

ExactalloyTM

*Solder preforms
for product and process
improvement*



There is an Exactalloy™ preform in the right shape and size to improve your assembly operation, product reliability and quality.



Each batch of Exactalloy™ preforms is carefully examined under magnification to assure compliance with dimensional requirements.

Improved quality and performance

Alpha-Fry's experienced representatives are ready to work directly with your designers to recommend solder preforms to provide maximum assembly efficiency, product quality, and improve your manufacturing processes.

We can furnish Exactalloy™ preforms in discs, rectangles, squares, rings, washers, sleeves and washer arrays (linked preforms). Your Alpha-Fry technical representative can help you specify the size and shape to achieve the maximum benefit for your soldering process.

Custom shapes can also be produced to match specific applications. Tooling charges may apply to custom shapes and sizes.

Exactalloy™ solder preforms are the ideal solution to high volume, precision-soldering processes in electronic assemblies, sealed lighting, filtered connectors, multiple leaded connectors, component manufacturing and the plumbing industry.

What are preforms?

Preforms are precisely formed pieces of solder, produced in large quantities with very tight tolerances. There are almost unlimited combinations of different preform shapes, sizes, combinations of solder alloys and flux delivery systems.

Preforms are commonly formed in 63/37 tin/lead solder. Both lower melting point and higher melting point alloys are also available. See the *Soft Solder Alloys* table on page 10 for a list of the most common alloys used to produce Exactalloy™ preforms. Some solder alloys cannot be used to produce some preform shapes. High bismuth alloys, for example, can be very brittle, and cannot withstand rolling and stamping processes required to form some shapes.

Opposite: Exactalloy™ preforms can be produced in thousands of shapes and sizes, solving even the most difficult soldering design challenge.



A wide range of design choices

Exactalloy™ preforms are available in sizes from 0.020" to 2.00" (squares, discs or washer OD). Thickness can range from .004" to 0.25". They can be externally coated with RA, RSA and RMA fluxes. Internally fluxed Exactalloy™ preforms

are available in No-clean, WSOA and Rosin-type fluxes. Generally, flux add-on represents .5% to 2.5% by weight of the preform.

Alpha-Fry's unique *flux coating* process offers two distinct advantages over *flux filled* preforms: a flux-coated Exactalloy™ preform delivers flux to the area to be soldered when it is needed most — just before the solder is melted, and flux-coated solder is protected from oxidation. Oxide-free solder yields better wetting and joint strength, and can eliminate the formation of cold solder joints that can have a severe impact on product reliability. Flux coating is limited to preforms at least .007" (0.18 mm) thick. Thinner preforms may lose their shape in the fluxing process.



Both X-ray diffraction and wet analysis methods are used to assure that every lot of Exactalloy™ preforms meets or exceeds the metallurgical requirements of the IPC and the customer.

Exactalloy™ preform solutions provide a wide range of advantages in electronic circuit assembly applications.

There are numerous examples where the use of Exactalloy™ preforms can optimize one or both of the common mass soldering techniques.

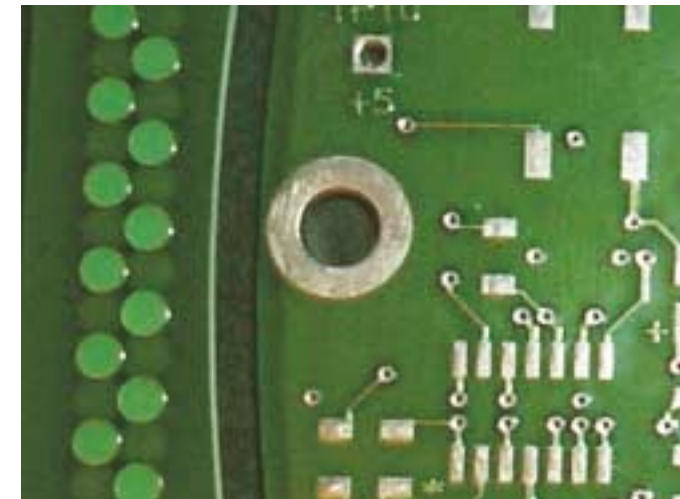
Eliminate hand soldering

The use of preforms can provide a more consistent quality alternative to repetitive hand soldering applications. If core wire is being used to hand solder multiple leaded connectors, or to solder a non-planar area in a circuit assembly, preforms often offer a better solution.

