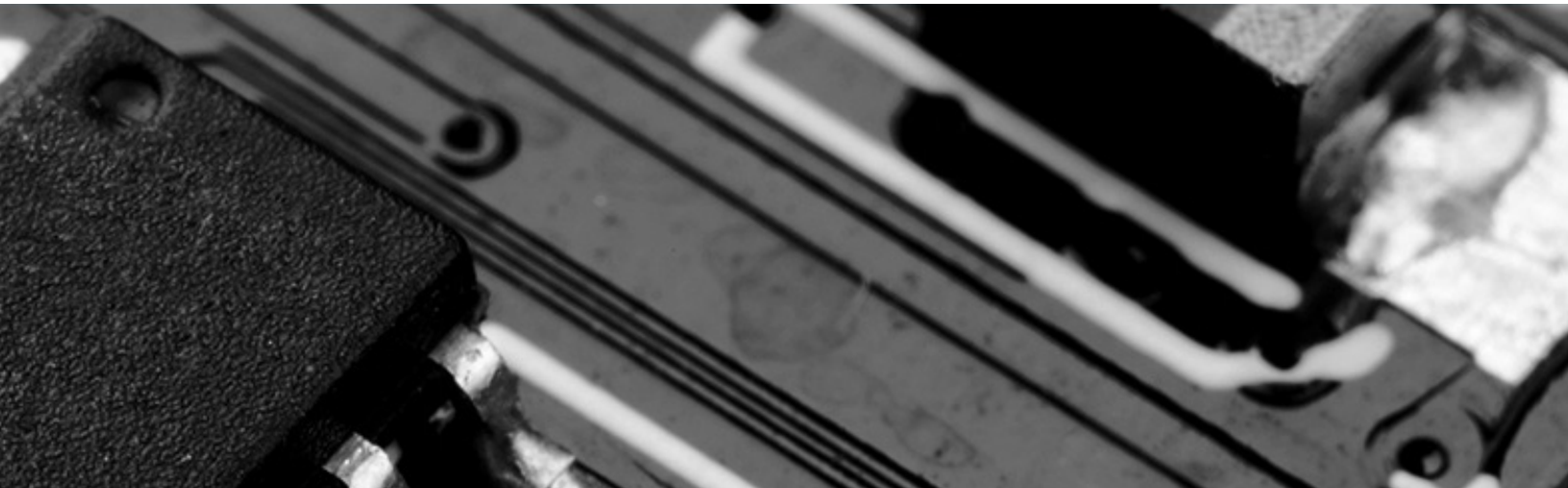




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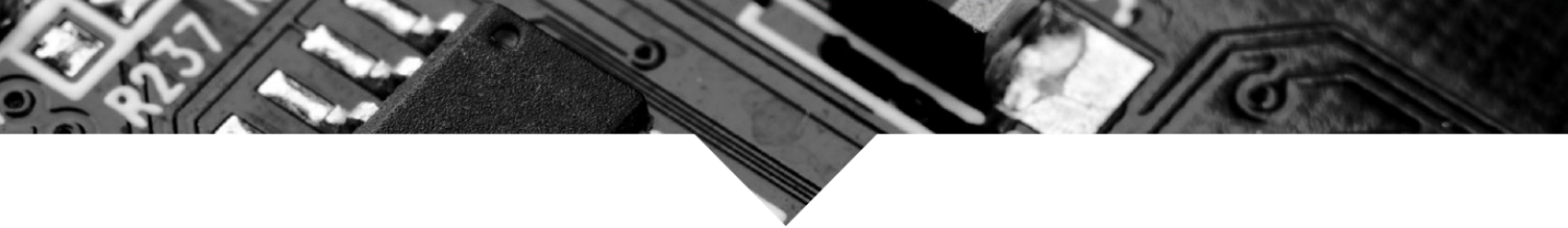
The Bead Electronics
Swaging Process:

**From Concept
to Reality**



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Unless you're in the metal fabrication industry, it's likely you aren't very familiar with what we do here at Bead Electronics. A quick glimpse at our website will tell you we develop, manufacture and distribute custom, high-quality tubular, solid wire and end-to-end interconnect pins. But how exactly do we do this? And what sets us apart from the competition? This whitepaper answers these questions and more but, to really give you an idea of what Bead Electronics does, we need to start with our process: swaging.

Swaging and Other Metal Fabrication Methods

There are so many metal forming methods, when picking one for your application or product, the choice can be overwhelming. Many methods have been around for decades (we've been swaging for nearly 100 years) and new ones are currently being developed. Let's take a look at some of the most common metal forming techniques in use today, specifically **die rolling, four-slide forming, deep drawing, progressive stamping, and of course swaging.**

Die rolling starts with round wire that is cut to a pre-determined length. These blanks are fed into tapered carbide dies with precision radii ground into each end. As the blank rolls through the die, the metal flows and takes on the shape of the die cavity. This process is very fast and very consistent. Only round, straight pins can be made this way.

Four-slide forming starts when round or square wire, or a flat metal strip, is fed past four movable slides. Each slide automatically performs a bending, forming, stamping or cutting operation as the metal passes by. Many different shapes can be made using this method, but tooling and setup can be complex.

Deep drawing starts with round blanks stamped from a continuous metal strip. The blanks are then transferred through a series of precision dies and punches that draw or stretch the blank to the desired final shape. The resulting seamless metal components offer a high level of precision and dimensional consistency. This process is best suited round parts like single or multi diameter shells and eyelets.

