



# High Precision and High Reliability Machined and Plated Solutions

We solve engineering challenges for the harshest environment applications, including Medical, Aerospace, and Defense.

# Experience the benefits of our all-inclusive manufacturing complex.

With no outsourcing, our seamless operational setup allows you to individualize the services you need, do a combination, or select them all!



With ***“get it right the first time”*** accuracy, we deliver:

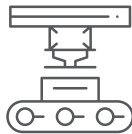
- » High Quality
- » Specialized Projects – we do things no one else can!
- » Everything under one roof, giving us end-to-end control of the project
- » Engineering support throughout your entire project
- » Catered to you! Pick the services you need!
- » Production Scaling

Choose the service you need - select one, multiple or all!



## High Precision Tools Shop

Realize better yields and increased efficiencies with tools made to maintain tight tolerances and high quality.



## Machining Center

We take on the smallest, most intricate parts with complex geometries.



## Plating House

We excel at MIL-SPEC plating and handling difficult plating issues involving complex geometries. Our gold plating is known for its unparalleled strength!



## Electromechanical Assembly & Design

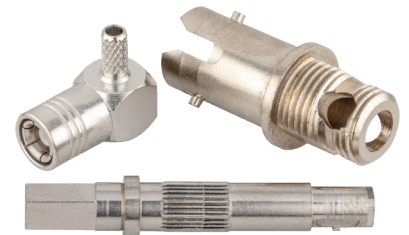
Design, prototype and production – we do it all in-house.



## Engineering Services

With decades of experience, our engineers will help you find the right solution, no matter how challenging the requirement!

## High Precision Tools Shop



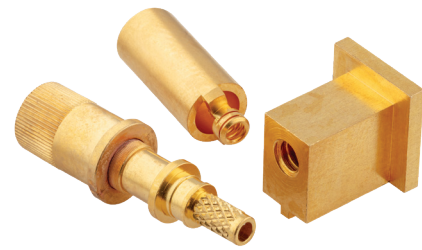
**Precision tooling, the fabrication of components and assemblies to meet exact specifications for manufacturing, is crucial for consistency and efficiency of high-quality finished products.**

Our tooling proficiency was born out of necessity – we make our own tools so that we can hold the tolerances, polishes and surface finishes required to manufacture the high-quality, high-reliability products we make. We can do this for you, too!

Our dedicated team has worked with the most demanding industries, including medical, aerospace, defense, automotive, telecom and more, and are known to get things to fit the first time – saving time and money. From design to precision manufacture, the team's unparalleled expertise combined with our high quality tools and fixtures lead to high quality precision products. Our products are built to better tolerances, have a better surface finish, and have reduced defects.

## High Precision Tools Shop

*continued*



The ability of our tools to maintain exact tolerances is well aligned with needs in the medical and defense industries. We have a variety of competencies – arbour press tooling, bend/forming, punch and cut, nested, Rockwell hardening – that make our tools second-to-none! We work together with you to design a tool that meets your requirements, no matter how challenging!

### Capabilities:

- » Work from customer-provided drawings, or we can draw
- » Tools made for manual and automated equipment; hand-held or machine-operated
- » Machine repair parts or refabricate equipment
- » Produce all kinds of machine parts
- » Surface finishing
- » Fixtures
- » Specialized components
- » Die fabrication
- » Tool hardening to perform in harsh environments

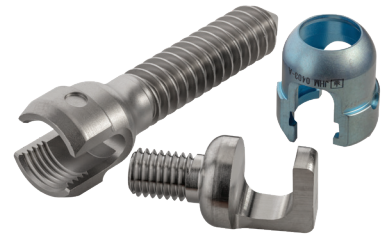
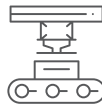
### Benefits:

- » Our tools are ready for immediate use
- » Increase efficiencies and yield
- » Increase quality levels
- » Improve finished product
- » Reduce equipment jams
- » Cost effective and saves time!

