KESTER®

Electronic Assembly Materials

Connecting Innovation™

KESTER VISION STATEMENT

Smart Products. Great Service. No Boundaries.

Kester will be the leading global supplier of high performance interconnecting materials and related services for the electronic assembly and component assembly markets.

To achieve this we will focus on customer-driven innovation and exceptional service worldwide.

Kester entered its second century of business in the year 2000. It has been a great first century of growth, change, and progress. In the new century, change will come even faster for everyone in our industry. Kester's mission is to continue to build on its position as a leading manufacturer of electronic assembly and packaging materials on a global scale.

With four product development and testing laboratories around the world, Kester is equipped and staffed to work proactively with customers seeking advanced interconnection materials and applications.

Kester Online
www.kester.com

- Company Corporate Background Information
- Product Index
- Product Technical Data Sheets
- Product Material Data Safety Sheets (MSDS)
- Global Manufacturing Facilities
- Sales Locations and Contact Information

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Technical Service Department

Kester's Technical Support Team can help you with the following:

- Product recommendations
- Technical product data
- Process solutions
- Technical field support
- Future product development

Technical Service can be contacted by calling:
800-2-KESTER

or by faxing:
(847) 699-4980

email:
technicalservice@kester.com

Customer Service Department

Kester's Customer Service Team can help you with the following:

- Order placement & expediting
- Price quotes
- Literature requests
- Product sample requests
- Part number information
- Shipping dates & schedules

Customer Service can be contacted by calling:
800-2-KESTER

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Information necessary for ordering Kester products.

Solder Paste	Cored Solder Wire
1. Paste Flux type	1. Alloy type
2. Solder Powder Alloy	2. Wire diameter
3. Powder Mesh type	3. Spool size
4. Metal/Flux weight ratio	4. Core Flux type
5. Package type and size	5. Core Flux size
6. Quantity required	6. Quantity required

Bar Solder	Liquid Flux
1. Alloy type	1. Formula number
2. Bar type and size	2. Unit size
3. Quantity required	3. Thinner number (if required)
	4. Quantity required

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Solder Paste Formulas for Surface Mount and General Electronic Assemblies

All Kester solder paste formulas are manufactured using the highest quality raw materials available. Kester's worldwide research facilities work together to design solder paste formulas which bring the latest technological developments to electronic manufacturers around the globe. The solder paste products listed represent the current product recommendations at the time of printing. Please contact Kester's Technical Service Department for a specific product recommendation for your application. Specific product information that will be needed at the time of ordering is listed on page 3.

Standard alloys* for solder paste products

				Recommended Formulas			
Application	Alloy**	Melting Range		Stencil Printing		General Syringe Dispensing	
		°F	°C	No-Clean	Water Soluble	No-Clean	Water Soluble
Standard SMT	Sn63Pb37	361	183	PureMark 202, Easy Profile® 256	HydroMark 531, R562	R276	R500
Standard SMT	Sn62Pb36Ag02	354 - 372	179 - 189	PureMark 202, Easy Profile® 256	HydroMark 531, R562	R276	R500
Lead-Free	Sn96.5Ag3.5	430	221	R905	R520A	R276	R505
Lead-Free	Sn96.5Ag3.0Cu0.5	423	217	R905	R520A	R276	R505
Low Temperature	Sn43Pb43Bi14	291 - 325	144 - 163	Easy Profile® 256	HydroMark 531	R276	R500

*** Other alloys available on request.**
**** In conjunction with the IPC/J-STD-006 specification.**

Standard solder powder distributions for solder paste

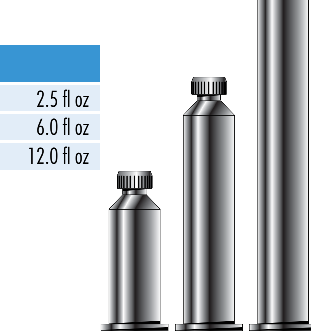
Powder Type	Mesh Designation	Typical Particle Diameter	Recommended Surface Mount Application (Pitch)
Type 3	-325 +500	25 to 45 micron	Down to 16 mil
Type 4	-400 +500	25 to 38 micron	Down to 12 mil
-450	-450	< 31 micron	Less than 12 mil

Solder paste packaging options

Jar*	
250 gram	2.0 fl oz
500 gram	4.0 fl oz

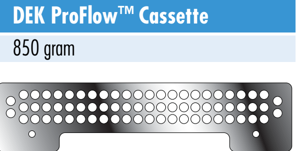
* Jars are sized to fit Malcom® style viscometer.

Cartridge	
250 gram	2.5 fl oz
600 gram	6.0 fl oz
1000 or 1400 gram	12.0 fl oz



Syringe	
35 gram	10cc
100 gram	30cc

DEK ProFlow™ Cassette
850 gram



Solder paste formulas for stencil printing applications

No-Clean formulations

	No-Clean	No-Clean
Formula Type	**PureMark 202**	**Easy Profile® 256**
Product characteristics	Engineered to provide the print and reflow flexibility required by today's advanced electronics assemblies. Consistent print volume regardless of process parameters and 0201 application capable. Wide reflow process window and soft probe-friendly residues for ICT in all applications. Capable of printing after downtimes of over 2 hours with an effective first print down to 20 mils. Achieves print speeds of up to 8 in/sec. Compatible with enclosed print head systems.	Standard no-clean paste for a wide variety of reflow profiles and printing conditions. Industry standard formula that performs well in a variety of applications. Compatible with enclosed print head systems.
Residue removal method	Not normally required	Not normally required
Expected stencil life	12+ hours	8+ hours
Atmosphere required for reflow	Air or Nitrogen	Air or Nitrogen
Compliant specifications	Telcordia Issue 1 GR-78-CORE, IPC/J-STD-004 Flux Designator ROLO	Telcordia Issue 1 GR-78-CORE, IPC/J-STD-004 Flux Designator ROLO

