91/155/EEC - 2001/58/EC

SAFETY DATA SHEET



EF-9301

1. Identification of the substance/preparation and of the company/undertaking

Product name : EF-9301
Code : 93086
Head Office : **Cookson Electronics** **Manufacturer** : Ashford Manufacturing Site
Fornyth Road **Hythe Road**
Shearwater **Ashford**
Woking **Kent**
Surry **TN24 8DM**
0121 992 **Tel: +44(0)1483 728400**
Tel: +44(0)1483 728400 **Fax: +44(0)1483 728837**

2. Composition/information on ingredients

Substance/Preparation : Preparation

Chemical name*	CAS no.	%	EC Number	Classification
Europe propan-2-ol	67-63-0	80-100	200-661-7	F: R11 Xi: R36 R43
rosin, hydrogenated	8050-09-7	1-5	266-041-3	R37 R43
rosin, hydrogenated	8050-09-7	0.5-1	232-475-7	R43

* See Section 16 for the full text of the R Phrases declared above

* Occupational Exposure Limit(s), if available, are listed in Section 8

3. Hazards identification

The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.
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 The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.
 The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.

Classification : F: R11
 Xi: R36
 R43

Classification : F: R11
 Xi: R36
 R43

Classification : F: R11
 Xi: R36
 R43, 67

Classification : F: R11
 Xi: R36
 R43

Effects and symptoms

Skin contact : Irritation of the product in case of skin contact: Not available.
 Hazardous in case of skin contact (sensitizer).

Eye Contact : Hazardous in case of eye contact (irritant).

Aggravating conditions : Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Date of issue : 03/07/2003.

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Recommended Process Parameters

		Suggested Process Settings	
		Tin-Lead Alloy System	Lead-Free Alloy System
Single Wave	Conveyor Speed*	1.5-2.2 m/min	0.8-2.0 m/min
	Flux Loading	<185 micrograms/sq cm	<235 micrograms/sq cm
	Topside Preheat ¹	75-95°C	85-110°C
	Solder Pot Temperature ¹	240-250°C	250-265°C
	Wave Height	1/2 to 2/3 of board thickness	1/2 to 2/3 of board thickness
Dual Wave	Conveyor Speed*	1.5-2.2 m/min	0.8-2.0 m/min
	Flux Loading	<235 micrograms/sq cm	<235 micrograms/sq cm
	Topside Preheat ¹	75-95°C	85-110°C
	Solder Pot Temperature ¹	240-250°C	250-265°C
	Wave Height	1/2 to 2/3 of board thickness	1/2 to 2/3 of board thickness

*Capable of performing at slower speeds to accommodate certain types of Lead-Free wave soldering processes

¹Suggested ΔT between topside preheat and solder pot temperature should be $\leq 150^\circ\text{C}$ to minimize potential for thermal shock of SMT components.



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Flux Loading Table

Coverage Area cm ²	Suggested Wet Flux Weight (micrograms/cm ²)			
	Single Wave		Dual Wave	
	Suggested Lower Limit (125 micrograms /cm ²) grams	Suggested Upper Limit (185 micrograms /cm ²) grams	Suggested Lower Limit (160 micrograms /cm ²) grams	Suggested Upper Limit (235 micrograms /cm ²) grams
100	0.179	0.264	0.229	0.336
150	0.268	0.396	0.343	0.504
200	0.357	0.529	0.457	0.671
250	0.446	0.661	0.571	0.839
300	0.536	0.793	0.686	1.007
350	0.625	0.925	0.800	1.175
400	0.714	1.057	0.914	1.343
450	0.804	1.189	1.029	1.511
500	0.893	1.321	1.143	1.679
550	0.982	1.454	1.257	1.846
600	1.071	1.586	1.371	2.014
650	1.161	1.718	1.486	2.182
700	1.250	1.850	1.600	2.350
750	1.339	1.982	1.714	2.518
800	1.429	2.114	1.829	2.686
850	1.518	2.246	1.943	2.854
900	1.607	2.379	2.057	3.021
950	1.696	2.511	2.171	3.189
1000	1.786	2.643	2.286	3.357
1050	1.875	2.775	2.400	3.525
1100	1.964	2.907	2.514	3.693
1150	2.054	3.039	2.629	3.861
1200	2.143	3.171	2.743	4.029
1250	2.232	3.304	2.857	4.196
1300	2.321	3.436	2.971	4.364
1350	2.411	3.568	3.086	4.532
1400	2.500	3.700	3.200	4.700
1450	2.589	3.832	3.314	4.868
1500	2.679	3.964	3.429	5.036
1550	2.768	4.096	3.543	5.204
1600	2.857	4.229	3.657	5.371
1650	2.946	4.361	3.771	5.539
1700	3.036	4.493	3.886	5.707
1750	3.125	4.625	4.000	5.875
1800	3.214	4.757	4.114	6.043
1850	3.304	4.889	4.229	6.211
1900	3.393	5.021	4.343	6.379
1950	3.482	5.154	4.457	6.546
2000	3.571	5.286	4.571	6.714
2050	3.661	5.418	4.686	6.882
2100	3.750	5.550	4.800	7.050
2150	3.839	5.682	4.914	7.218
2200	3.929	5.814	5.029	7.386

