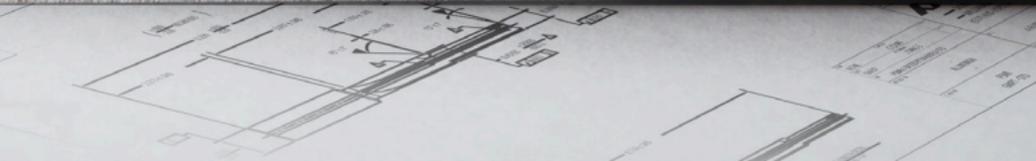




 **PRECORP**  
Aerospace Solutions



# Commitment to Quality

We appreciate your interest in **PRECORP** precision tooling. We are dedicated to the improvement of advanced material machining.

Our quality objectives are:

- *Quality Tooling*
- *On-Time Delivery*
- *Competitive Pricing*



We actively help solve the challenges our customers face. **PRECORP** has a long history of solving difficult applications in the aerospace and automotive industries. We have the ability to conduct in-house testing and designing with our current equipment. In addition, we have the resources to accommodate difficult and new applications.

**PRECORP**'s engineering team offers a unique knowledge of the ever changing applications of its customers and they work to create the most effective tooling solutions. Please feel free to consult our MARCS engineering group with any concerns or questions you may have.

Regards,  
John Bunting, **CEO**  
Rich Garrick, **President**



**PRECORP INC** was founded in 1986 to manufacture PCD drills using a new patented vein process. These drills found success in the aerospace industry drilling precision fastener holes in Carbon Fiber Reinforced Composites (CFRP). Over the years we have added new PCD cutting tools and entered new markets expanding our PCD tool offering to reamers, end mills, spot facers, milling and turning inserts, and countersink tools.

With the acquisition of PCD Carbide Tooling Company in 2003, **PRECORP** added custom carbide tooling to provide their customers with a complete solution for their machining applications.

**PRECORP**, with its four manufacturing facilities, is focused on providing innovative solutions to difficult machining operations in both PCD and carbide cutting tool designs. **PRECORP** offers complete reconditioning services as well as new tool design and production.

**PRECORP** continues to incorporate the newest and latest manufacturing technologies, advancing creation of breakthrough tooling solutions.



## We Specialize in Custom Tooling

All **PRECORP** tooling is custom built to our customers specifications. Included in this brochure are some of our most common drill geometries that are used in aerospace applications. All of our point geometries can be manufactured on tooling that includes any of the following variations:

- *Custom Shanks*
  - Flat/Tang
  - Threaded Steel Adaptor
  - Hydraulic/Precision
  - Heat Shrink
- *Through Tool Coolant*
- *Countersinks*
- *Custom PCD Grades*
- *Tight Tolerances*



**PRECORP** has created the **MARCS** engineering group to support customers with tool selection and development. Over many years of experience, several tool geometries have been developed that provide excellent performance in advanced aerospace materials.

General Solutions			
	Material	PCD	Carbide
<b>Automated</b>	CFRP	85	85C
	CFRP/Metal	86	40 DH
<b>Powerfeed</b>	CFRP	86PT	85C
	CFRP/Metal	86PT	PD
<b>Hand-Held</b>	CFRP	-	PHT
	CFRP/Metal	-	CMD

Everyday industry standards are improving. Previous and common solutions sometimes fail to meet the new requirements of higher quality aerospace products. Hence, the **MARCS** group utilizes all types of drilling machinery to develop new tooling for meeting any drilling requirements.



# Automated Solution 85



- PCD Veined Technology
- Designed for automated drilling of CFRP
- Upsharp cutting edge
- Features Precorp 'Chip Blocker'
- Available sizes: 0.125"-0.625" (3-16 mm)

The 85 Series geometry was designed specifically for new-age CFRPs. It is a sharp PCD-veined tool that maintains a keen edge even in the most abrasive CFRPs. It is built with a durable 4 facet point, conventional split gash, and has a standard 24° helix.

The Precorp 'Chip Blocker' exists on the outer diameter of the cutting edge to strengthen the corner and allow faster machining of CFRP. Customers report successes drilling at 10,000+ RPM.

The 85 series has proven its performance with both excellent entrance and exit quality in CFRP. As all CFRPs have different machining qualities, we've found that the 85 series is generally the best tool for any CFRP drilling application.

### Recommended Cutting Speeds

<b>CFRP</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
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\*Decrease advance rate to .001 ipr (.03 mm/rev) for improved breakout and delamination.

# Automated Solution 86



The 86 series is designed with unique micro-grinds located in high stress concentrated areas. These grinds allow the 86 series to maintain durability and sharpness.

The 20° included angle on the outside of the point cuts fibers with low thrust, leaving minimal fiber breakout and delamination.

The 86 has two common point angles. For CFRP/Aluminum we recommend a 118° point or 86A, and for material stacks involving titanium we recommend a 135° point or 86B.