Water-Soluble formulations

	Water-Soluble	Water-Soluble
Formula Type	**HydroMark 531**	**R562**
Product characteristics	This highly-active, anti-slump paste is produced consistently so that every batch results in high yield manufacturing. HydroMark 531 also offers extremely robust printing, even with idle time up to 1 hour and print speeds of up to 6 in/sec. This very active formula is effective on a wide variety of metallizations, including palladium. Compatible with enclosed print head systems.	Designed for maximum environmental robustness and minimal void production, R562 has a stencil life of over 8 hours and may be used in a wide range of humidities (10 - 85% RH). Compatible with enclosed print head systems.
Residue removal method	Use de-ionized water at 120 - 140°F	Use de-ionized water at 120 - 140°F
Expected stencil life	8+ hours	8+ hours
Atmosphere required for reflow	Air or Nitrogen	Air or Nitrogen
Compliant specification	IPC/J-STD-004 Flux Designator ORM0	IPC/J-STD-004 Flux designator ORH0

Solder paste formulas for syringe dispensing applications

	No-Clean	Water-Soluble
Formula Type	**R276**	**R500**
Product characteristics	Provides optimal performance in all types of dispensing applications. R276 is packaged void-free to ensure consistent dispensing in high speed automated processes. Exhibits excellent dispensing characteristics with a wide range of needle diameters.	The activator package in this formula is aggressive enough to remove tenacious oxide layers or solder to OSP coated boards. R500 delivers excellent wetting characteristics.
Residue removal method	Not normally required	Use de-ionized water at 120 - 140°F
Expected tack life	8+ hours	8+ hours
Atmosphere required for reflow	Air or Nitrogen	Air or Nitrogen
Compliant specifications	Telcordia Issue 1 GR-78-CORE, IPC/J-STD-004 Flux Designator ROLO	IPC/J-STD-004 Flux Designator ORH0

No-Clean liquid fluxes

	Alcohol Based		VOC - Free	
Formula Type	**959**	**951**	**979***	**971M***
Flux Type	Low Solids No-Clean	Rosin Free Low Solids No-Clean	VOC-Free No-Clean	VOC-Free No-Clean
Percent solids	3.9	2.0	4.5	3.25
VOCs (g/liter)	776	792	0	0
Specific gravity (gm/cc)	0.800 ± 0.005	0.814 ± 0.003	1.016 ± 0.010	1.005 ± 0.010
Product characteristics	Formulated for wave soldering of conventional and surface mount circuit board assemblies. Developed to minimize the formation of micro-solderballs during wave soldering. Designed for spray or foam applications.	Developed for single wave soldering machines only, 951 is extremely low solids content and minimizes solder bridges (shorts) and excessive solder defects. Designed for spray or foam applications.	Most active VOC-Free flux for optimal top-side wetting and solderball reduction. May be applied by spray fluxer only.	Designed for foam and wave fluxer applications.
Compliant specifications	Telcordia Issue 1 GR-78-CORE & IPC/J-STD-004 Flux designator ORL0	Telcordia Issue 1 GR-78-CORE & IPC/J-STD-004 Flux designator ORL0	Telcordia Issue 1 GR-78-CORE & IPC/J-STD-004 Flux designator ORL0	Telcordia Issue 1 GR-78-CORE & IPC/J-STD-004 Flux designator ORL0
Residue removal method (not normally required)	Wash with hot de-ionized water at 140 - 160°F with 1% solution of Kester #5768 Bio-Kleen® saponifier.	Wash with hot de-ionized water at 140 - 160°F with 1% solution of Kester #5768 Bio-Kleen® saponifier.	Wash with hot de-ionized water at 140 - 160°F with 2% solution of Kester #5768 Bio-Kleen® saponifier.	Wash with hot de-ionized water at 140 - 160°F with 2% solution of Kester #5768 Bio-Kleen® saponifier.
Thinner #	4662-SM	110	De-ionized water	De-ionized water
Flux test kit	PS-20 or PS-22	PS-22	PS-22 or PS-20	PS-20
Use on metals	Table1, Category 1, Page14	Table1, Category 1, Page14	Table1, Category 1, Page14	Table1, Category 1, Page14

*Products subject to U.S. Patent #5,281,281 and #5,334,260.

Flux residue remover

Formula	**5768 Bio-Kleen®**
Flux Type	Aqueous Saponifier
Product characteristics	Rosin residues can be easily removed in an aqueous solution through saponification. Designed for difficult to remove solder paste residues. It is not reactive with most metals present on electronic assemblies.
Application	This concentrated formula is intended to be used at a 5 - 15% concentration for removing rosin-based residues. A concentration of 1 - 4% Bio-Kleen® can assist in removing additional no-clean flux residues. Can be heated to 160°F to further facilitate residue removal. Designed to be used in a batch or in-line cleaning system. Not recommended for use in manual or ultrasonic cleaning operations.

Water-Soluble liquid fluxes

	Alcohol Based					VOC-Free
Formula	**2331-ZX**	**2235**	**2224-25**	**2222**	**2120**	**2222-VF**
Flux type	Neutral pH Organic Water-Soluble	Organic Water-Soluble	Organic Water-Soluble	Highly Activated Organic Water-Soluble	Organic Water-Soluble Halide-Free	VOC-Free Organic Water-Soluble
Percent solids	33	11	24	17	14	17
VOCs (g/liter)	729	763	650	426	670	0
Specific gravity (gm/cc)	0.899 ± 0.005	0.856 ± 0.005	0.882 ± 0.005	0.951 ± 0.005	0.862 ± 0.005	1.038 ± 0.10
Percent halides	2.2	1.5	1.5	3.0	0.0	3.0
Product characteristics	Original pH neutral organic flux for automated wave and drag soldering processes.	Low solids flux for surface mount assemblies designed to help reduce skips on bottom side surface mount pads.	Highly active organic flux designed for automated wave soldering applications. Higher percent solids than 2235 for greater heat stability.	Kester's highest activity organic acid flux that can be applied by foam or spray methods.	Low solids flux for surface mount assemblies. Provides optimal board cleanliness.	VOC-Free, water-soluble flux for difficult to solder assemblies, can be applied by spray, dip or foam techniques.
Compliant specifications	IPC/J-STD-004 Flux designator ORH1	IPC/J-STD-004 Flux designator ORH1	IPC/J-STD-004 Flux designator ORH1	IPC/J-STD-004 Flux designator ORH1	IPC/J-STD-004 Flux designator ORH0	IPC/J-STD-004 Flux designator ORH1
Residue removal method	Residue removal is required. Use de-ionized water at temperatures of 120 - 150°F.	Residue removal is required. Use de-ionized water at temperatures of 120 - 150°F.	Residue removal is required, Use de-ionized water at temperatures of 120 - 150°F.	Residue removal is required. Use de-ionized water at temperatures of 120 - 150°F.	Residue removal is required. Use de-ionized water at temperatures of 120 - 150°F.	Residue removal is required. Use de-ionized water at temperatures of 120-150°F.
Thinner #	4662	4662	4662	4662	4240	De-ionized water
Use on metals	Table 1 Category 1 & 2 page14	Table 1 Category 1 & 2 Page14	Table 1 Categories 1 & 2 Page14	Table 1 Categories 1, 2 & 3 Page14	Table 1 Category 1 & 2 Page14	Table 1 Category 1 & 2 Page14

