



LEAD-FREE Solutions™



RoHS
Ready

kester®
CONNECTING INNOVATION™

Enabling Technologies for Lead-Free Electronics Soldering

With over a hundred years of experience in soldering technology, Kester understands the challenges associated with the transition from leaded to lead-free soldering. Kester's Lead-Free Solutions™ provides assemblers access to the most complete line of lead-free products and chemistries backed by our unsurpassed experience in soldering technology.

Kester Lead-Free Solutions™ comprises of lead-free solder pastes for both no-clean and water soluble assembly; wave solder fluxes, both alcohol and VOC-free, formulated for lead-free soldering; and rework and hand assembly compatible lead-free solders. Lead-Free Solutions™ also includes solder bar, solder preforms, tacky soldering fluxes, solder spheres, and bumping pastes all designed to enable lead-free assembly.

Kester recognizes the many changes required to effectively implement lead-free assembly reliably and without reduction in production output. Lead-Free Solutions™ also includes Kester's

know-how to assist customers wishing to go lead-free. Training courses are offered to train personnel in lead-free SMT, wave soldering and rework. These courses bring practical knowledge and experience to the user, enabling the fulfillment of a company's training requirements and the rapid implementation of reliable lead-free assembly.

Kester RoHS Ready Logo

Kester further continues its promise to a smooth lead-free transition by establishing a RoHS Ready logo. When this logo is included on Kester product data sheets, you can be assured that the product meets the requirements of the RoHS (Restriction of Hazardous Substances) Directive, 2002/95/EC Article 4 for the stated banned substances.



Kester LEAD-FREE Solutions™ - Products, Experience, and Know-How

Lead-Free Solder Pastes

The key variables in lead-free SMT are the higher reflow temperatures, flux activity, residue characteristics, cleanability, and pin testability. The slower wetting speeds associated with lead-free alloys require enhanced flux systems. Kester solder pastes have innovative flux systems that are specifically

designed for lead-free assembly. These new flux systems promote good wetting and excellent solder joint integrity at the higher temperatures commonly seen with most lead-free alloys such as Sn-Ag-Cu (tin-silver-copper).

Formula	EnviroMark™ 907	EnviroMark™ 909	EnviroMark™ 808	R520A
Application	No-Clean Stencil Printing		Water-Soluble Stencil Printing	
Product Characteristics	Designed to exceed customers' expectations for high yield lead-free manufacturing. EM907 is engineered for the high thermal demands of assembling with lead-free alloys such as the family of SnAgCu (SAC). Joints are as cosmetically bright as SnPb joints. Prints down to 0201 pad sites. Designed to be reflowable in air as well as nitrogen.	EM909 is a pin probeable solder paste specifically designed for the thermal requirements of lead free alloys, including the Sn96.5Ag3.0Cu0.5 alloy. The resulting solder joints closely resemble those of SnPb alloys. EM909 is also capable of stencil printing downtimes up to 90 minutes with an effective first print down to 20 mils without any kneading.	Kester EM808 provides hours of stable stencil life, tack time and repeatable print definition. EM808's robust printing characteristics result in consistent solder paste volume regardless of idle time and print speed. The activator package is very aggressive and provides superior wetting to DSP coated and Immersion Silver boards.	R520A is designed to solder effectively difficult metal surfaces in an air or nitrogen reflow atmosphere. The activator package is able to withstand the higher temperatures without slump. The flux system is non-hydroscopic, reducing paste waste at the printer. It is available in all common lead-free alloys.
Residue Characteristics	Light colored	Soft, light colored	Cleanable in warm water	Cleanable in warm water
Copper Mirror Corrosion	Low	Low	High	High
Halide Tests	Halide-Free	Halide-Free	Halide-Free	Halide-Free
Surface Insulation Resistance	Pass (uncleaned)	Pass (uncleaned)	Pass (cleaned)	Pass (cleaned)
Printing Characteristics	Excellent to 16 mils pitch (0.4 mm)	Excellent to 16 mils pitch (0.4 mm)	Excellent to 16 mils pitch (0.4 mm)	Excellent to 16 mils pitch (0.4 mm)
Idle Time	60 minutes at 70°-77°F and 40-60% R.H.	90 minutes at 70°-77°F and 40-60% R.H.	60 minutes at 70°-77°F and 40-60% R.H.	90 minutes at 70°-77°F and 40-60% R.H.
Maximum Print Speed	Up to 150 mm/sec	Up to 150 mm/sec	Up to 150 mm/sec	Up to 150 mm/sec
Typical Metal Percentage	88.5% Type III Powder for Stencil Printing	88% Type III Powder for Stencil Printing	88% Type III Powder for Stencil Printing	89.5% Type III Powder for Stencil Printing
Expected Stencil Life	12+ hours at 70°-77°F and 40-60% R.H.	12+ hours at 70°-77°F and 40-60% R.H.	8+ hours at 70°-77°F and 40-60% R.H.	8+ hours at 70°-77°F and 40-60% R.H.
Reflow Atmosphere	Air or Nitrogen	Air or Nitrogen	Air or Nitrogen	Air or Nitrogen
Compliant Specifications	Telcordia Issue 1 GR-78-CORE IPC/J-STD-004 Flux Designator R0L0	Telcordia Issue 1 GR-78-CORE IPC/J-STD-004 Flux Designator R0L0	IPC/J-STD-004 Flux Designator ORMO	IPC/J-STD-004 Flux Designator ORHO

