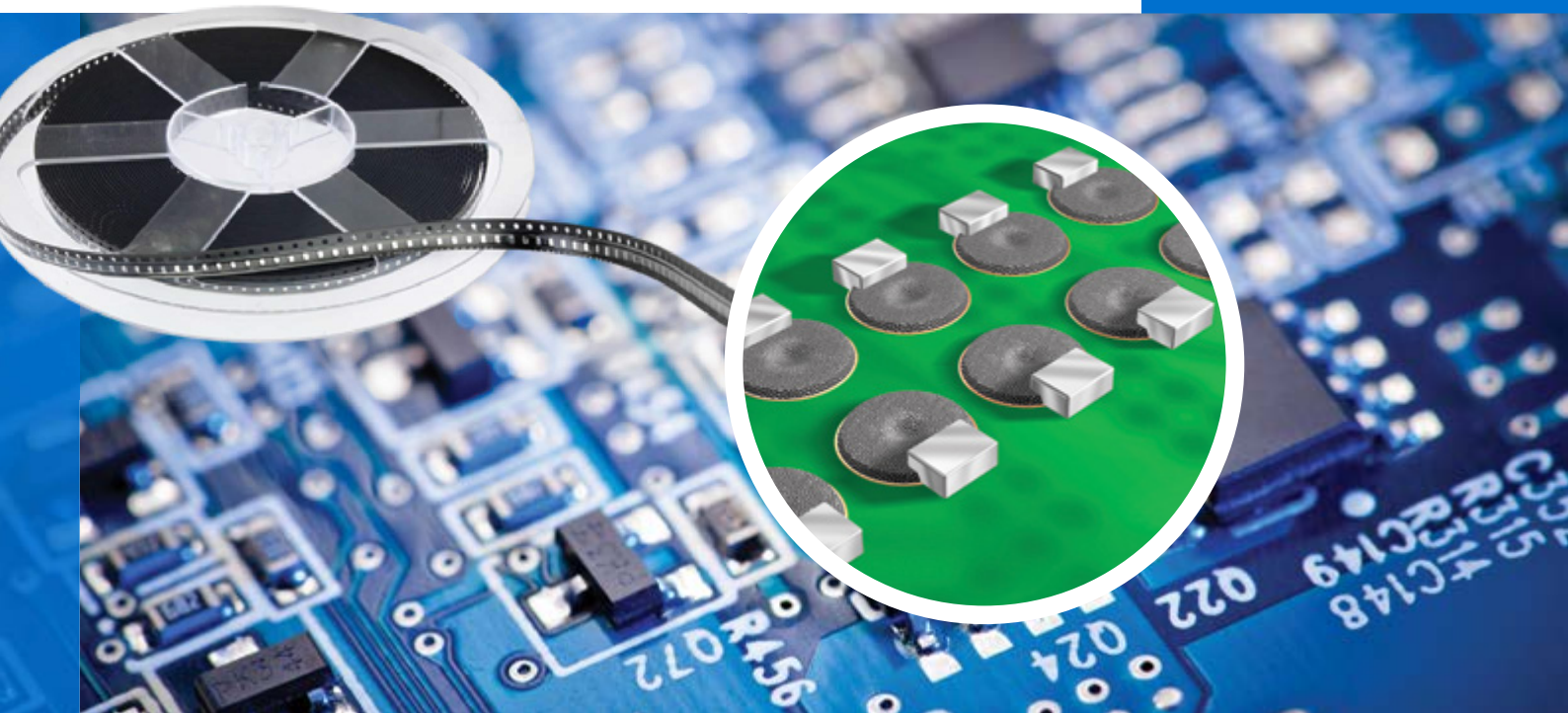


# alpha



## **ALPHA Solder Preforms for PCB Assembly**

*Solutions for Challenging PCB Assembly Applications*



[macdermidalpha.com](http://macdermidalpha.com)