Rosin based liquid fluxes

Flux Type	**Rosin Non-Activated**	**Rosin Mildly Activated**	**Rosin Activated**	**Rosin Mildly Activated**
Formula	**145**	**186 Series**	**1544**	**182**
Percent solids	25	18 to 36	50	25
Percent halides	0	0.02	0.44	0.05
Specific gravity (gm/cc)	0.844 ± 0.005	0.879 ± 0.003 (186) 0.848 ± 0.005 (186 - 25) 0.831 ± 0.005 (186 - 18)	0.928 ± 0.005	0.844 ± 0.005
Product characteristics	Excellent for solderability test procedures specified by military and commercial industries.	Designed for high thermal stability and superior solderability. Kester #186 is available in 18, 25, or 36 percent solids formulations.	Kester's active, non-corrosive rosin type flux is used on surfaces which are more difficult to solder.	IPC designated formulation for solderability testing.
Compliant specifications	IPC/J-STD-004 Flux designator ROL0	IPC/J-STD-004 Flux designator ROL1	IPC/J-STD-004 Flux designator ROM1	IPC/J-STD-004 Flux designator ROL0
Residue removal method	Residue is non-corrosive but may be removed with solvent or with Kester's #5768 Bio-Kleen saponifier at 7 - 10% solution in de-ionized water at 120 - 150°F.	Residue is non-corrosive but may be removed with solvent or with Kester's #5768 Bio-Kleen saponifier at 7 - 10% solution in de-ionized water at 120 - 150°F.	Residue is non-corrosive but may be removed with solvent or with Kester's #5768 Bio-Kleen saponifier at 7 - 10% solution in de-ionized water at 120 - 150°F.	Residue is non-corrosive but may be removed with solvent or with Kester's #5768 Bio-Kleen saponifier at 7 - 10% solution in de-ionized water at 120 - 150°F.
Thinner #	108	120	104	4662-SM
Use on metals	Table 1 Category 1 Page14	Table 1 Category 1 Page14	Table 1 Categories 1, 2 & 3 Page14	Table 1 Category 1 Page14

Standard cored wire solders

Flux Type	No-Clean	Rosin Mildly Activated	Organic Water-Soluble	Rosin Activated
Formula	**275**	**285**	**331**	**48**
Product characteristics	Superior wetting performance leaving an extremely clear post-soldering residue. Designed to be a low splattering core flux.	Mildly activated rosin cored wire for sensitive electronic and military applications.	Industry standard water washable core for most electrical and electronic hand soldering.	Very high activity rosin flux used for difficult to solder metals.
Compliant specifications	Telcordia Issue 1 GR-78-CORE & IPC/J-STD-004 Flux designator ROL0	Telcordia Issue 1, GR-78-CORE & IPC/J-STD-004 Flux designator ROL0	IPC/J-STD-004 Flux designator ORH1	IPC/J-STD-004 Flux designator ROM1
Residue removal method	Not required for most applications. May be removed with solvent or Kester #5768 Bio-Kleen® saponifier.	Not required for most applications. May be removed with solvent or Kester #5768 Bio-Kleen® saponifier.	Residue removal is required. Use soft or de-ionized water at temperatures of 120 - 150°F.	Not required for most applications. May be removed with solvent or Kester #5768 Bio-Kleen® saponifier.
Use on metals	Table 1, Category 1 Page14	Table 1, Category 1 Page 14	Table 1, Categories 1, 2 & 3 Page 14	Table 1, All Categories Page 14

Flux Type	No-Clean	Rosin Non-Activated	Organic Water-Soluble	Rosin Activated
Fomula	**245**	**Plastic**	**OR-421**	**44**
Product characteristics	Performance similar to a mildly activated rosin core, but leaves a visually cleaner appearance after soldering.	Non-activated rosin flux.	Activity level similar to an acid flux.	Activated rosin core with excellent wetting action. Industry standard for most electrical and electronic hand soldering.
Compliant specifications	Telcordia Issue 1 GR-78-CORE & IPC/J-STD-004 Flux designator ROL0	IPC/J-STD-004 Flux designator ROL0	IPC/J-STD-004 Flux designator ORH1	IPC/J-STD-004 Flux designator ROM1
Residue removal method	Not required for most applications. May be removed with solvent or Kester #5768 Bio-Kleen® saponifier.	Not required for most applications. May be removed with solvent or Kester #5768 Bio-Kleen® saponifier.	Residue removal is required. Use Kester #5760 neutralizer in water followed by a warm water rinse.	Not required for most applications. May be removed with solvent or Kester #5768 Bio-Kleen® saponifier.
Use on metals	Table 1, Category 1 Page 14	Table 1, Category 1 Page 14	Table 1, Categories 1, 2 & 3 Page 14	Table 1, Categories 1 & 2 Page 14

Standard flux-core sizes

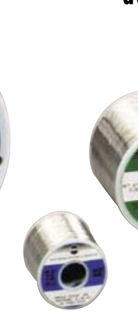
Standard	Standard	Standard
No. 50 Small	**No. 58 Medium**	**No. 66 Regular**
Flux / Solder	Flux / Solder	Flux / Solder
***1.1%**	***2.2%**	***3.3%**

* Average weight percentage for Sn60Pb40 alloy. The average weight percentage will vary slightly depending on the density of the alloy.