### Materials Used:

- » Brass
- » Steel
- » Stainless Steels
- » Invar
- » Copper alloy C11000
- » Aluminum
- » Plastics
- » Machineable ceramics
- » Graphite

## Close Precision Machining Center



**Knowles has been fabricating various metal parts with Swiss Screw Manufacturing techniques since 1947. Our machinists have over 200 years of combined Swiss Screw experience.**

Swiss machining is capable of producing extremely small intricate parts with little margin for error. Traditionally, Swiss machines have been used for parts like screws; however, they can also produce components that have no turned surfaces at all.

Our precision machining center focuses on concentricity, line-to-line fit and tolerance in order to provide the best performance. We have a reputation for taking on the smallest, most intricate parts with complex geometries for medical, aerospace and defense and industrial applications:

- » Bone Screws
- » Spinal rods
- » RF connectors
- » RF tuning components
- » Precision valves and hose connectors
- » Precise mechanical lock components for high security applications in national defense

### Capabilities:

- » Our equipment has 24 hr auto loading ability
- » We can handle a variety of materials, including: Brass C26000 Half Hard, Phosphor Bronze, Teflon, Delrin, ABS Plastic, Titanium, Kovar, Invar 36, Alloy 42, Stainless Steel, (303, 416, 440), Copper Alloy, C11000, and Aluminium, 6061-T6, 2011-T3
- » Threading up to 200 threads per in., thread diameters up to 32 mm

- » Tolerance capability  $\pm .0002$ " on diameters,  $\pm .0005$ " on lengths
- » Unlimited geometries with the milling, cross drilling, cross-tapping and saw slotting capabilities
- » Standard tolerances:  $\pm .0002$ " for diameters, and  $\pm .0005$ " for lengths

### Benefits:

- » Extremely tight tolerances
- » Complex parts
- » Press-fit for dimension control
- » Variety of materials for use

## Specialist Plating House



Knowles has been barrel and rack plating components for over 60 years. Our experts are often sought out for their experience and ability to handle difficult plating issues. We work closely with you to adapt and customize our plating process to fit your requirements!

### Capabilities:

- » Plate exotic stackups that aren't readily available industry-wide
- » Plate challenging geometries (for example, plating throws into a threaded hole or blind via)
- » Thread Plating
- » Temperature handling
- » Our Gold plating exceeds all ASTM and MIL specifications for temperature withstanding and adhesion
- » Plate a variety of materials, including: Invar, Kovar, Brass and Copper

### Automated Barrel Plating:

- » Gold, Copper, Silver, Bright Tin, Tin/Lead 60/40, Nickel, Electrodes Nickel, Passivation
- » Military and American Society for Testing and Materials (ASTM) compliant
- » Adhesion testing available
- » Inspection and certification options
- » Piece part size range from .002in<sup>2</sup> - 2.5in<sup>2</sup>
- » In-house chem lab ensures proper chemistry of plating solutions

### MIL-SPEC Plating:

- » Military specifications (MIL-SPECS) require products to meet tight tolerances and have the durability and reliability to withstand harsh environments. Our unmatched proficiency in plating parts with unique and complex geometries has earned Knowles Precision Devices the reputation as the go-to manufacturer for plating numerous Aerospace, Military & Defense projects.
- » We are ISO 9001:2015 certified, and ASTM compliant.

## Electromechanical Assembly Design & Prototyping



Not only can we design and prototype, we can produce the part! Since we manufacture our own tooling – allowing us to maintain excellent tolerances – standing up an assembly capability for a custom product is right in our wheelhouse!

- » Off-the-shelf products such as trimmer capacitors
- » Custom work:
  - o Baluns
  - o Air Core inductors
  - o Custom RF Connectors
- » Press-fits, soldering, hand assembly



## Engineering Services



**Our experts are there for you every step of the way!**

No matter what service you are interested in, our engineers are problem solvers and eager to help you find the right solution.

Visit our website at [www.knowles.com](http://www.knowles.com) for more information and a complete list of our products and services.