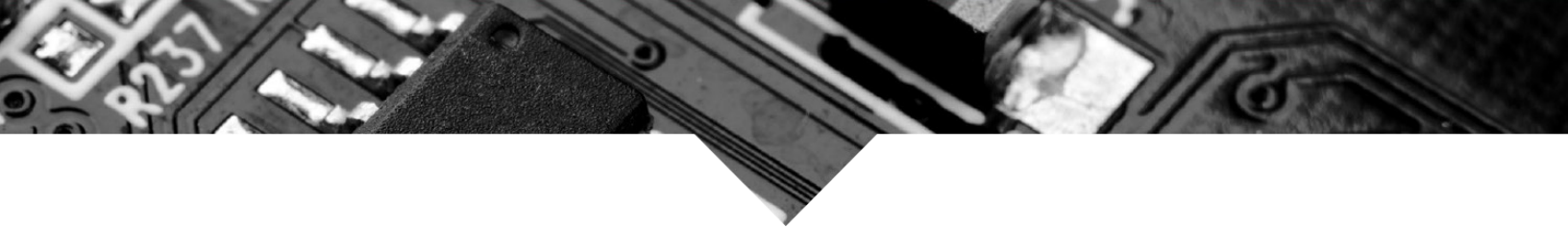
Swaging is a unique cold-forming process that starts when a continuous metal strip is pulled through a precision-

engineered draw die to form a seamed tube. Tube diameters are then reduced in progressive forming cavities. Oscillating the tube prevents die flash. Fully formed parts are then separated from the tube. Swaging is a high-speed, virtually scrapless process where metal is moved and not removed. It's capable of producing small, tubular metal components that are dimensionally consistent as well as inexpensive.

The swaging process helped to revolutionize the electronics industry in the 1920s when Bead developed inexpensive, high-quality contact pins for radio vacuum tubes. Swaging also produced the first smooth "parabolically revolved" wire pin tips in the 1960s, which helped the telecom industry reduce its gold plating specification by 50%. Even today, swaged pins are solving processing problems in the electronics industry. Bead's patented True Grip Pin is a hybrid design combining the mechanical strength and reliability of a through hole interconnect pin with the ease of surface mount processing. It also saves solder and gives PCB manufacturers a competitive advantage.

Over the years, Bead has developed solid wire and end-to-end interconnect pins using our unique swaging process. We've also invested in automated equipment to manufacture custom pin assemblies. All our products benefit from the inherent advantages of our scrapless, high speed, economical swaging process. Additionally, our end-to-end pins offer consistent lengths and smooth tips for precise cut-off and lower insertion force. Our wire pins are available with various retention and anti-rotation features like stars, collars, serrations, and barbs. Our customers in the automotive, telecom, connector, PCB assembly, medical and aerospace industries appreciate the precision, reliability and value of all our custom interconnect products.

As you can probably tell, we're partial to swaging over other metal fabrication methods, but it's not just because swaging



is what we do; we truly believe that swaging is the best choice for various applications because of the unique benefits it offers.

As mentioned above, one of the reasons swaged parts are inexpensive is because the process is virtually scrapless. We start with a 1000 pound coil of metal and end up with 1000 pounds of finished parts. Because swaging only moves metal and does not remove metal, we generate very little scrap. In addition, our tubular contacts weigh 40% less than comparable solid machined pins without sacrificing mechanical or electrical performance.

Less material, of course, means less cost. It's also more environmentally responsible. In other words, swaging can make your company greener while saving you money. If you're looking for a faster, cheaper, greener way to produce contact pins, look no further.

Now that you've learned a little about what swaging has to offer, let's focus on how Bead Electronics can help solve your interconnect problems.

Bead Electronics the Partner

When it comes to how we do business, we like to take inspiration from our swaging process and focus on efficiency, without sacrificing your needs. Whether you're a new customer or an existing one, we pride ourselves on acknowledging your order within 24-48 hours of that order being placed. This means that, within a couple of days, we will have entered your order, sent you a confirmation and will have a date of when you can expect that order to be complete.

After that initial encounter, we continue to be responsive to any and all customer inquiries and requests. This allows us to stay on top of your needs should they change, as well as serve you better. We believe it's important to work closely with customers in order to provide them with exactly what they need and

that it's crucial for any supplier to cover the basics, so you can feel fulfilled in terms of your needs being met.

This holds true in the long term as well. While our swaging process is capable of attracting return business simply because it offers a high degree of speed and affordability, we add to that with excellent customer service and consistency at every level. If you've worked with us before, you'll know exactly the quality we provide: attention, care, speed and cost effectiveness.

Bead Electronics the Manufacturer

While most people associate custom products with premium prices and long lead-times, Bead's automated design and manufacturing processes support our mass customization business model. We use state-of-the-art CAD, CAM, engineering knowledge and business software to deliver custom interconnect components quickly and inexpensively.

Is Swaging Right for You?

Now that you have a good idea of what swaging is and how we operate at Bead, you may be wondering if our process is right for you. We've been making economical, custom interconnect pins for challenging applications for over 70 years. While every process has limitations, we can generally design a pin to function reliably in your specific application. When you consider the advantages of swaging -- the precision, the quality and the cost effectiveness -- you'd be hard-pressed to find a better alternative.

So if "off the shelf" won't do and you need a custom interconnect pin, contact Bead today to see how we can make your vision a reality.



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