Exactalloy™ preforms deliver the exact volume of solder required. They can be placed exactly where needed, and multiple solder joints can be reflowed simultaneously using a heat gun, or a reflow oven. Low melting temperature preforms are commonly used to eliminate disturbance of other solder joints already formed on the assembly.

High-temperature preforms can be used if the hand soldering assembly is being performed before conventional SMT or wave soldering processes. 10/88/2 (Tin/Lead/Silver) or 96/4 (Tin/Silver) are common choices for this application. See the *Soft Solder Alloys* table on page 10.

Precise control of foil thickness is a critical step in providing the exact volume of solder required. Here, linked arrays are used to eliminate hand soldering on multiple-row connector sets. Preforms also provide more solder volume, eliminating inefficient paste-in thru-hole processes.



Paste-in thru-hole

Problem: In an attempt to eliminate wave soldering, many assembly processes use solder paste to solder thru-hole components. The goal is to eliminate wave soldering, and subsequent thermal stress resulting from multiple solder reflow cycles.

Solder paste is very difficult to stencil over an open hole, and dispensing adequate volumes of paste can be just as challenging. Thick, multiple layer boards also make paste in thru-hole processes more difficult. Per IPC Standard B 610, at least 75% of the space between the lead pin and the hole must be filled with solder.

Solution: The use of Exactalloy™ washers or linked washer arrays eliminates the inherent problems of delivering enough solder to meet the IPC standard. The design of the preform begins with the inner diameter of the washer. It should be -0.001 " to $.003$ " larger than the OD of the lead pin. The next

consideration is the diameter of the thru-hole or via. The OD of the Exactalloy™ washer must be at least $.005$ " greater than the diameter of the hole. The limit of the OD is usually the diameter of the pad surrounding the plated thru-hole.

Given the ID and the OD, Alpha-Fry can manufacture the washer to any thickness from $.004$ " to a limit of 110% of the ID. Using this technique, Exactalloy™ preforms can be engineered to meet or exceed the IPC standard.



Step stenciling

Problem: In some SMT assemblies, larger volumes of solder are required on one or more surface mount pads. Traditional co-planar paste stenciling will not yield the solder volume required. In this case, the process engineer has two choices, neither of which may be acceptable: stencil more paste onto the required pads or use a second dispensing process. The dispensing option is often impossible in fine pitch applications.

Solution: Place an Exactalloy™ solder preform segment (square or rectangle) into the stenciled paste. Exactalloy™ preforms are available in tape and reel packaging. The preform is sequenced in your pick and place process to be positioned *prior* to placement of the SMT component designated for that pad.

Simply sequence the preform placement prior to the component requiring the additional solder volume.



Above left: Cladded discs provide a simple method of soldering very large components from the opposite side of the board.

Top right: Alpha-Fry can package preforms on tape and reel for use with common pick and place equipment.

Left: Our extensive engineering capabilities can turn your ideas into high-production reality. Bimetallic solder sleeves are but one example of Alpha-Fry's ability to engineer solder fabrication.

See how Exactalloy™ preforms are providing innovative solutions in actual applications.

Flux-filled and flux-coated lead-free solder preforms are used by the major automobile lighting producers to deliver the exact amount of solder, in exactly the right shape, exactly where it is needed.



Reduce or eliminate wave soldering

Problem: The primary assembly process used is SMT. There are still one or more thru-hole components on the assembly where the board must be run through the wave to assure a complete solder joint. The second thermal cycle may damage some of the paste joints, the components and the extra step increases the cycle time of each assembly.

Solution: After the paste has been stenciled, and all of the SMT components have been placed, use a semi-automatic technique to position flux-coated preform solder washers on the thru-hole component leads. This completely eliminates the wave soldering step, increasing the production rate and reducing rejects. (See the connector jig schematic, on opposite page)

Sealed beam lighting

As the leader in lead (Pb) free soldering, Alpha-Fry Technologies has developed several alloys that exceed today's requirements for the elimination of lead, which is the trend in this industry. Both flux-coated washers and flux-cored segments are used to automate the placement of solder in sealed beam lighting.