Standard wire gauge

Inch	Metric	Standard Wire Gauge
0.010	0.25mm	30
0.015	0.40mm	28
0.020	0.50mm	25
0.025	0.64mm	23
0.031	0.80mm	21
0.040	1.00mm	19
0.050	1.30mm	18
0.062	1.50mm	16
0.093	2.50mm	13
0.125	3.20mm	10

Kester's flux cored and solid wire solders are produced in many alloys including those conforming to IPC/J-STD-006 and ASTM B32.



Kester Solderforms®

Kester Solderforms® are extruded, stamped, compacted or formed pieces of pure soft solder alloys manufactured with strict known tolerances to customer specifications. Kester also creates other preforms such as collars, ribbon forms, rings, and wireforms that 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 for high volume applications. Try Kester Solderforms® today to reduce your rework and realize improved first-pass yields.

Solderforms®

		Minimum (in.)	Maximum (in.)
Ribbons	Width Thickness	0.015 ± 0.005 0.002 ± 0.001	3.50 ± 0.030 0.125 ± 0.005
Cut-offs	Width Length Thickness	0.015 ± 0.005 0.030 ± 0.010 0.002 ± 0.001	3.50 ± 0.030 20.0 ± 0.050 0.125 ± 0.005
Washers	Outside Diameter Inside Diameter Thickness	0.035 ± 0.002 0.015 ± 0.002 0.002 ± 0.001	3.00 ± 0.005 2.30 ± 0.005 0.125 ± 0.010
Discs	Outside Diameter Thickness	0.016 ± 0.002 0.002 ± 0.001	3.00 ± 0.005 0.125 ± 0.010
Pellets	Diameter Length	0.010 ± 0.001 0.020 ± 0.005	0.585 ± 0.005 6.00 ± 0.030
Sleeves	Outside Diameter Inside Diameter Height Wall	0.070 ± 0.002 0.060 ± 0.002 0.075 ± 0.010 0.010 ± 0.001	0.560 ± 0.005 0.550 ± 0.005 0.200 ± 0.010 ––––––
Stampings	Description	Stampings use special dies that are customer specific and require a customer's engineering drawing and specification.	

Preforms are available in tape and reel for automatic placement.

Manufacturing Aides

Kester Flux-Pen® is a unique tool for rework and touch-up soldering. It allows controlled applications of flux, eliminating the mess from flux bottles. The Flux-Pen® is ideally suited for surface mount rework, component add-on applications, and TAB assembly operations. The three available formulas are listed in the chart below.

Flux-Pen® formulas

Formula	951	186	2331-ZX
Flux type	Low solids No-Clean	Mildly Activated Rosin	Neutral pH Water-Soluble

wire solder for surface mount assembly and repair is ailable in electro-static discharge spools.

Bar Solder and Related Products

The quality of Kester Bar and Anode Solder is guaranteed by using high purity metals and strict quality control standards. Kester extrudes its bar and anode products to minimize oxidation, limit segregation and provide a denser grain structure than cast bar. Kester manufactures solder to 5 distinct specifications. Each meets and exceeds requirements of QQ-S-571, ASTM B32, and IPC/J-STD-006.

Kester Ultrapure®

Made by a special process which controls the inclusion of oxides and metallic and non-metallic impurities, Kester Ultrapure® is the industry standard bar solder for use in high tech electronics applications where lower surface tension and hole filling ability are essential. The purity of Kester Ultrapure® far exceeds the requirements of QQ-S-571, ASTM B32, and IPC/J-STD-006.

Kester Ultra Low Dross

Manufactured using the Ultrapure® process that contains the same metal purity as Kester Ultrapure®. Kester Ultra Low Dross is formulated with a special low dross additive which dramatically decreases dross formation on the solder pot. Lower dross formation minimizes joint weakening inclusions in the solder, keeps surface tension low and decreases costly solder loss through drossing.

Kester Ultrapure® HAL

Kester Ultrapure® HAL bar solder combines the Ultrapure® process with electrolytically refined raw materials producing the highest purity solder available on the market.

Kester E-Bar

Designed for electrical, electronic and mechanical applications requiring bar solder that meets or exceeds the requirements of QQ-S-571, ASTM B32, and IPC/J-STD-006.

Ultrapure® Plating Anodes

Kester Ultrapure® plating anodes are made in the same process and meet the same metallic impurity limits as Kester Ultrapure® bar solder. The high pressure extrusion and the Ultrapure® process assure that anodes are made with a dense fine grain structure. They permit higher current densities without passivation, guarantee uniform dissolution, and do not normally require bagging.

Kester 5744 Solder Saver®

A chloride-free, inorganic white powder formulated to remove dross, which is the oxide of solder, from still solder pots and wave soldering machines. It does not decompose to sticky residues that are harder to remove than the original dross. The product is low fuming and is stable at molten solder temperatures.

Solder Recycling Program

The Kester Solder Recycling Program is an economical and environmentally friendly way to maximize solder dollars. Kester provides customers with credit or payments for solder dross, pot dumpings, and unused solder which are based on published metals markets. Customers may return solder in their own containers or those provided by Kester free of charge. The returned material is then recycled or purified for use in appropriate applications.

Solder Analysis Program

The Kester Solder Analysis Program is a prepaid method for rapid response solder sample analysis. It allows customers to document solder pot impurities for conformance to Federal Specifications or ISO quality requirements. Customers purchase prepaid mailers and then simply insert a solder sample into the mailer and return it to Kester. Reports are issued within two business days after receipt.

Maximum allowed impurities

Element		Kester E-Bar	Kester Ultrapure	Ultrapure HAL	Ultra Low Dross	Ultrapure Anodes
Copper	Cu	0.020	0.015	0.001	0.015	0.015
Gold	Au	0.002	0.002	0.001	0.002	0.002
Antimony	Sb	0.500	0.050	0.010	0.050	0.020
Cadmium	Cd	0.001	0.001	0.001	0.001	0.001
Zinc	Zn	0.001	0.001	0.001	0.001	0.001
Aluminum	Al	0.002	0.002	0.001	0.002	0.002
Iron	Fe	0.010	0.010	0.003	0.010	0.010
Arsenic	As	0.020	0.020	0.001	0.020	0.020
Bismuth	Bi	0.025	0.020	0.003	0.020	0.020
Silver	Ag	0.003	0.002	0.001	0.002	0.002
Nickel	Ni	0.002	0.002	0.001	0.002	0.002
Indium	In	0.007	0.007	0.002	0.007	0.007