The sharpness of the 86 series provides a clean cut as the drill exits the material stack, yielding small exit burrs.

- PCD Veined Technology
- Designed for CFRP/Metal
- Micro-Grinds in High Stress Areas
- Available sizes: 0.125"-0.625" (3-16 mm)
- Coolant in Metal Recommended

### Recommended Cutting Speeds

<b>CFRP</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
<b>Aluminum</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
<b>Titanium</b>	50 sfm (15 smm)	.001 ipr (.03 mm/rev)

# Automated Solution 85<sub>C</sub>



- *Tungsten Carbide*
- *Designed for CFRP only*
- *20° included point angle cut fibers*
- *Features Precorp 'Chip Blocker'*
- *Available sizes: 0.050"-1"+ (1-25+ mm)*

The 85 Series geometry was designed specifically for new-age CFRPs. It is a sharp carbide tool built with a durable 4 facet point, conventional split gash, and has a standard 24° helix. The carbide version of the PCD 85 series mimics the performance of PCD 85, but wears quicker and costs less. The 85C is ideal for CFRP applications requiring few holes.

The Precorp 'Chip Blocker' exists on the outer diameter of the cutting edge to strengthen the corner and allow faster machining of CFRP. Customers report successes drilling at 10,000+ RPM.

For CFRP-specific cutting tool geometries, please contact the MARCS engineering group.

### Recommended Cutting Speeds

<b>CFRP</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
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\*Decrease advance rate to .001 ipr (.03 mm/rev) for improved breakout and delamination.

US Patent 7,575,401

# Automated Solution 40<sub>DH</sub>



With the wide applicability of aluminum drilling the 40DH was designed with a high-helix angle for improved evacuation of metal chips. The 40DH also features a very durable cutting edge, making it a suitable candidate for drilling CFRP and titanium as well.

Customers report that they are able to drill high-tolerance holes in thick aluminum stacks with the 40DH at speeds up to 24,000 RPM.

For high-tolerance, automated drilling we offer a 'high-rake' version of the 40DH that provides a sharper cut in aluminum.

- *Tungsten Carbide*
- *Designed for Aluminum Drilling*
- *Also works with CFRP/Metal*
- *40° helix angle and thin lands for chip ejection*
- *Available sizes: 0.050"-1"+ (1-25+ mm)*

### Recommended Cutting Speeds

<b>CFRP</b>	200 sfm (60 smm)	.005 ipr (.13 mm/rev)
<b>Aluminum</b>	200 sfm (60 smm)	.005 ipr (.13 mm/rev)
<b>Titanium</b>	60 sfm (18 smm)	.003 ipr (.08 mm/rev)

# Powerfeed Solution 86PT



- *PCD Veined Technology*
- *Durable Design for Powerfeed in CFRP/Metal*
- *Carbide-Shielded PCD Vein*
- *Available sizes: 0.125"-0.625" (3-16 mm)*
- *Coolant in Metal Recommended*

The 86PT features a carbide-shielded PCD vein making it much more durable for less rigid setups like powerfeed applications.

The 86PT has two common point angles. We generally recommend a 118° point or 86APT, but for material stacks exiting titanium we recommend a 135° point or 86BPT. If exiting CFRP, we recommend the 86APT-R, featuring more axial cutting rake.

Many powerfeed applications require specialty shanks. Precorp currently tests with many powerfeed manufacturers globally to improve powerfeed applications. The 86PT is

available with any shank design.

## Recommended Cutting Speeds

<b>CFRP/ Aluminum</b>	200 sfm (60 smm)	.005 ipr (.13 mm/rev)
<b>Titanium in Stack</b>	50 sfm (15 smm)	.001 ipr (.03 mm/rev)

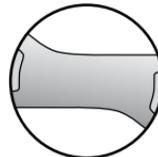


# Powerfeed Solution PD

The PD Series drill was designed for CFRP / Metal stack drilling. This rugged drill shines in a one-shot CFRP/Aluminum/Titanium power-feed application.

The unique feature of the drill is in the flute form. The flute is designed for both maximum chip clearance and strength. The picture below shows a cross-section of the flute form. The cross-section resembles the cross-section of a tang. The form has a heavy web and a wide flute opening. The drill has double margins to enhance hole roundness and stability in bushings.

- *Tungsten Carbide*
- *Designed specifically for CFRP/metal drilling*
- *Flute form that maximizes chip clearance and strength*
- *Available sizes 0.050"-1"+ (1-25+ mm)*



## Recommended Cutting Speeds

<b>CFRP</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
<b>Aluminum</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
<b>Titanium</b>	60 sfm (18 smm)	.002 ipr (.05 mm/rev)

# Handheld Solution PHT



- *Tungsten Carbide*
- *Designed specifically for hand drilling CFRP*
- *Left hand helix on a right hand cut*
- *Available diameters 0.050"-1"+ (1-25+ mm)*

The PHT was a specific solution to handheld drilling of CFRP. This tool features a left hand helix on a right hand tool. **PRECORP** created a product that not only drills a clean hole but also allows an inexperienced operator to successfully and quickly drill.