Exactalloy™ preforms deliver exactly the right amount of solder, in the exact alloy, every time. Consistent, reproducible soldering is the real benefit to the lighting industry.

Connectors

Filtered and Shielded Connectors

Exactalloy™ preform washers are made in both a single alloy, and in laminated layers of a base metal and solder. A typical application is attaching a ferrite EMI shield to a connector pin. The pin is suspended in the middle of the ferrite tube by the unmelted base metal. The solder layers on either side of the base metal form the solder joint. Similar technology is used to produce RFI shielded connector leads. Alpha-Fry's

lead-free alloys and flux-coating processes provide an unlimited number of beneficial solutions for the connector manufacturer.

Pre-Soldered Connectors

Exactalloy™ preforms can be automatically placed on connector leads, and the resulting connector requires no additional paste or thru-hole soldering by the connector user. Your Alpha-Fry technical representative can show you several methods of applying preforms to multiple pin connectors.

Attaching Coaxial Connectors

Hand soldering can be eliminated as a high volume method of soldering coaxial connectors to cable ends. Several unique solutions have been developed by Alpha-Fry for attaching solder sleeves to bare wire ends. Coaxial connectors can be slid over the preform ring, followed by induction reflow of the solder. Flux-coated sleeves make this process highly efficient and reproducible.

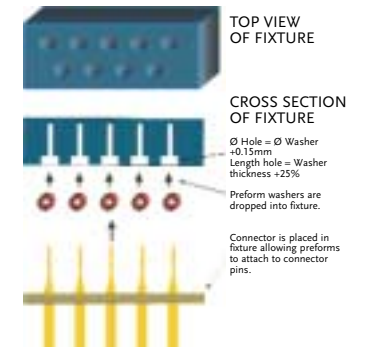


Component manufacturing

Capacitors

Preforms are used in both surface mount and thru-hole component manufacturing. Both axial and radial leaded capacitors are manufactured using solder preforms. A high temperature alloy (Sn 95/Ag 5, Sn 10/Pb 88/Ag2, Sn 5/Pb 85/Sb 10) is typical, to eliminate solder reflow when the capacitor is soldered to the final circuit assembly. High temperature alloys allow for the use of thermal curing encapsulents as well.

Soldering lead frames to ceramic capacitor bodies with flux-coated Exactalloy™ preforms can eliminate problems associated with the use of solder paste. Preforms also offer the additional advantages of delivering reproducible volume, eliminating flux residue, increasing production speed and producing faster reflow cycle times.



Hundreds of solder washers can be placed automatically by using fixtures. Your Alpha-Fry technical representative can help you design a fixture for rapid placement of flux-coated washers on multiple-pin assemblies.

Automatic placement of preforms is often the key in reaping the efficiency offered by automatic soldering. In this application, a bowl feeder dispenses flux-coated washers for subsequent placement and reflow.



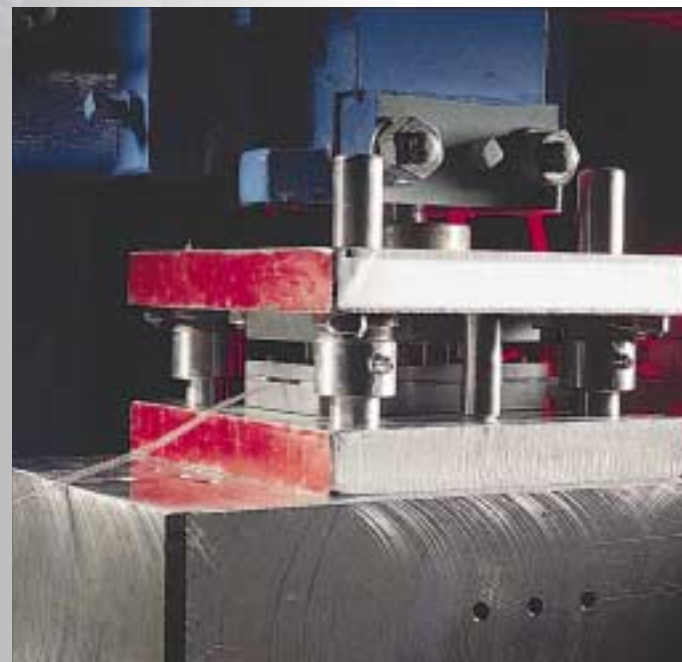
Using a solder preform to coat the surface mount contacts with solder in chip scale capacitors eliminates dipping heat-sensitive ceramics into high melting point solder baths.