February, 2023

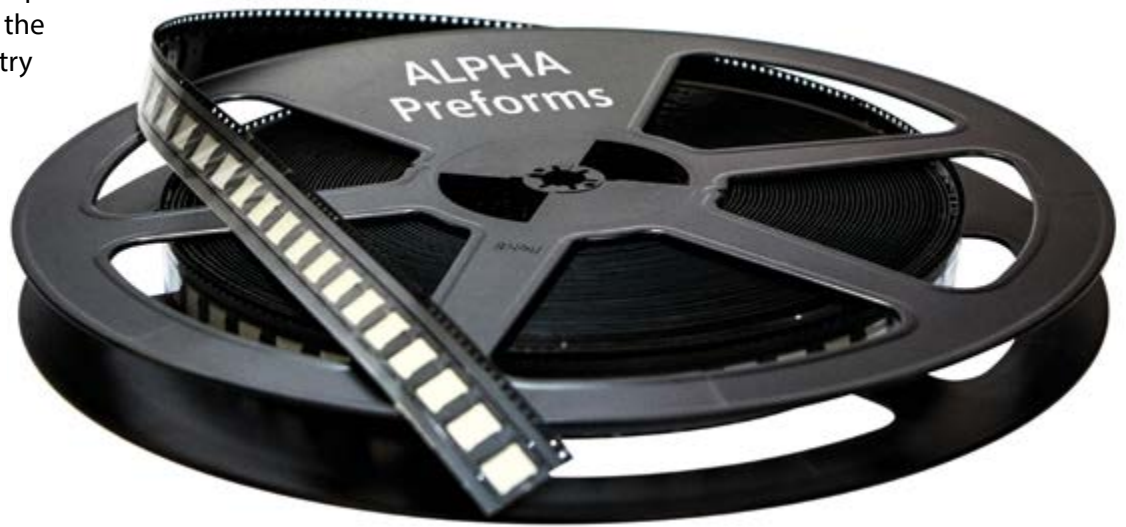
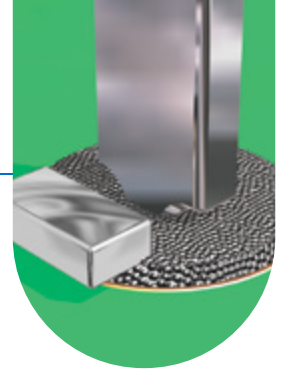
# ALPHA Solder Preforms for PCB Assembly

For over 50 years, Alpha's Solder Preforms have provided versatile, custom solutions for a variety of SMT challenges in PCB Assembly. By providing a repeatable and precise volume of solder, the technology improves the reliability and performance of components used in SMT assembly.

ALPHA Exactalloy® solder preforms are the enabling technology that have set the surface mount industry standard for product innovation and utility. Alpha was the first to introduce solder preforms in tape and reel packaging and provided the innovation that set the industry standard for developing the

world's smallest volume solder preforms – first with the introduction of the 0402 preform and then with the 0201 preform.

Alpha's latest preform innovations include void reduction solutions, bond line control mechanisms, along with NEW high reliability and low temperature alloys. Our solutions are based on dedicated research and development work which is focused on meeting your PCB Assembly requirements.



## ALPHA Preform Technologies for PCB Assembly provide solutions for:

### Increase Solder Volume

- Selective solder volume increase
- Solder joint strengthening
- Reduction of flux residues
- Supports intrusive reflow
- Elimination of step stencils
- Low temperature compatible

### Paste free Soldering

- Features integrated flux, for paste-free soldering
- Provides 100% hole fill reliability
- Supports Elimination-of-Wave Soldering
- Low temperature compatible

### Void Reduction

- AccuFlux® technology enables consistent void levels to < 10%
- Eliminates rework due to excessive voids
- Available for many standard bottom terminated component package sizes

### Spacer Technology

- Sets a fixed bond line thickness
- Stops corner solder bridging in high density BGA devices
- Prevents component tilt
- Provides a path for void evacuation under components

# INCREASE SOLDER VOLUME

With electrical components sizes becoming ever smaller, printing sufficient amounts of solder paste onto miniaturized, overpopulated PCBs has become increasingly challenging.

**ALPHA Exactalloy Tape and Reel Preforms** are specifically designed to overcome these solder volume deficiencies, enhancing the solder joint strength and reliability and providing 100% hole fill.