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Evaluation Guide

1. Flush flux tank, hoses and spray nozzles prior to any trial with appropriate solvent (DI water, ALPHA flux thinner or IPA). This is to avoid cross contamination from the prior flux.
2. Check for uniform spray on the board and measure flux loading. Compare with recommended levels.
3. Check fingers and pallets for cleanliness.
4. Assure that the solder wave is free from dross. Remove dross if necessary.
5. Check solder level in the pot. Make sure solder level is appropriate for the machine.
6. Assure that the solder wave is level to the board. Use ALPHA Levchek, if necessary.
7. Check the wave height to make sure it is set to 1/2 to 2/3 of the board thickness, including chip wave, if used.
8. Set conveyor speed to the recommended level.
9. Measure top side preheat with flux applied on the bottom side of the board. Adjust temperature setting on the machine to achieve the recommended temperature.

Notes:

1. Temperature tabs can be placed at multiple locations on the board (pick high density and low density areas to determine overall range of temperature).
2. Thermocouple probes or moles can be used as well (pick high density and low density board areas to determine overall range of temperature).
3. The highest and lowest measured top-side preheat temperatures should be within the recommended guidelines.



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Evaluation Guide

Product Focus and Key Features

- Provides high yields in both Tin-Lead and Lead-Free applications
- Tin-Lead – smooth solder joints with full dulling
- Lead-Free – fully fused joints typical of SAC305 with full dulling
- Excellent hole fill demonstrated by >95% yield on 10 mil holes
- Reduced bridging versus leading competitor on connectors and bottom side SMT components
- Reduced amount of solderballs
- Evenly spread, low tack flux residue

Demonstration Procedure

Run 5 boards with EF-9301 at suggested process parameters for either single wave or dual wave

- I. Evaluate hole fill compared to current flux
- II. Count microsolderballs on selected connectors and compare to current flux
- III. Count the number of bridges, skips and icicles compared to the current flux
- IV. Evaluate joint cosmetics for smoothness and dulling properties compared to the current flux
- V. Evaluate board cosmetics for uniformity and repeatability.



EF-9301 Flux

Troubleshooting Guide

Troubleshooting Guide

Use the CD version of the Product Guide to access the Troubleshooting Guide.



COOKSON ELECTRONICS **Wavesoldering No-Clean Process Troubleshooting**

Welcome!

This guide was designed to help the process engineer determine the cause and solution for the most common defects. Because the wave solder process is complex and many variables interact to produce the results, it is difficult to pinpoint the exact cause and solution. This guide will provide the user with several cause and solutions that could affect the process and result in the selected defect. Refer to the Wavesolder Machine and Process section for more information on how machine parameters affect the process and nominal parameter values. The board and component quality, type of solder mask, flux chemistry, component orientation and lead length are some of the non-machine variables that will affect the process and must also be considered.

SPEEDLINE ELECTRONIC OVEN

alpha

EF-9301 Flux

A solution for every need.

ALPHA EF-9301 is part of our EF-Series of environmentally friendly fluxes designed to keep your process fully productive. Whether you specialize in consumer products, telecommunications, automotive or high product-mix production, you'll find ALPHA EF-Series fluxes will meet your needs for higher yield and throughput. Select the EF-Series product that is right for your needs.