Kester solder analysis program

Option A	Option C	Option D
Tin	Tin	Tin
Copper	Antimony	Antimony
Antimony	Copper	Copper
Gold	Gold	Gold
	Cadmium	Cadmium
	Aluminum	Aluminum
	Zinc	Zinc
	Iron	Iron
	Arsenic	Arsenic
	Bismuth	Bismuth
	Silver	Silver
	Nickel	Nickel
		Sulfur
		Phosphorous

Solder paste formulas for stencil printing applications

	No-Clean		Water-Soluble	
Formula	**R905**		**R520A**	
Alloy	Sn96.5Ag 3.0Cu0.5	Sn96.5Ag 3.5	Sn96.5Ag 3.0Cu0.5	Sn96.5Ag 3.5
Product characteristics	R905 maintains the highest possible activity for a halide-free no-clean formula. R905 demonstrates a robust printing process with an extended stencil and shelf life. It also maintains excellent solder deposit definition, allowing printing of fine pitch devices without slumping. May be reflowed in air or nitrogen atmospheres.		Water-soluble formula designed to withstand higher temperatures that are needed when soldering with lead-free alloys. R520A exhibits minimal voiding, long stencil life and tack time while still delivering exceptional solderability to a wide variety of metallic substrates. May be reflowed in air or nitrogen atmospheres.	
Residue removal method	Not normally required		Use de-ionized or soft tap water at 130°-150°F.	
Expected stencil life	8+ hours		8+ hours	
Compliant specifications	Telcordia Issue 1 GR-78-CORE IPC/J-STD-004 Flux Designator ROLO		IPC/J-STD-004 Flux Designator ORHO	

SMT Products		Wave Soldering Products		Rework Products		Micro-Electronic Materials	
No-Clean	**Water-Soluble**	**No-Clean**	**Water-Soluble**	**No-Clean**	**Water-Soluble**	**No-Clean**	**Water-Soluble**
R905 Solder Paste	R520A Solder Paste	955-20C Low Solids 979 VOC-Free Flux	2220 Alcohol Based Flux 2220-VF VOC-Free Flux	275 Cored Wire	331 Cored Wire	TSF-6522	TSF-6805

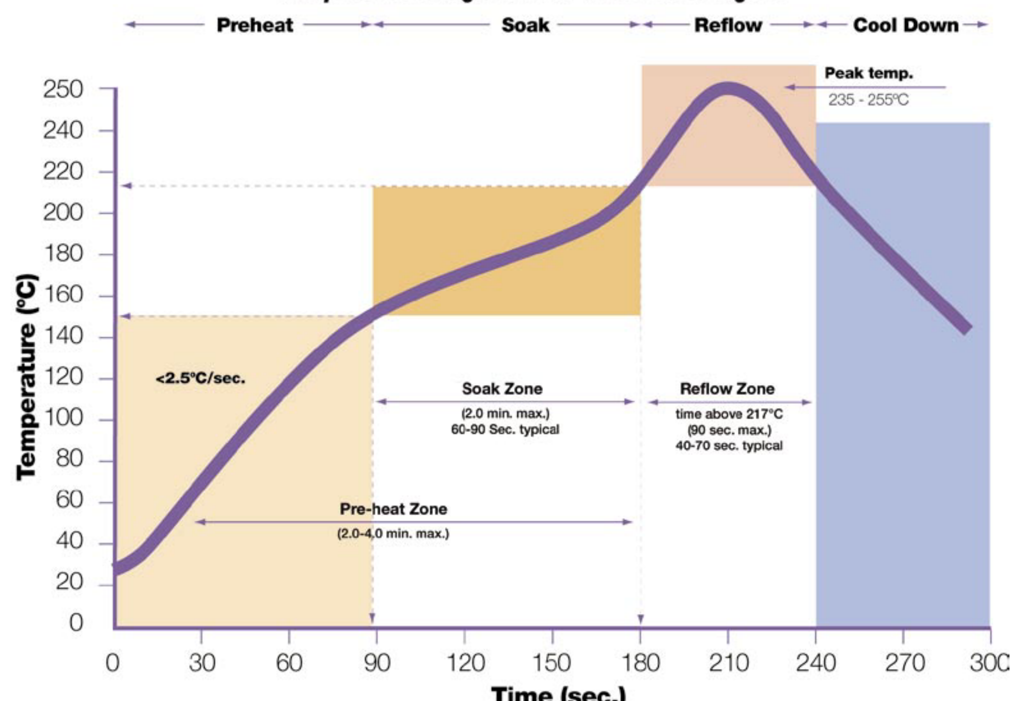
Common Lead-Free Alloys		
***Alloys**	**Melt Temperature**	**Application**
Sn96.5Ag3.0Cu0.5	423 F/217 C	SMT/Hand
Sn96.5Ag3.5	430 F/221 C	SMT/Hand
Sn99.3Cu0.7	440 F/227 C	Wave

Kester Licensing Agreements

Kester is licensed to manufacture, use, and sell any solder product covered by U.S. Patent 5,527,628 that is assigned to Iowa State University Research Foundation (ISURF)

Kester is additionally licensed to manufacture and sell solder compositions patented by Senju/Matsushita with Japanese Patent JP3027441.

A non-exclusive sublicense for the Oatey Company lead-free solder (U.S. Patent 4,879,096 and Canadian Counterpart) was also obtained.



Stage 1 - Preheat Zone (Rapid Heating Stage)

The purpose of this zone is to quickly bring the assembly up to a temperature where solder paste can become chemically active.

Stage 2 - Soak Zone (Temperature Equalization Zone)

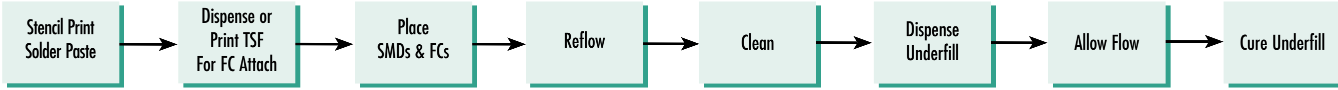
The purpose of this stage is for the thermal mass of the assembly to reach a uniform temperature plateau so that there is a very small differential between the hottest and coldest soldering locations on the assembly.