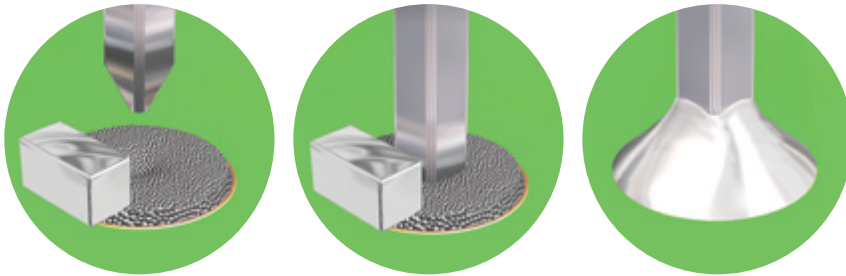
ALPHA Exactalloy Preforms in tape and reel packaging provide an easy to implement method for increasing the solder volume of SMT and through-hole components assembled using surface mount technology.

Specifically targeted for use with solder paste in SMT assembly applications, small solder rectangles are inserted into solder paste to precisely increase solder volume, the solder paste acting as both an adhesive and flux vehicle. The solder rectangles are 100% alloy, and due to the minimal amount of solder paste required to provide adequate wetting, near zero flux residue is realized.

The entire family of solder rectangles in tape and reel packaging are placed with standard pick and place equipment, utilizing industry standard chip capacitor size preforms for ease of use.

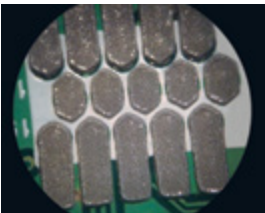


## Supplemented with ALPHA Exactalloy Preforms

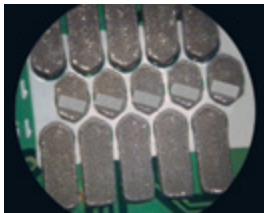


A preform added to solder paste yields 100% hole fill plus fillet.

## Restricted Printing Area



Solder paste as printed



Preforms placed in paste



Solder paste and preforms reflowed



Add a preform to an SMT component lead to increase joint strength.



[Click here to watch preform reflow video.](#)



ALPHA Exactalloy Tape and Reel Preforms enable the use of standard pick and place equipment.



Preforms provide additional solder for tight pitch components and thick PCBs ensuring 100% hole fill and fillet formation.



# INCREASE SOLDER VOLUME

**Alpha Exactalloy Tape and Reel Preforms** provide customers with:

- Increased solder joint reliability
- Improved first pass yields
- 100% hole fill
- Increased solder volume without the need for PCB layout changes or use of step stencils
- A significant time-to-market advantage with the use of tape and reel packaging

ALPHA Exactalloy Preforms are available in a wide variety of solder alloys, including low temperature, RoHS compliant alloys, such as SnBiAg and the Innolot alloy for extra joint strength.



0603H

0603

0402

Different chip cap. size solder preforms applied before reflow



Desired result after reflow, the 0603 chip cap. size creating the largest fillet

Size		Dimensions			Volume	Dimensions			Volume	Pb-Free	Sn-Pb	Low Temp Pb-free
		a	b	c		a	b	c				
inch	mm	mm			mm <sup>3</sup>	mil			mil <sup>3</sup>			
0201H	0503H	0.51	0.25	0.10	0.013	20	10	4	800	✓	*	*
0201	0503	0.47	0.28	0.28	0.037	19	11	11	2,249	✓	✓	✓
0202	0505	0.51	0.51	0.25	0.065	20	20	10	3,968	✓	✓	✓
0402H	1006H	1.00	0.60	0.25	0.150	39	24	10	9,154	✓	✓	✓
0402	1005	1.00	0.50	0.50	0.250	39	20	20	15,256	✓	✓	✓
0603H	1608H	1.60	0.80	0.50	0.640	63	31	20	39,055	✓	✓	✓
0603	1608	1.60	0.80	0.80	1.024	63	31	31	62,488	✓	✓	✓
0805H	2013H	2.01	1.30	0.40	1.045	79	51	16	63,782	✓	✓	✓
0805	2013	2.01	1.30	0.76	1.986	79	51	30	121,186	✓	✓	✓
0805S	2013S	2.01	1.30	1.30	3.397	79	51	51	207,292	✓	✓	*
1406	3515	3.56	1.52	0.77	4.167	140	60	30	254,263	✓	✓	*

\* Production will depend on market demand. Please check with your local sales representative for availability.