ALPHA Flux Product line

Features	Water-Based				Alcohol-Based
	EF-2202	EF-3001	EF-3215	EF-4102	EF-9301
Appearance	Clear	Milky	Milky	Amber	Pale Yellow
Resin/Rosin Content	0%	<5%	<5%	<10%	<6%
VOC Content	<2%	<1%	<2%	<10%	<93%
Lead-Free Compatible	Y	Y	Y	Y	Y
Bellcore Compliant	Y	Y	N	Y	Y
Wetting/Hole Fill	2	3	1	1	1
Solderballing	1	2	2	1	1
Pin Testability	1	3	2	-	1
Cleanability	2	3	3	3	3
Tack	-	2	2	2	2
Conformal Coating	1	1	1	-	-
Joint Cosmetics	1	2	2	1	1 (Full Dulling)*
Selective Soldering	1	3	2	-	-

Note: 1=Superior, 2=Excellent, 3=Good, Y=Yes, N=No

*In product category



Cookson Electronics

EF-9301 Flux

ALPHA Flux Product line

Selector Guide

ALPHA EF-Series Water-Based Fluxes

Series	Product	Application
ALPHA EF-2000	ALPHA EF-2202	EMS, Telecom, Computer
ALPHA EF-3000	ALPHA EF-3001, ALPHA EF-3215	Consumer Products, Automotive
ALPHA EF-4000	ALPHA EF-4102	Consumer Products

ALPHA EF-Series Alcohol-Based Fluxes

Series	Product	Application
ALPHA EF-9000	ALPHA EF-9301	Consumer Products

CEAM's Leading ALPHA Fluxes

Series	Product	Application
ALPHA RF-800	RF-800 Universal, No-Clean	Universal
ALPHA SLS-65	SLS-65C Rosin-Free, No-Clean	EMS, Telecom
Water-Soluble	856, 373	Universal
ALPHA NR-330	NR-330 Universal, No-Clean VOC-Free	EMS, Telecom

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EF-9301 Flux

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A global solution with worldwide support.

ALPHA EF-Series wave-soldering fluxes are backed by the worldwide resources of Cookson Electronics. From advanced R&D to 24-hour tech support, Cookson has the resources and the insight to solve your most challenging problems anywhere in the world you need us.



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Consolidated Alloys

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NEW ZEALAND

Active Components (NZ) Ltd

8 Target Court Glenfield • Auckland 1310 New Zealand •
Tel: 64.9.443.9500 • Fax: 64. 9. 443.9502



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EF-9301 Flux

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alpha metals lotsysteme gmbh

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Cookson Electronics

ALPHA EF-9301

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

GENERAL DESCRIPTION

ALPHA EF-9301 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 performance in hole fill and solderballing. Additionally, it provides dull joints with an evenly spread, low-tack flux.

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

Benefits:

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

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 5µg/in² 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 cleaned. Bioact SC-10 Solvent Cleaner has been found to be very useful for these cleaning applications.

FLUX APPLICATION - ALPHA EF-9301 can be applied by spraying or foaming. 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.

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



Cookson Electronics ASSEMBLY MATERIALS

ALPHA EF-9301 Wave Soldering Flux for Tin-Lead and Lead-Free Applications

GENERAL GUIDELINES FOR MACHINE SETTINGS

OPERATING PARAMETER	TYPICAL LEVEL
Amount of Flux Applied	Spray: <1500 µg/in ² of solids/in ² dual wave, <1200 µg/in ² of solids/in ² single wave
Top-Side Preheat Temperature	85-110°C for Lead-Free and 75-95°C for Tin-Lead
Bottom side Preheat Temperature	0 to +40°F (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 Angle	5 - 8° (6° most common recommended by equipment manufacturers)
Conveyor Speed	1.5 – 2.2 m/min for Tin-Lead and 0.8 – 2.0 m/min for Lead-Free. *ALPHA EF-9301 is capable of running at slower conveyor speeds to accommodate certain types of Lead-Free wave soldering processes
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 - 4.0 seconds (2.5 - 3 seconds most common)
Solder Pot Temperature:	
Sn63/Pb37 Alloy	235 - 260°C
Lead-Free Alloy - 96.5Sn/3.0Ag/0.5Cu	255 - 265°C
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 – The solids content of ALPHA EF-9301 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 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 BIOACT solvent defluxers are recommended.