Formula	275	48	331
	No-Clean	Activated Rosin	Water-Soluble
Halide Percentage	< 0.05%	1.0%	1.25%
Flux Content Availability	58 and 66 core (2.2% and 3.3%)	66 core (3.3%)	58 and 66 core (2.2% and 3.3%)
Compliant Specifications	Telcordia Issue 1 GR-78-CORE & IPC/J-STD-004 Flux designator R0L0	IPC/J-STD-004 Flux Designator R0L1	IPC/J-STD-004 Flux designator ORH1

Solder Wires for Lead-Free Assembly

To promote rapid and complete wetting of the surfaces to be soldered with lead-free, a flux system with an effective activator package is essential. Kester solder wires have been tested and proved to give good contact angles and shiny joints when using lead-free solders. They are available with all common lead-free alloys.



Liquid Soldering Fluxes for Lead-Free Wave Soldering

Lead-free wave and selective soldering require exposing the flux to slightly higher soldering temperatures. Lead-free alloys traditionally wet metal surfaces more slowly than tin-lead. Kester liquid fluxes for lead-free assembly have new activator packages to enable rapid wetting and hole-filling, ensuring reliable product output.

*Formula	979 VOC-Free	959T	2220-VF VOC-Free	2331-ZX
	No-Clean	No-Clean	Water-Soluble	Water-Soluble
Application	Spray or Wave Fluxer	Spray or Foam Fluxer	Spray, Wave or Foam Fluxer	Spray or Foam Fluxer
Halide Content %	Halide - free	Halide - free	1.6	2.2
Specific Gravity	1.016 ± 0.010	0.794 ± 0.005	1.055 ± 0.010	0.899 ± 0.005
Solids %	4.5	2.9	7	33
Compliant Specifications	IPC/J-STD-004 Flux Designator ORLO	IPC/J-STD-004 Flux Designator ORLO	IPC/J-STD-004 Flux Designator ORH1	IPC/J-STD-004 Flux designator ORH1

*These products are designed specifically for high performance lead-free applications.



Kester Ultrapure® K100 Lead-Free Solder Bar

Designed specifically as a low-cost alternative to traditional lead-free alloys, Ultrapure® K100 is a near-eutectic tin/copper alloy with controlled metallic dopants to manage the grain structure within the solder joint. This improves joint reliability and virtually eliminates the occurrence of common defects such as icling and bridging. The improved grain structure also results in completely filled and shinier solder joints than traditional lead-free alloy alternatives.



Common Lead-Free Alloys		
Alloys	Melt Temperature	Application
K100	~227°C/441°F	Wave/Hand
Sn96.5Ag3.0Cu0.5	217°C/423°F	SMT/Wave/Hand
Sn96.5Ag3.5	221°C/430°F	SMT/Hand
Sn99.3Cu0.7	227°C/440°F	Wave

Tacky Soldering Fluxes for Lead-Free Assembly

Rework and attachment of lead-free BGA, CSP, PGA requires new flux systems able to sustain higher thermal requirements without charring or rendering flux residue removal difficult. These tacky fluxes are formulated for lead-free assembly.