# PASTE FREE SOLDERING USING SOLDER WASHERS

Achieving 100% hole fill on through-hole components can be problematic.

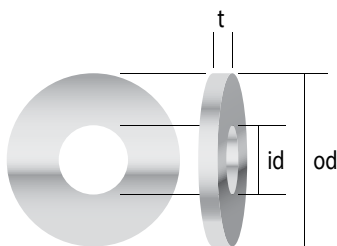
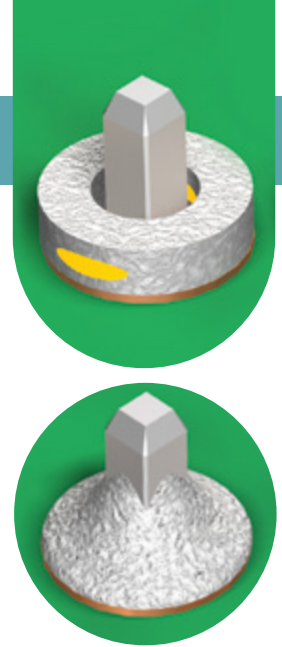
**ALPHA Exactalloy Solder Washers** provide a precise amount of solder volume to allow for a highly repeatable soldering process, in many cases, ensuring a top and bottom fillet for extra joint strength.

Alpha's Solder Washers are supplied with integrated flux eliminating the need for solder paste. The solder washer is placed directly over the component's through hole pin and provides adequate solder and flux to fill the plated through hole.

ALPHA Exactalloy Solder Washers enable customers with:

- Increased hole fill to 100%
- Elimination of wave and secondary manual soldering processes
- Low temperature soldering processes with temperature sensitive through hole components
- Supports non-traditional PCB soldering methods such as induction, laser resistance and vapor phase soldering

ALPHA Exactalloy Solder Washers are available in a wide range of custom sizes, as well as an assortment of rosin based and water soluble fluxes to meet your assembly needs. These preform washers support all Alpha alloys enabling low temperature soldering processes for through-hole components that cannot tolerate standard SMT reflow temperatures. ALPHA Exactalloy Solder Washers can be supplied in bulk or tape and reel packaging for automated assembly.



od

Min = 0.76mm (.030")  
Max = 47.63mm (1.875")

id

Min = 0.25mm (.010")  
Max = 34.93mm (1.375")

t (thickness)

Min = 0.10mm (.004")  
Max = 2.80mm (.110")

Alpha has close to 1,000 washer sizes and countless thicknesses available to meet your specific assembly requirements.

ALPHA external flux coating for preforms	Flux classification		Remarks
Flux name	QQS 571	J-STD	
RS2	RMA	ROL0	No clean, halide free, mildly activated flux (Finishes: Ni/Au, Ag, Cu, etc.)
RS2.2	RMA	ROL1	No clean, mildly activated flux (Finishes: Ni/Au, Ag, Cu, etc.)
RS4	RA	ROM1	No clean flux with higher activation (Finishes: Brass, NiAg, Cu, Sn, etc.)
RS7	RSA	ROH1	No clean flux with highest activation for challenging soldering surface

ALPHA internal flux core for preforms	Flux classification		Remarks
Flux name	QQS 571	J-STD	
HF-850	RMA	ROL0	Halogen-free, mildly activated flux (Finishes: Ni/Au, Ag, Cu, etc.)
SMT	RA	ROM0	Halide-free flux with higher activation (Finishes: Brass, Ni, Cu, Sn, etc.)
Fluitin 1532	RA	ROM1	ROM1 type flux for use in Europe only.
RS7MI	RSA	ROM1	Highest flux activation for challenging soldering surfaces.

ALPHA external flux coating for preforms	Flux classification		Remarks
Flux name	QQS 571	J-STD	
BTC-578	RMA	ROL0	Zero-halogen, mildly activated flux (Finishes: Ni/Au, Ag, Cu, etc.)