TECHNICAL SPECIFICATIONS

Physical Properties	Typical Values	Parameters/Test Method	Typical Values
Appearance	Clear, Pale Yellow Liquid	pH, as is	3.7
Solids Content, wt/wt	7.0	Recommended Thinner	ALPHA 425
Specific Gravity @ 25°C (77°C)	0.798 ± 0.005	Shelf Life	12 months
Acid Number (mg KOH/g)	15.7 – 16.5	IPC J-STD-004 Designation	ROM1
Flash Point (T.C.C.)	12°C		

**CORROSION AND ELECTRICAL TESTING****CORROSION TESTING**

Test	Requirement for ROM1	Results
Silver Chromate Paper IPC-TM 650 Test Method 2.3.33	No detection of halide	PASS
Copper Mirror Tests (IPC/Bellcore Method)	No evidence of mirror breakthrough	No evidence of mirror breakthrough
Copper Corrosion Test IPC-TM 650 Test Method 2.6.15	No evidence of corrosion	No evidence of corrosion

J-STD-004 SURFACE INSULATION RESISTANCE (All values shown are in ohms)

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	85°C/85% RH, 7 days	1.0 x 10 ⁸ minimum	6.5 x 10 ⁹
"Comb-Up" Uncleaned	85°C/85% RH, 7 days	1.0 x 10 ⁸ minimum	2.6 x 10 ¹⁰
Control Boards	85°C/85% RH, 7 days	2.0 x 10 ⁸ minimum	1.3 x 10 ¹⁰

IPC Test Condition (per J-STD-004): -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 x 10 ¹¹ minimum	1.0 x 10 ¹¹ minimum	3.0 x 10 ¹¹
After 96 Hours	40°C / 90% RH	1.0 x 10 ¹⁰ minimum	1.0 x 10 ¹¹ minimum	2.2 x 10 ¹²
Recovered	35°C/85% RH, 5 days	1.0 x 10 ¹¹ minimum	2.0 x 10 ¹¹ minimum	1.1 x 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 x 10 ¹¹ minimum	1.0 x 10 ¹²
"Comb-Up" Uncleaned	35°C/85% RH, 5 days	1.0 x 10 ¹¹ minimum	2.3 x 10 ¹¹
Control Boards	35°C/85% RH, 5 days	2.0 x 10 ¹¹ minimum	2.2 x 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 x 10 ¹⁰	1.4 x 10 ¹¹	SIR (Initial)/SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	4.5 x 10 ¹¹	7.3 x 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).

1. Identification of the substance/preparation and of the company/undertaking

Product name : **EF-9301**
 Code : **53066**
 Head Office : **Cookson Electronics** : **Ashford Manufacturing Site**
Forsyth Road **Henwood Industrial Estate**
Sheerwater **Hythe Road**
Woking **Ashford**
Surrey **Kent**
GU21 5RZ **TN24 8DM**
Tel: +44(0)1483 756400 **Tel: +44 (0) 1233 610110**
Fax: +44(0)1483 728837 **Fax: +44 (0) 1233 664323**

2. Composition/information on ingredients

Substance/Preparation : Preparation

Chemical name*	CAS no.	%	EC Number	Classification
Europe propan-2-ol	67-63-0	80-100	200-661-7	F: R11 Xi: R36 R67
rosin, hydrogenated	8050-09-7	1-5	266-041-3	R43
rosin, hydrogenated	8060-09-7	0.5-1	232-475-7	R43

See Section 16 for the full text of the R Phrases declared above

* Occupational Exposure Limits, if available, are listed in Section 8

3. Hazards identification

The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.
 The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.
 The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.
 The preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.

Classification : F: R11
 Xi: R36
 R43
 Classification : F: R11
 Xi: R36
 R43
 Classification : F: R11
 Xi: R36
 R43, 67
 Classification : F: R11
 Xi: R36
 R43

Effects and symptoms

Skin contact : Irritation of the product in case of skin contact. Not available.
 Hazardous in case of skin contact (sensitizer).
 Eye Contact : Hazardous in case of eye contact (irritant).
 Aggravating conditions : Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

EF-9301

4. First-aid measures

First-Aid measures

- Inhalation**
- : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Obtain medical attention.
- Ingestion**
- : Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.
- Skin contact**
- : In case of contact, immediately flush skin copiously with water for at least 15 minutes while removing contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Clean shoes thoroughly before reuse. Obtain medical attention.
- Eye Contact**
- : Check for and remove any contact lenses. In case of contact, immediately flush eyes with a copious amount of water for at least 15 minutes. Cold water may be used. Obtain medical attention.