Stage 3 - Reflow Zone (Rapid Heating and Cooling)

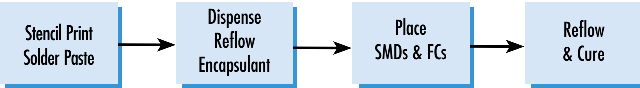
The purpose of this stage is to rapidly heat the assembly above the melting (liquidus) temperature of the solder and subsequently cool the assembly down quickly to solidify the solder. Wetting of solder onto substrates occurs in the reflow zone.

Kester enters its second century of innovation in soldering materials with its SE-CURE® line of technologically advanced materials for component packaging and assembly. These products include SE-CURE® Reflow Encapsulants (RE), capillary underfills, wafer bumping pastes, Tacky Soldering Fluxes (TSF's), and high precision Ultra-Spheres®. This product line is further enhanced by Kester's experienced global customer technical support. Contact your Kester sales representative for assistance tailored to your application and for information on materials not covered.

Traditional Assembly Process with Capillary Underfill



Streamlined Reflow Encapsulant Process

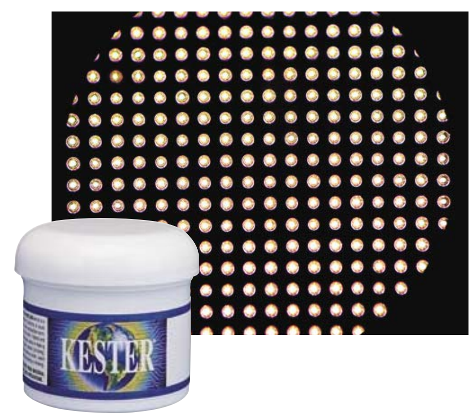


Reflow encapsulants & capillary underfills

	Reflow Encapsulants			Capillary Underfill
Formula	**SE-CURE® 9126**	**SE-CURE® 9110**	**SE-CURE® 9130**	**SE-CURE® 9208**
Product class features	SE-CURE® 9100 series Reflow Encapsulants are compression-flow flux and underfill materials used in flip chip attachment operations. These Reflow Encapsulants are single component materials which act as flux during soldering operations and as underfill material after the soldering process. • Eliminates long underfill and flow times and post curing operations. • Compatible with a wide range of gap sizes and pad metallurgies. • Excellent adhesion strength.			SE-CURE® 9208 capillary underfill material provides thermal cycle and mechanical protection for flip components assembled to rigid organic and ceramic substrates. This fast flowing and self-filtering underfill material is formulated for high adhesion to die passivation layers for process flexiblity.
Product characteristics	• Single pass flip chip on rigid board • Low voiding	• Single pass flip chip on flexible circuit	• Lead-free • Single pass flip chip on rigid board • Low voiding	SE-CURE® 9208 is a filled one-component, snap cure underfill epoxy material designed for flip chip applications. It has excellent strength properties with a wide robust process window producing a void-free epoxy encapsulant for gaps of 0.001 - 0.005 inches (25 - 150 microns).
Cure Schedules	Single pass typical SMT reflow profile * Refer to page 14	Single pass typical SMT reflow profile * Refer to page 14	Single pass typical SMT reflow profile * Refer to page 11	• 20 minutes @ 125°C • 8 minutes @ 150°C • 5 minutes @ 160°C
CTE (ppm/°C)	70	65	70	26.5
Tg (°C)	70	75	70	150

Water-Soluble wafer bumping solder paste

Formula	SE-CURE® 7101
Product characteristics	Designed for wafer bumping and ultra-low pitch bumping applications, SE-CURE® 7101 is a themally stable flux system that reduces voiding in Flip Chip (FC) and Chip Scale Packages (CSP). When using Kester's engineered 7101, the voiding level of FC and CSP's have been reduced from 25% to less than 10%. SE-CURE® 7101 releases cleanly from stencil apertures up to area ratios of 1.5 (mesh size dependant) without slumping or flux bleedout and with optimal deposit definition. The activator package has been formulated to exhibit exceptional wetting characteristics to many different Under Bump Metallurgies (UBM) and is available with Sn63Pb37, lead-free alloys, Low alpha (<0.02 cph/cm^2), and Ultra Low alpha (< 0.002 cph/cm^2) solder alloys.
Residue removal method	Use de-ionized water @ 120 - 140°F
Powder distribution	Available in Type 5 and Type 6 powder



SE-CURE® 7101 Wafer Bumping Solder Paste

Epoxy fluxes & Tacky soldering fluxes (TSF)

Formula	SE-CURE® 9603 Epoxy Fluxes*	SE-CURE® 9611 Epoxy Fluxes*	TSF-6522 No-Clean	TSF-6502 No-Clean	TSF-6805 Water-Soluble
Product characteristics	SE-CURE® 9600 series Epoxy Fluxes are designed for flip chip soldering and underfill applications to printed wiring assemblies. • Ideal for FC-BGA/-PGA, DCA, COB, FC-CSP die attachment • Residues polymerize with underfill for highest level of reliability • Air or Nitrogen reflowable • High activity no-clean soldering/underfill process		High viscosity. Ideal for sphere and pin attachment (BGA, CSP, PGA) flip chip mounting (FCIP and FCOB) and no-clean rework operations. Compatible with air or nitrogen reflow. Residues interact well with many capillary underfill materials.	Low viscosity. Ideal for sphere and pin attachment (BGA, CSP, PGA) flip chip mounting (FCIP and FCOB) and no-clean work operations. High activity no-clean soldering, for more difficult metallizations. Compatible with air or nitrogen reflow. Residues interact well with many capillary underfill materials.	Low voiding for sphere/pin attachment to BGA or PGA substrates. Residue can be exposed to multiple reflow cycles prior to cleaning. Air or nitrogen reflowable. Leaves shiny solder joints after reflow. Low foaming during wash cycles.
Typical application method	• Rotating drum/doctor blade applicator • Thin film applicator • Screen printing	• Slide Fluxer • Rotating drum/doctor blade applicator • Thin film applicator	• Stencil or screen printing • Dot dispensing • Thin film applicator	• Stencil or screen printing • Pin transfer • Rotating drum/doctor blade applicator • Thin film applicator	• Stencil or screen printing • Pin transfer • Rotating drum/doctor blade applicator • Thin film applicator
Viscosity	34 kcps @ 5 rpm Brookfield @ 25°C TD-spindle	5.1 kcps @ 5 rpm Brookfield @ 25°C TD-spindle	285 poise @ 10 rpm Malcom @ 25°C	100 poise @ 10 rpm Malcom @ 25°C	260 poise @ 10 rpm Malcom @ 25°C
Tack (grams-force)	175	> 100	100	120	85
Compliant Specifications	IPC/J-STD-004 Flux designator REH1	IPC/J-STD-004 Flux designator REH1	IPC/J-STD-004 Flux designator ROL0	IPC/J-STD-004 Flux designator ROL1	IPC/J-STD-004 Flux designator ORH0
Residue removal method	Removal of residue is not required but can be done with solvent systems (aliphatic ketones).		Removal of residues is not required but residues can be eliminated using Kester #5768 Bio-Kleen® saponifier at 10 to 12% solution in de-ionized water at 130 - 150°C.		Residues are best removed using 130 - 150°F de-ionized water in automated cleaning equipment.