# VOID REDUCTION SOLUTIONS

The increased use of bottom terminated component packages (e.g., QFN, QFP, and DPAK), has posed the assembly industry with significant challenges in void reduction due to higher power densities, increased thermal reliability and peak RF performance requirements. **ALPHA AccuFlux BTC-578 Preforms** are specifically designed to provide the industry's lowest and most consistent void reduction performance for bottom terminated component assemblies.

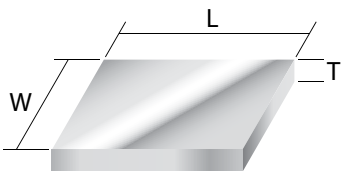
ALPHA AccuFlux BTC-578 Preforms are designed to enhance reliability and heat transfer through the reduction of voids at

the thermal interface assembly level of bottom terminated components. The AccuFlux BTC-578 technology employs a combination of low void flux with a precision controlled micro-flux coating process. Alpha's proprietary flux application process ensures a consistent coating from preform to preform and lot to lot, which is paramount to enabling repeatable, low void performance.

ALPHA AccuFlux BTC-578 Preforms provide customers with:

- Effective heat dissipation through consistent low void level
- Enhanced process stability and predictable reliability through repeatable void distribution
- Maximizes mechanical strength through increased solder volume
- Enhanced electrochemical reliability from low flux residues

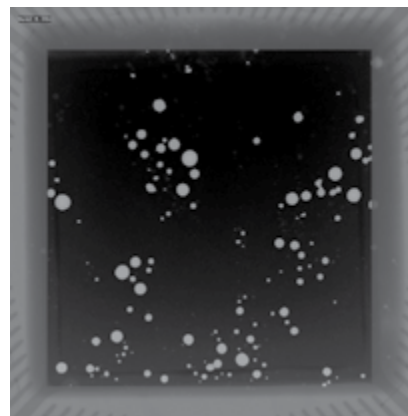
ALPHA AccuFlux BTC-578 Preforms are packaged in tape and reel to provide an easily implemented void reduction solution for new or existing PCB assemblies.



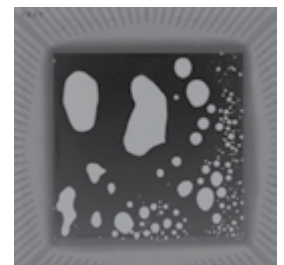
**ALPHA AccuFlux BTC-578 Preforms** are sized to support the most common bottom terminated component packages (QFN, QFP, D-PAK, etc.) to optimize void reduction.

L		W		Standard Thickness (T)			
mm	inch	mm	inch	mm	inch	mm	inch
1.40	0.055	1.40	0.055	0.10	0.004	0.15	0.006
2.00	0.079	2.00	0.079	0.10	0.004	0.15	0.006
2.40	0.094	2.40	0.094	0.10	0.004	0.15	0.006
3.00	0.118	3.00	0.118	0.10	0.004	0.15	0.006
3.40	0.134	3.40	0.134	0.10	0.004	0.15	0.006
3.90	0.154	3.90	0.154	0.10	0.004	0.15	0.006
4.40	0.173	4.40	0.173	0.10	0.004	0.15	0.006
4.70	0.185	4.70	0.185	0.10	0.004	0.15	0.006
4.90	0.193	4.90	0.193	0.10	0.004	0.15	0.006

Production will depend on market demand. Please check with your local sales representative for availability.



Minimal voiding with BTC Preform



Void result using solder paste only

# SPACER TECHNOLOGY

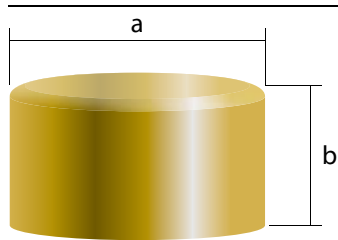
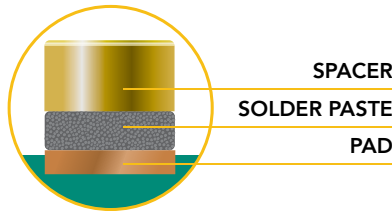
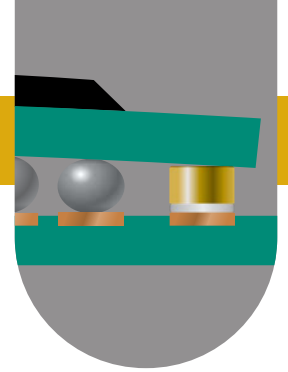
In modern electronic assembly applications, creating a very tightly controlled gap between the printed circuit board and electronic components can prove to be essential. **ALPHA TrueHeight® Spacers** were specifically designed to control corner solder bridging caused by BGA warp during reflow. Since then, other uses have been realized. Adding a precision standoff will prevent bond line thickness variations, component tilt, and excessive voids.