5. Fire-fighting measures

Extinguishing Media

Suitable : SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Hazards thermal decomposition products : These products are carbon oxides (CO, CO₂).

- Special fire-fighting procedures** : Fire fighters should wear self-contained positive pressure breathing apparatus (SCBA) and full turnout gear.
- Protection of fire-fighters** : Be sure to use an approved/certified respirator or equivalent.

6. Accidental release measures

Personal Precautions : Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Environmental precautions and cleanup methods : Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with dry earth, sand or other noncombustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed.

Note: See section 8 for personal protective equipment and section 13 for waste disposal.

7. Handling and storage

Handling : Keep locked up. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/vapour/spray. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label.

Storage : Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Excluding materials

Recommended use : Use original container.

Danish Fire Class : Not available.

8. Exposure controls/personal protection

Engineering measures

- : Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapours below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are close to the workstation location.

Hygiene measures

- : Wash hands after handling compounds and before eating, smoking, using lavatory, and at the end of day.

Occupational Exposure Limits

Europe

propan-2-ol

ACGIH TLV (United States, 2007).

STEL: 1230 mg/m³ 15 minute(s).

STEL: 500 ppm 15 minute(s).

TWA: 983 mg/m³ 8 hour(s).

TWA: 400 ppm 8 hour(s).

Sweden

propan-2-ol

AFS (Sweden, 2000).

KTV: 600 mg/m³ 15 minute(s).

KTV: 250 ppm 15 minute(s).

NGV: 350 mg/m³ 8 hour(s).

NGV: 150 ppm 8 hour(s).

Denmark

Date of issue

: 01/07/2003.

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Arbejdstilsynet (Denmark, 2000). Skin
GV: 490 mg/m³ 8 hour(s).
GV: 200 ppm 8 hour(s).

Norway

propan-2-ol
Arbejdstilsynet (Norway, 2001).
AN: 245 mg/m³ 8 hour(s).
AN: 100 ppm 8 hour(s).

France

propan-2-ol
INRS (France, 1999). Notes: Not Legal
VLE: 960 mg/m³ 15 minute(s).
VLE: 400 ppm 15 minute(s).
INRS (France, 1999). Notes: Not Legal
VME: 0.1 mg/m³ 8 hour(s).
INRS (France, 1999). Notes: Not Legal
VME: 0.1 mg/m³ 8 hour(s).

rosin, hydrogenated

rosin, hydrogenated

Netherlands

propan-2-ol
Nationale MAC-lijst (Netherlands, 2001). Notes: Legal
TGG 8 uur: 650 mg/m³ 8 hour(s).
TGG 8 uur: 250 ppm 8 hour(s).

Germany

propan-2-ol
MAK-Werte Liste (Germany, 2000).
Spitzenbegrenzung: 1000 mg/m³ 4 times per shift, 30 minute(s).
Spitzenbegrenzung: 400 ML/M3 4 times per shift, 30 minute(s).
TWA: 500 mg/m³ 8 hour(s).
TWA: 200 ML/M3 8 hour(s).
TRGS900 MAK (Germany, 2001).
Spitzenbegrenzung: 2000 mg/m³
TWA: 500 mg/m³ 8 hour(s).
Spitzenbegrenzung: 800 ppm
TWA: 200 ppm 8 hour(s).

Finland

propan-2-ol

Työturvallisuus (Finland, 2001).
STEL: 620 mg/m³ 15 minute(s).
STEL: 250 ppm 15 minute(s).
TWA: 500 mg/m³ 8 hour(s).
TWA: 200 ppm 8 hour(s).

United Kingdom (UK)

propan-2-ol

EH40-OES (United Kingdom (UK), 2002). Notes: OES
STEL: 1250 mg/m³ 15 minute(s).
STEL: 500 ppm 15 minute(s).
TWA: 999 mg/m³ 8 hour(s).
TWA: 400 ppm 8 hour(s).

rosin, hydrogenated

rosin, hydrogenated

Austria

propan-2-ol

BMWA MAK (Austria, 2001).
STEL: 1960 mg/m³ 4 times per shift, 30 minute(s).
STEL: 800 ppm 4 times per shift, 30 minute(s).
TWA: 980 mg/m³ 8 hour(s).
TWA: 400 ppm 8 hour(s).