Thyristors

Exactalloy™ preforms are the ideal metal to metal, and metal to diode joining material. High temperature alloys are used to eliminate solder reflow during the coating and curing of epoxy encapsulents. Flux-coated Exactalloy™ preforms (discs, rectangles or squares) are ideal for this application.

Rectifiers

Diode attachment with the suitable preform alloy choice makes high volume production possible.



Precise solder shapes can be used as counterweights in analog instruments.

Optoelectronics

Indium-based alloys, marketed by Alpha-Fry's Arconium division, afford excellent ductility, gold scavenging resistance, and low temperature soldering (where needed) in this rapidly evolving market. Indium's ductility allows for soldering material with large differences in their coefficient of thermal expansion. Arconium's technical service personnel will help you specify the best alloy and preform to improve your application.

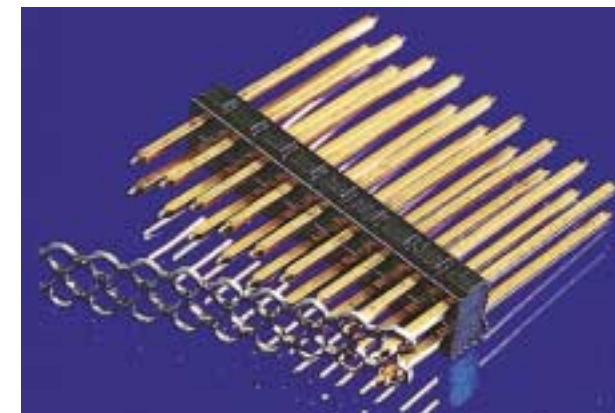
Hybrid Circuits

Solder based fuses are used to protect high temperature

circuits. Tin/lead and tin/lead/silver alloys, stamped into horseshoe-shaped preforms, are used in automotive rheostats and other hybrid circuits to prevent catastrophic failures from excess heat.

Plumbing

Lead-free Exactalloy™ preform rings and washers are used to solder internal plumbing joints, and to automate the joining of brass, copper, bronze and tin plate materials. Alpha-Fry has several IAPMO certified alloys for use in these applications. Washers up to 2" in diameter are available. Larger rings can also be produced flux-coated, flux-filled or plain.



Connector manufacturers can attach Exactalloy™ preform sets, providing customers with ready-to-solder assemblies

Our ISO 9001 certified quality program, along with extensive tool making capabilities have made Alpha-Fry the first choice of solder preform users.

Total Quality Management is the driving force in the design and manufacture of Alpha-Fry precision Exactalloy™ preforms. Alpha-Fry Technologies has earned ISO 9001 certification for its Exactalloy™ production facilities. Comprehensive quality controls include SPC (statistical process control), non-destructive tests and random sample analysis.

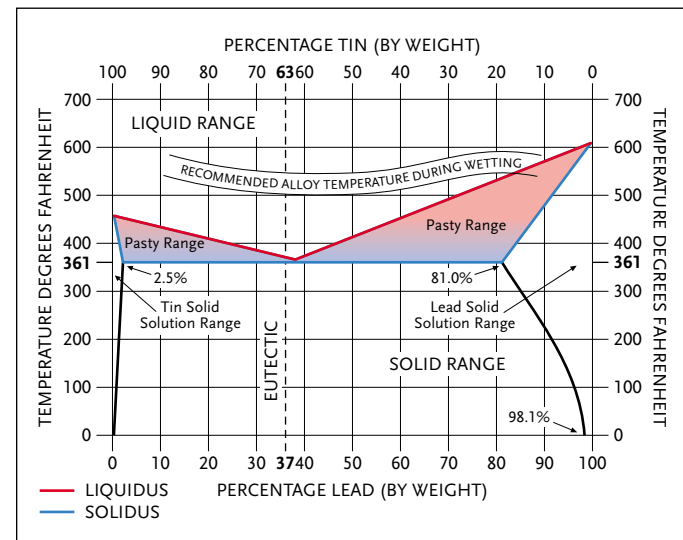
All incoming metals are examined by spectrographic analysis and all alloy materials are analyzed for content and purity prior to in-house molten state processing. Alpha-Fry Technologies' unique post-alloying batch analysis is used to identify preforms by date, time, and materials used in manufacturing. All materials, including fluxes, are examined using emission spectrography, X-ray defraction, gas chromatography, atomic absorption and classical wet chemistry techniques.