ALPHA TrueHeight Spacers are burr free, non-collapse, plated copper discs with superior height accuracy. TrueHeight Spacers are designed to be automatically placed and reflowed on a SMT pad using a small amount of solder paste. Where SMT pads cannot be found, component adhesive can be used for attach.

ALPHA TrueHeight Spacers provide customers with:

- Precise height control for managing solder bond line thickness
- A hard stop feature that manages component tilt and provides clearance for void escape
- A precision standoff to offset any through-hole component to allow intrusive reflow

ALPHA TrueHeight Spacers are available in a number of different heights, and are packaged in tape and reel for easy implementation into any pick and place operation.

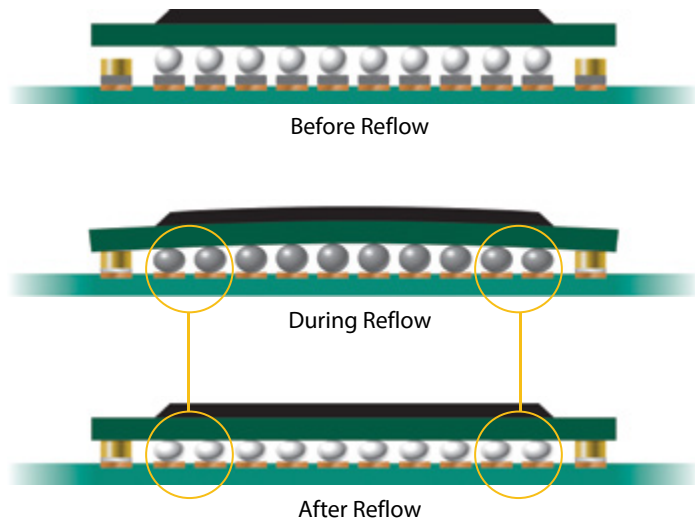


Size	a		b	
	mm	inch	mm	inch
<b>DS-D076H010</b>	<b>0.76</b>	0.030	<b>0.10</b>	0.004
<b>DS-D076H025</b>	<b>0.76</b>	0.030	<b>0.25</b>	0.010
<b>DS-D076H030</b>	<b>0.76</b>	0.030	<b>0.30</b>	0.012
<b>DS-D076H038</b>	<b>0.76</b>	0.030	<b>0.38</b>	0.015

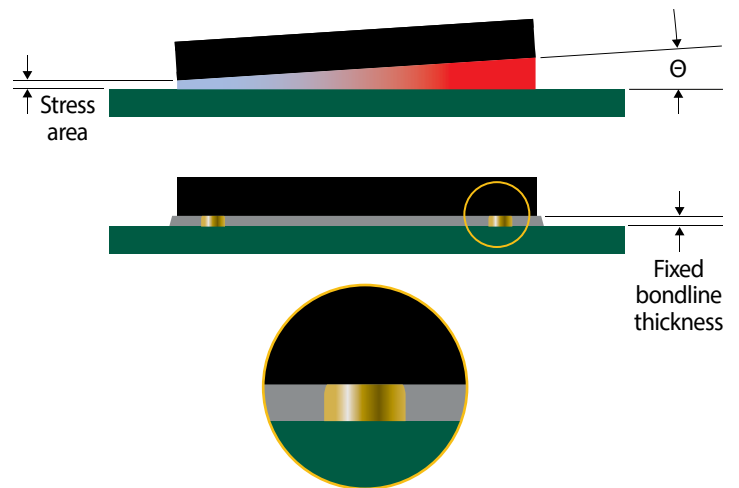
Tolerance on the part dimension 'a':  $0.76 \pm 0.05\text{mm}$

Tolerances on the part dimensions 'b':  $0.10 \pm 0.010\text{mm}$  ;  $0.25 \pm 0.013\text{mm}$  ;  $0.30 \pm 0.015\text{mm}$  ;  $0.38 \pm 0.020\text{mm}$

## Control of Corner Solder Bridging



## Bondline Thickness Control and Component Tilt Prevention



TrueHeight Spacer enables component collapse to a fixed feature during reflow.