Switzerland

propan-2-ol

SUVA (Switzerland, 2001). Notes: Not Temporary
Kurztzeitgrenzwerte: 1000 mg/m³ 15 minute(s).
Kurztzeitgrenzwerte: 400 ppm 15 minute(s).
MAK: 500 mg/m³ 8 hour(s).
MAK: 200 ppm 8 hour(s).

Belgium

propan-2-ol

Lijst Grenswaarden (Belgium, 1998).
VCD: 1248 mg/m³ 15 minute(s).
VCD: 500 ppm 15 minute(s).
VL: 997 mg/m³ 8 hour(s).
VL: 400 ppm 8 hour(s).

Spain

propan-2-ol

INSHT (Spain, 2001).
STEL: 1250 mg/m³ 8 hour(s).
STEL: 500 ppm 8 hour(s).
TWA: 998 mg/m³ 8 hour(s).
TWA: 400 ppm 8 hour(s).

- Respiratory system : Wear appropriate respirator when ventilation is inadequate.
- Skin and body : Lab coat.
- Hands : Gloves.
- Eyes : Splash goggles.

Protection based on MAL.

: According to the regulations on work involving coded products, the following stipulations apply to the use of personal protective equipment:

General: Gloves must be worn for all work that may result in soiling. Apron/overall/protective clothing must be worn when soiling is so great that regular work clothes do not adequately protect skin against contact with the product. A face shield must be worn in work involving splattering if a full mask is not required. In this case, other recommended use of eye protection is not required.

In all spraying operations in which there is return spray, respiratory protection with air supply and arm protectors/apron/overall/protective clothing must be worn as appropriate or as instructed.

MAL-code: 4-5

Application: When using scraper or knife, brush, roller, etc. for pre- and post-treatments in a spray booth where the operator is outside the spray zone; and when working in similar new* facilities of the combined-cabin, spray-cabin and spray-booth type where the operator is working inside the spray zone. When spraying in new* booths and cabins with non-atomising guns.

- Protective clothing must be worn.

When using scraper or knife, brush, roller, etc. for pre- and post-treatments in cabins or booths of the existing* facility type, if the operator is inside the spray zone. When using scraper or knife, brush, roller, etc. for pre- and post-treatments outside a closed facility, spray booth or spray cabin.

- Air-supplied half-mask, protective clothing and eye protection must be worn.

When spraying in new* booths if the operator is outside the spray zone.

- Air-supplied half-mask and eye protection must be worn.

When spraying in existing* spray booths, if the operator is outside the spray zone. During non-atomising spraying in existing* facilities of the combined-cabin, spray-cabin and spray-booth type where the operator is working inside the spray zone. During downtimes, cleaning and repair in closed facilities, spray booths or cabins, if there is a risk of contact with wet paint or organic solvents.

- Air-supplied full mask and protective clothing must be worn.

During all spraying where atomisation occurs in cabins or spray booths where the operator is inside the spray zone; and during spraying outside a closed facility, cabin or booth.

- Air-supplied full mask, protective clothing and hood must be worn.

Drying: Items for drying/drying ovens that are temporarily placed on such things as rack trolleys, etc. must be equipped with a mechanical exhaust system to prevent fumes from wet items from passing through workers' inhalation zone.

Polishing: When polishing treated surfaces, a mask with dust filter must be worn. When machine grinding, eye protection must be worn. Work gloves must always be worn.

Caution The regulations contain other stipulations in addition to the above.

*See Regulations.

9. Physical and chemical properties

- Physical state : Liquid.
- Colour : Colourless to light yellow.
- Odour : Alcohol-like.
- pH : Not available.
- Boiling point : 82°C (179.6°F)
- Melting point : May start to solidify at -88.83°C (-127.9°F) based on data for: propan-2-ol.
- Flash point : Closed cup: 12°C (53.6°F). (Pensky-Martens.)
- Autoignition temperature : The lowest known value is 399.05°C (750.3°F) (propan-2-ol).
- Explosive properties : Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
- Lower explosion limit : LOWER: 2% UPPER: 12%
- Outfiring properties : Not available.