The physical characteristics of precision preforms, including dimensions, weight and uniformity, are checked meticulously to ensure conformance with customer specifications and Alpha-Fry Technologies' rigid in-house standards.

Soft Solder Alloys

ALLOY	MELTING TEMPERATURE RANGE	
	°F	°C
TIN/LEAD		
63Sn/37Pb	361	183
60Sn/40Pb	361-379	183-190
50Sn/50Pb	361-421	183-216
45Sn/55Pb	361-441	183-227
40Sn/60Pb	361-460	183-238
30Sn/70Pb	361-491	183-257
25Sn/75Pb	361-511	183-266
15Sn/85Pb	440-550	227-288
10Sn/90Pb	514-576	268-299
5Sn/95Pb	581-594	305-312
3Sn/97Pb	597-608	314-320
SILVER BEARING		
62Sn/36Pb/2Ag	355	179
96.5Sn/3.5Ag	430	221
95Sn/5Ag	430-473	221-245
10Sn/92.5Pb/2.5Ag	549-565	287-296
97.5Pb/2.5Ag	579	304
1Sn/97.5Pb/1.5Ag	588	309
TIN/ANTIMONY		
100Sn	450	232
95Sn/5Sb	450-464	232-240
99Sn/1Sb	453	234
LOW-TEMPERATURE		
16Sn/32Pb/52Bi	204	96
48Sn/52In	244	118
50Sn/40Pb/10Bi	248-332	120-167
43Sn/43Pb/14Bi	291-325	144-163
37.5Sn/37.5Pb/25In	274-358	134-181
50Sn/32Pb/18Cd	293	145

Tin/Lead Phase Diagram



Standard Dimensional Tolerances

DIMENSION (INCHES)	TOLERANCE (INCHES)
Diameter	±0.002
Length and Width	±0.005
Thickness	Up to 0.005 ±0.0005 0.006 to 0.010 ±10% of thickness Greater than 0.010 ±15% of thickness
Thickness (flux-filled)	Up to 0.010 ±0.0015 0.011 to 0.030 ±15% of thickness Greater than 0.030 ±10% of thickness but not less than 0.0045
Horizontal Burr	0.005 maximum
Vertical Burr	Up to 0.010 0.003 maximum Greater than 0.010 3% but not to exceed 0.005

WASHER

OD
Min = .020"
Max = 3.00"

ID
Min = .008"
Max = OD-.010"

T (Thickness)
Min = .002"
Max = .110"

RECTANGLE

S (Side)
Min = .020"
Max = 2.30"

T (Thickness)
Min = .002"
Max = .200"

DISC

D (Diameter)
Min = .020"
Max = 2.10"

T (Thickness)
Min = .001"
Max = .200"

SLEEVE

OD
Min = .057"
Max = 1.05"

ID
Min = .049"
Max = 1.024"

H (Height)
Min = .024"
Max = .472"

Use these drawings to help specify Exactalloy™ solder preforms

The size ranges indicated on these drawings represent the dimensions in which Exactalloy™ solder preforms are available. For information on preforms outside of these dimensions to meet your specific application needs, please contact your Fry Technology Sales Representative at 1-800-289-3797. You may also fax drawings to us at: 1-814-944-8094, or contact us on our web site at: www.frytechnology.com

Alpha-Fry Technologies is a member of Cookson Electronics. The power behind the process.

As a member of Cookson Electronics, Alpha-Fry Technologies shares Cookson's goal: To create total process solutions that will power our customers to greater productivity. We are committed to optimizing every element of our customers' production capabilities by providing advanced process development, comprehensive consulting and world-class training. Our people aim to deliver real results. To share their knowledge in ways that improve performance and productivity and help our customers achieve their goals. Cookson Electronics. Alpha-Fry Technologies. *The Power Behind The Process.*



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