# ALPHA Solder Preforms for PCB Assembly



ALPHA Exactalloy solder preforms are available in a wide range of leaded and lead-free alloys to meet the most challenging assembly requirements.

Leaded Exactalloy		Melting Temp Range		Remarks
Alloy Name	°C	°F		
Sn62 Pb36 Ag2	179	354		Silver containing eutectic alloy
Sn63 Pb37	183	361		Most popular leaded eutectic alloy
Sn60 Pb40	183-188	361-370		Off-eutectic, silver free alloy
In50 Pb50	184-209	363-408		High ductility alloy
Low Temp Leaded Exactalloy		Melting Temp Range		Remarks
Alloy Name	°C	°F		
Sn16 Pb32 Bi52	95-96	203-205		Ultra low temperature, cadmium free
Sn25 Pb25 Bi50	95-115	203-239		Low temperature, cadmium free
High Temp Leaded Exactalloy		Melting Temp Range		Remarks
Alloy Name	°C	°F		
Sn10 Pb88 Ag2	268-290	514-554		Most popular high leaded, high temperature alloys
Sn5 Pb92.5 Ag2.5	280	536		
Sn2 Pb95.5 Ag2.5	299-304	570-579		
In5 Pb92.5 Ag2.5	300	572		
Sn5 Pb95	310-314	590-597		

RoHS Compliant Exactalloy		Melting Temp Range		Remarks
Alloy Name	°C	°F		
SAC305*	217-221	422-430		Most popular RoHS compliant alloy
SACX	217-228	422-442		Low silver (Ag0.3) SAC alloy
Sn96.5 Ag3.5	221	430		Eutectic, copper free
SN96 Ag4	221-238	430-460		Off-eutectic, copper free
Sn99 Sb1	235	455		Eutectic, Sb containing alloy
Sn95 Sb5	232-240	450-464		Off-eutectic, Sb containing alloy
Low Temp RoHS Compliant Exactalloy		Melting Temp Range		Remarks
Alloy Name	°C	°F		
Sn42 Bi58	138	280		Eutectic, RoHS compliant alloy
Sn42 Bi57.6 Ag0.4	138-139	280-282		Silver added for ductility
Sn60 Bi39.6 Ag0.4	138-170	280-338		Off-eutectic, low temperature RoHS alloy
Sn52 In48	118-131	244-268		Ultra low temperature, off eutectic alloy
Sn48 In52	118	244		Ultra low temperature, eutectic alloy
High Reliability RoHS Compliant Exactalloy		Melting Temp Range		Remarks
Alloy Name	°C	°F		
Innot	206-218	403-424		High reliability alloy
Powerbond® 2050	235-240	455-464		Thermal fatigue resistance alloy
Powerbond® 2110	222-266	432-511		Thermal fatigue resistant, high thermal conductive alloy

\* Various other SAC alloy variants can be made available, including SAC105, SAC387 and SAC405  
 \*\* Above listed alloys are the most commonly used types in our industries. Please consult us about the availability of other alloys.

For available preform shapes, alloys, sizes and flux options, please refer to the corresponding Technical Bulletin or contact your local Alpha Sales Office.

## Sustainability

All ALPHA Exactalloy Solder Preforms are produced in an ISO 14001 & 45001 qualified production environment. This certification ensures strict adherence to environmental management systems with a strong focus on health and safety. All metal waste resulting from our manufacturing processes is recycled.

ALPHA Exactalloy Solder Preforms are manufactured in TS16949 certified production sites.

During assembly processes, solder preforms support the use of alternative soldering methods like induction, laser or light beam soldering, using short bursts of energy rather than prolonged energy consumption associated with traditional soldering methods. ALPHA Exactalloy Solder Preforms are available in a range of low temperature, RoHS compliant alloys, enabling the most energy efficient soldering solutions.



macdermidalpha.com  
February 2023

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