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- Density : 0.798 g/cm³ (20°C / 68°F)
 Solubility : Soluble in cold water, hot water.
 Vapour density : The highest known value is 2.07 (Air = 1) (propan-2-ol).
 Evaporation rate (butyl acetate = 1) : 1.7 (propan-2-ol) compared to (n-BUTYL ACETATE=1)

10. Stability and reactivity

- Stability** : The product is stable.
Hazardous decomposition products : These products are carbon oxides (CO, CO₂).
rosin, hydrogenated: Sensitized persons may subsequently show asthmatic symptoms when exposed to atmospheric concentrations well below the OEL.
rosin, hydrogenated: Sensitized persons may subsequently show asthmatic symptoms when exposed to atmospheric concentrations well below the OEL.

11. Toxicological information**Acute toxicity**

Ingredient Name
ISOPROPANOL

Test	Results	Route	Species
LD50	5045 mg/kg	Oral	Rat
LD50	6410 mg/kg	Oral	Rabbit
LD50	3600 mg/kg	Oral	Mouse
LD50	12800 mg/kg	Dermal	Rabbit
LDLo	1537 mg/kg	Oral	Dog
LDLo	3570 mg/kg	Oral	human
LDLo	5272 mg/kg	Oral	man

Local effects

- Eye irritation** : Hazardous in case of eye contact (irritant).
Sensitization : Hazardous in case of skin contact (sensitizer).
Chronic toxicity : Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

12. Ecological information**Toxicity Data**

Ingredient Name
propan-2-ol

Species	Exposure	Result
Pimephales promelas (EC50)	48 hours	10000 mg/l
Lepomis macrochirus (LC50)	96 hours	>1400 mg/l
Pimephales promelas (LC50)	96 hours	6550 mg/l
Pimephales promelas (LC50)	96 hours	9640 mg/l
Pimephales promelas (LC50)	96 hours	10400 mg/l
Pimephales promelas (LC50)	96 hours	11130 mg/l

13. Disposal considerations

- Methods of disposal** : Waste of residues : Contaminated packaging : Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Waste Classification : Not applicable.
European Waste Catalogue (EWC) : Not available.
Hazardous Waste : The classification of the product may meet the criteria for a hazardous waste

14. Transport information**International transport regulations**

Regulatory Information	UN number	Proper shipping name	Class	Packing group	Label	Additional Information
ADR/BIB Class	1993	FLAMMABLE LIQUIDS, 3 N.O.S. (propan-2-ol)	3	II		Hazard identification number 33 CEFC Transcard 30GF1-II

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IMDG Class	1993	FLAMMABLE LIQUIDS, 3 N.O.S. (propan-2-ol)	II	Emergency Schedules (EmS) 307
IATA-ICGR Class	1993	FLAMMABLE LIQUIDS, 3 N.O.S. (propan-2-ol)	II	.

15. Regulatory information

EU Regulations

Hazard symbol(s)



Highly flammable, Irritant

Indication of Danger
Risk Phrases

: Highly flammable, Irritant
: R11- Highly flammable,
R36- Irritating to eyes.

: R43- May cause sensitization by skin contact.

Safety Phrases

: S9- Keep container in a well-ventilated place.

S16- Keep away from sources of ignition - No smoking.

S24- Avoid contact with skin.

S37- Wear suitable gloves.

S51- Use only in well-ventilated areas.

S60- This material and its container must be disposed of as hazardous waste.

Contains

: rosin, hydrogenated

Product Use

: Classification and labelling have been performed according to EU directives 67/548/EEC, 1999/45/EC, including amendments and the intended use.

EC Statistical Classification

(Tariff Code)

: 32089091

National regulations

Highly flammable, Irritant

Denmark

Additional Warning Phrases

: Not applicable.

Denmark – Cancer Risks

: Not available.

MAI-code

: 4-5

Denmark – Restrictions on Use

: Not to be used by professional users below 18 years of age, see the National Working Environment Authorities Executive Order on young peoples dangerous work.

Statutory Order 571 on

Aerosols

Netherlands

K-Klasse

: K1

CPR

: 6

SHHR

: 2U

Germany

Employment restrictions in

accordance with § 15h of the

Hazardous Substance

Ordinance

: Yes.

Hazardous Incident Ordinance

: Class: B

Ordinance on Combustible

Liquids

Hazard class for water

: 2

16. Other information

Full text of R-Phrases with no. appearing in Section 2 - Europe

- : R11- Highly flammable.
- : R36- Irritating to eyes.
- : R43- May cause sensitization by skin contact.
- : R67- Vapours may cause drowsiness and dizziness.

Text of classifications appearing in Section 2 - Europe

- : F - Highly flammable
- : Xi - Irritant

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