*U.S.Patent #6,367,150

Ultra-Spheres®

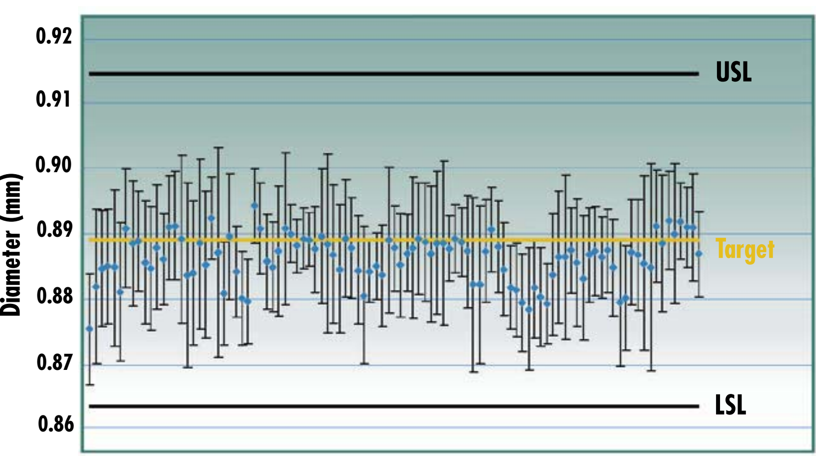
Kester's unique, proprietary manufacturing technology produces spheres with smooth, clean surfaces, and tight size distributions. Process characteristics include free flow in placement equipment, resistance to fretting damage (darkening), and exceptional solderability.

Size (mil)	2 oz.	6 oz.
35 ± 1	—	200,000
30 ± 1	—	300,000
25 ± 1	300,000	—
20 ± 1	600,000	—
18 ± 1	800,000	—
16 ± 0.5	1,200,000	—
14 ± 0.5	1,600,000	—
12 ± 0.5	2,500,000	—

Available Alloys
Sn63Pb37
Sn62Pb36Ag02
Sn10.5Pb90
Sn95.5Ag4.0Cu0.5
Sn95.5Ag3.8Cu0.7

Contact Kester for additional alloys and sizes.

Ultra-Spheres® Lot to Lot Consistency
For 0.889 mm (0.035 in), Sn10Pb90 spheres with +/-3 sigma error bars



Production Lots

Table 1 metal solderability chart

Category	If trying to solder to this metal surface:	Solder Paste and Tacky Soldering Fluxes	Liquid Fluxes and Flux-Pen® formulas	Cored Wire
1	Platinum, Gold, Copper, Tin, Solder, Silver.	All products can solder these metal surfaces.	All products can solder these metal surfaces.	All products can solder these metal surfaces.
2	Nickel, Cadmium, Brass, Lead, Bronze, Rhodium, Beryllium Copper, Palladium, Immersion Tin and Immersion Silver.	PureMark 202, Easy Profile 256, HydroMark 531, TSF6502, TSF6800 Series	186, 1544, 2120, 2331-ZX, 2235, 2224-25, 2222, 2222-VF	44, 48, 331, OR-421
3	Nickel-Iron, Kovar.	Base metal must be plated.	2222, 2222-VF	48, 331, OR-421
4	Zinc, Mild Steel, Chromium, Inconel, Monel, Stainless Steel.	Base metal must be plated.	Call Kester's customer service department.	48

Example 1: When soldering Beryllium Copper to Tin, you could use any of the products listed in Category 2, 3 or 4 since Beryllium Copper requires more active products than Tin.
Example 2: If you were soldering solder-coated leads to a Copper surface, you could use any of Kester's products (Category 1, 2, 3 or 4).

Weights and measures common conversions

To Change	To	Multiply by
Gallons (US)	Liters	3.7853
Quarts (liquid)	Liters	0.9463
Pounds (avdp.)	Grams	453.592
Pounds (avdp.)	Kilograms	0.4536
Ounces (avdp.) Liters	Grams	28.3495

Formula for adding tin to solder pots

Tin can be added to solder to replace tin lost by oxidation. The pot temperature should be at least 238°C. Tin bars should be added slowly and the solder should be mixed well.

$$T = \frac{W(A - B)}{(100 - A)}$$

Example

$$\text{Ex: } \frac{900\ (63 - 61.6)}{(100 - 63)} = \frac{1260}{37} = \text{34 lbs. of Tin to add.}$$

T = Pounds of Tin to add.
W = Pounds of solder in pot.
A = Percentage of Tin desired.
B = Percentage of Tin in pot.

Stage 1 - Preheat Zone (Rapid Heating Stage)

The purpose of this zone is to quickly bring the assembly up to a temperature where solder paste can become chemically active.