Formula	TSF-6592	TSF-6850
	No-Clean	Water-Soluble
Application	Designed as a low voiding lead-free solution for an array of lead-free interconnect applications such as flip chip attach, sphere/ball attach and rework/repair of CSPs, BGAs, and SMDs.	Designed as a low voiding lead-free solution for an array of lead-free interconnect applications such as flip chip attach, sphere/ball attach and rework/repair of CSPs, BGAs, and SMDs.
Product Characteristics	TSF-6592 is compatible with lead-free solder alloys such as SnAg, SnCu, SnAgCu, SnAgBi, and can be reflowed in nitrogen or air with peak temperatures up to 270°C. Aggressive fluxing performance on many surface finishes such as OSP-Cu, ENIG, and Immersion finishes. The residues are clear, non-conductive, and non-corrosive.	TSF-6850 is an aggressive flux with residues that are easily and completely cleaned yielding bright, shiny joints. TSF-6850 is a drop-in lead-free solution for solder alloys that will have a peak reflow temperature up to 270°C such as SnAg, SnCu, SnAgCu, and SnAgBi. The rheology is suitable for most application methods such as printing, dispensing, and rotating drum/slide fluxer.

Flux-Pens® for Lead-Free Rework

Kester Flux-Pens® are unique tools for rework and touch-up lead-free soldering. This packaging style allows for controlled application of flux, eliminating the mess from flux bottles. Flux-Pens® are ideally suited for SMT repair, wave soldering repair, and other hand soldering applications. The three available formulas for lead-free Flux-Pens® are listed below.

Formula	959T	186	2331-ZX
	No-Clean	RMA No-Clean	Water-Soluble
Description	959T Low Solids No-Clean (20 pens/carton)	186-18 RMA No-Clean (20 pens/carton)	2331-ZX Neutral pH Water-Soluble (20pens/carton)

Kester University Lead-Free Training and Consulting Services

Kester understands that lead-free implementation will offer new challenges to the electronic assembly industry. Kester University offers complete training modules coupled with practical hands-on training on lead-free assembly. These courses can be offered at your facility or training can be had at the Des Plaines Training Center where an applications laboratory can demonstrate lead-free SMT and wave assembly. All courses are offered with certification to satisfy your ISO training needs.

Courses available now at your location or at the Kester Training Center in Des Plaines, Illinois:

- Lead-Free SMT Assembly
- Lead-Free Wave Soldering
- Lead-Free Assembly Technology

Lead-Free Solderforms®

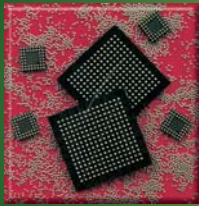
Kester Solderforms® are extruded, stamped, compacted or formed pieces of pure soft solder alloys manufactured with strict known tolerances to customer specifications. Kester can create a wide variety of preform shapes such as washers, discs, pellets, collars, ribbon forms, rings, and wireforms for all your stringent lead-free assembly specifications.

Solderforms® are available in solid or fluxed varieties. Depending on your application, the preform flux may be included internally or externally. Kester has No-Clean, Water-Soluble, RMA and RA flux chemistries suited for all types of soldering applications. These preforms can be color-coded to aid in part identification and can be packed on tape and reel equipment or waffle packs for high volume applications.



Lead-Free Ultra-Spheres®

Kester's unique proprietary manufacturing process technology produces spheres with smooth, clean surfaces, and tight size distributions. Lead-free solder spheres are available in a variety of diameters and alloys.



Scanning Electron
Microscopy (SEM)
photo of Kester
Ultra-Sphere

Size (mils)	Packaging	
	2 oz. Jar	6 oz. Jar
35 ± 1	—	210,000
31.5 ± 1	—	290,000
30 ± 1	—	335,000
28 ± 1	—	410,000
25 ± 1	325,000	—
20 ± 1	650,000	—
18 ± 1	875,000	—
16 ± 0.5	1,250,000	—
14 ± 0.5	1,900,000	—
12 ± 0.5	3,000,000	—

Available Alloys
Sn96.5Ag3.0Cu0.5
Sn95.5Ag4.0Cu0.5
Sn95.5Ag3.8Cu0.7

Contact Kester for additional
alloys and sizes.

Visit us at www.kester.com

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