The design of the PHT tools included measures to counterbalance the thrust forces applied by the operator when drilling the hole, thereby allowing the drill bit to slowly exit the CFRP material and avoid the damage that often occurs with drill bits of a straight flute design. Additionally the PHT tool line design eliminated much of the 'grab' that was common among conventional or right hand flute design, thereby eliminating many potential risks to the operator.

### Recommended Cutting Speeds

<b>CFRP</b>	200 sfm (60 smm)	.002 ipr (.05 mm/rev)
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# Handheld Solution CMD

The Composite Metal Drill (CMD) was specifically designed for hand drilling of composite/metal stacks. The CMD has been successfully utilized in stacks containing aerospace CFRP and several metals including aluminum, titanium and stainless steel.

The CMD comes in both piloted and unpiloted designs for predrilled and non-predrilled applications. The point design allows the drill to center itself quickly and not wander on the surface of the part. Once the drill engages in the cut, minimal force is required by the operator to finish the hole. When used with a handheld guide bushing the CMD produces holes with minimal size difference between materials in the stack.

- *Tungsten Carbide*
- *Designed for handdrilling composite/metal stacks*
- *Double margin for increased hole roundness*
- *Available sizes 0.050"-1"+ (1-25+ mm)*

### Recommended Cutting Speeds

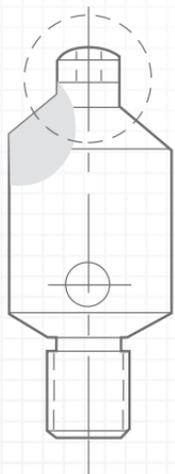
<b>CFRP</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
<b>Aluminum</b>	200 sfm (60 smm)	.003 ipr (.08 mm/rev)
<b>Titanium</b>	50 sfm (15 smm)	.002 ipr (.05 mm/rev)
<b>Stainless Steel</b>	50 sfm (15 smm)	.002 ipr (.05 mm/rev)

# Single Flute Countersink



The Precorp Single Flute Countersink was specially designed for countersinking CFRP.

- PCD Cutting Edge allows **Multiple Re-sharps**
- **Carbide Pilot** is substantially more durable than steel, maintaining accuracy
- All specifications and dimensions are **Customer Specific**
- Single flute makes the **Radius More Accurate**
- **No Variability** caused by lip height between flutes
- **Lower Life Costs** than multi flute styles



*Multi-Flute styles also available.*

# We Are Drill Experts

## MODULAR DRILL COUNTERSINKS

**PRECORP** has developed a modular drill countersink, PMC, that keeps runout under control. The removable countersink insert uses high tolerance surfaces to maintain accuracy and precision.



## MICRO TOOLS

Precorp has a long history of producing PCD micro-tools for machining of circuit boards and other industrial parts. Micro tools are available in both carbide and PCD in sizes greater than 0.012 inches (.3 mm).

## REAMING AND MILLING

For any reaming or milling application, **PRECORP** can build customized tooling solutions. Many of our customers find that when precision is a must, our PCD and carbide reamers are the ultimate solution.

## OTHER TOOLING

As with all our tooling, we are expert at creating new designs for customer specific applications. We can design and build



any custom cutting tool needed. Feel free to contact us to discuss a customized solution for any machining need.

# Polycrystalline Diamond (PCD) Process

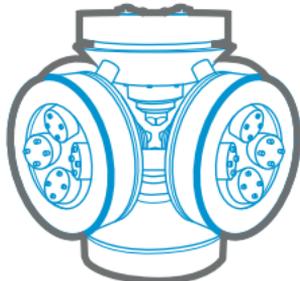
## Step 1

A carbide blank is slotted and (PCD) polycrystalline diamond powder is inserted.



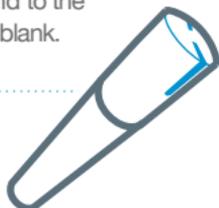
## Step 2

The carbide blank is inserted into one of Precorp's high-pressure, high-temperature presses and subjected to 2,700 degrees F and 876,000 psi. In this process the diamond powder is compressed and the diamond crystals are bonded to each other and to the carbide blank.



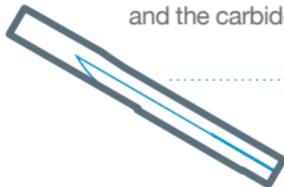
## Step 3

The PCD nib is then brazed to a solid carbide shank. The braze is located sufficiently away from the tip of the tool to avoid any potential thermal damage. This allows the use of a high-temperature high-strength braze joint between the nib and the carbide shank.



## Step 4

The tool geometry is ground to produce the finished PCD tool. This patented process allows for many tool geometries that were impractical and/or impossible using conventional PCD insert processes.



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