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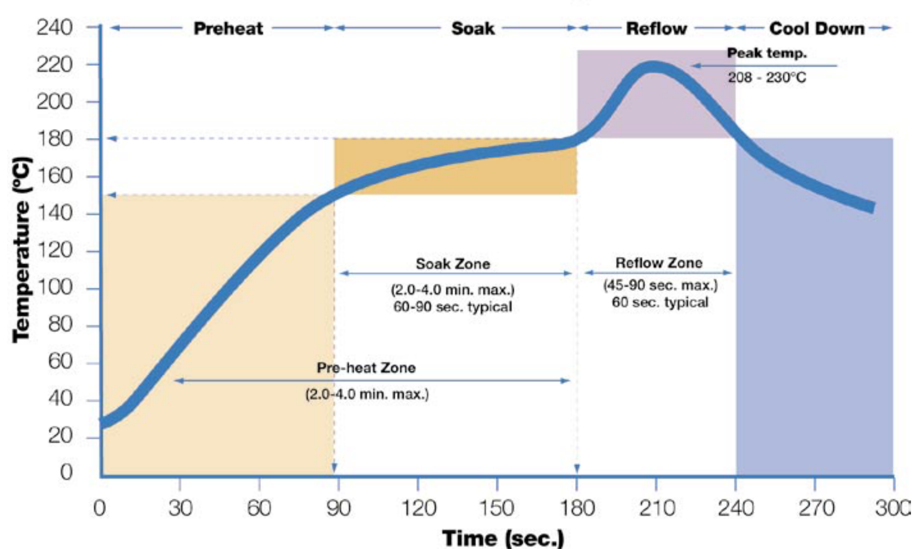

Kester Specialty Alloy Capability

Kester is dedicated to producing high quality solder products meeting our customers' application driven requirements. A few of the most common alloys used by the electronic assembly market are shown below. However, if you have a need for a low melting solder alloy (< 350°C) not shown below, containing elements such as Tin (Sn), Lead (Pb), Silver (Ag), Bismuth (Bi), Antimony (Sb) or Copper (Cu), contact our customer service department with your requirements. Chances are that Kester has made it before. Special alloys can often be produced in several forms including bar, wire, solder preforms and solder paste.

Common Alloy Temperature Chart

Commonly specified solder alloys are shown in the table. The selection of alloy is determined by applications, melting temperature and physical properties. The alloys listed may be available in forms other than those indicated.

Other solder alloys are also available. Where applicable, Kester solder material products meet and exceed ASTM B32, QQ-S-571 and IPC/J-STD-006 specifications

Solder alloys and available forms

Alloy	Melting Range		Available Forms			
Tin-Lead	**F**	**C**	**Wire**	**Bar**	**Solder Paste**	**Solderforms®**
Sn63Pb37	361	183	•	•	•	•
Most common, tin-lead eutectic used in PCB assembly applications.						
Sn62Pb36Ag02	354 - 372	179 - 189	•	•	•	•
Nearly eutectic silver bearing alloy for general applications. Most commonly used when soldering to silver-bearing boards or components.						
Sn43Pb43Bi14	291 - 325	144 - 163	•	•	•	•
Used in low temperature applications.						
Sn10Pb88Ag02	514 - 570	268 - 299	•	•	•	•
Used in products that operate in high ambient temperature environments.						
Sn10Pb90	514 - 576	268 - 302		•		•
Alloy of choice for solder spheres and columns used in ceramic BGA/CGA fabrication.						
Sn60Pb40	361 - 374	183 - 190	•	•		•
Used in single sided board soldering and solder dipping operations						
Sn50Pb50	361 - 420	183 - 214	•	•		•
Intended use for bit soldering and sweat soldering iron, steel and copper.						

Alloy	Melting Range		Available Forms			
Lead-Free	**F**	**C**	**Wire**	**Bar**	**Solder Paste**	**Solderforms®**
Sn96.5Ag3.0Cu0.5	423	217	•	•	•	•
Recommended industry standard alloy for all SMT, wave and hand soldering assembly applications.						
Sn96.5Ag3.5	430	221	•	•	•	•
High temperature, eutectic alloy provides high joint strength.						
Sn99.3Cu0.7	440	227	•	•		•
High temperature, eutectic alloy for lead-free wave soldering applications.						
Sn95Sb05	450 - 464	232 - 240	•	•	•	•
For applications where connections see peak temperatures near 400 F.						
100%Sn	450	232	•	•		•
Sometimes referred to as Sn99, is used for making tin additions to solder pots.						
Sn97Cu2.0Sb0.8Ag0.2	426 - 454	219 - 235	•	•		•
(SAF-A-LLOY) Special alloy developed for general use where lead free solder is mandated. Ideal plumbing alloy.						

Definitions:

eutectic An alloy that exhibits no plastic range upon melting. The melting point is also lower than that of any other alloy composed of the same constituents in different proportions.

dross A waste product or an impurity, especially an oxide formed on the surface of molten metal.

sweat soldering To join metal parts by interposing cold solder and then heating.

silver leaching The tendency for tin/lead-bearing solder to dissolve silver-bearing surface metallizations during reflow operations. Ceramic component metallizations often contain silver which is very easily dissolved into tin. The leaching of silver by molten tin/lead solder alloy is reduced by using solder alloys which contain small amounts of silver.

World Facilities

Kester, established in 1899, joined Northrop Grumman's newly established Component Technologies Sector in 2001. As a leading worldwide manufacturer, supplier, and marketer of soldering materials, Kester has nine modern and efficent manufacturing facilities. Kester is headquartered in Des Plaines, IL, United States, with additional manufacturing locations in Canada, Germany, Brazil, Singapore, Taiwan, Malaysia, Philippines, and Japan.

Kester products and services are used by a wide range of industries such as telecommunications, computer, automotive, military, components manufacturing, and consumer electronics. Throughout the world, Kester products are known for their high quality and advanced technology. Kester's multiple plants assure quick delivery and protection against regional shipping delays and natural disasters.

In addition, Kester has an extensive distributor network which permits easy access to sources of supply for Kester's fine products.

Global Headquarters
Des Plaines, Illinois, USA

European Headquarters
Gernlinden, Germany

Asia-Pacific Headquarters
Singapore

Branches
Brazil
Canada
Japan
Malaysia
Philippines
Taiwan

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The following trademarks are registered in the United States of America: BIO-KLEEN, FLUX-PEN, SE-CURE, SOLDER SAVER, SOLDERFORMS, ULTRAPURE, "44", EASY PROFILE, ULTRA-SPHERES. SOLDERFORMS is also registered in Canada. "44" is also registered in Canada, Hong Kong, Malaysia, Singapore and Taiwan. CONNECTING INNOVATION is a trademark by Kester. ProFlow™ developed from concept by Novatec.