

Precision Tungsten Carbide Parts Manufacturing for Tooling Applications

Tungsten carbide (WC) is prized in tooling for its **extreme hardness, wear resistance, and thermal stability** ¹ ² . With a Mohs hardness of about 9–9.5 and a melting point around 2780°C ³ , carbide tools stay sharp and cool under high-speed cutting. Industry sources note that sintered carbide cutters are “very abrasion resistant” and tolerate higher temperatures than steel tools ⁴ . Shenzhen Xinxin Precision Equipment Co., Ltd. leverages these material advantages to manufacture custom tungsten carbide punches, dies, nozzles, inserts, needles and more. Our advanced CNC machining, EDM and chemical etching capabilities yield ultra-fine tolerances, superior finishes, and long service life in high-performance tooling components.

Key Properties of Tungsten Carbide

- **Extreme Hardness:** Tungsten carbide ranks ~9.0–9.5 on the Mohs scale (Vickers hardness \approx 1500–2500 HV) ¹ ² , far above hardened steel.
- **Outstanding Wear Resistance:** The high hardness gives carbide exceptional abrasion resistance; carbide cutting tools maintain sharp edges much longer than steel and cut abrasive materials with minimal wear ⁴ ¹ .
- **Thermal Stability:** With a melting point near 2780°C and thermal conductivity \sim 110W/m · K ⁵ , WC dissipates heat well. This lets carbide tools run at higher speeds and temperatures without softening ⁴ .
- **Chemical Durability:** Tungsten carbide is largely inert in most environments (resisting oxidation and acids), so carbide parts tolerate corrosion and high-heat oxidation better than many tool steels.

Common Tungsten Carbide Tooling Parts

Shenzhen Xinxin produces a wide range of WC components for tooling, including:

- **Punches & Dies:** Precision carbide punches, dies and die inserts for metal stamping, blanking and forming tools.
- **Nozzles & Spray Tips:** High-wear nozzles and orifices for abrasive blasting, fluid dispensing, or cutting heads.
- **Insert Tools & Blades:** Cutting inserts, endmills, blades and form tools made of carbide for high-speed machining.
- **Micro Components:** Tiny carbide pins, bushings, spacers and precision shims for micro-manufacturing and MEMS tooling.
- **Custom Tungsten Needles:** Fine tungsten wire needles and probes used in electronic testing and medical devices.

Tungsten carbide components like blast nozzles (shown above) exemplify the material’ s durability in abrasive service ⁴ . Shenzhen Xinxin manufactures such parts to exact dimensions, ensuring each nozzle, punch pin or insert meets your specifications.

Advanced Manufacturing: CNC Machining, EDM & Etching

We use multiple precision processes to shape carbide parts:

- **CNC Machining:** Multi-axis CNC milling and grinding with diamond tooling produces **precision tungsten components** at sub-micron tolerances ⁶. Complex geometries (3D contours, complex cores) are machined directly, enabling tight-tolerance features that meet demanding tooling drawings.
- **EDM (Wire & Sinker):** Electrical-discharge machining erodes carbide using controlled sparks, ideal for creating intricate shapes, deep cavities and fine slots that conventional cutting can't reach ⁷. EDM is especially useful for sharp internal corners and micro-features without inducing mechanical stress.
- **Chemical (Photo) Etching:** We also employ advanced photochemical etching of tungsten and tungsten-alloy parts. In this process a precision mask defines the part outline and controlled acids "wash away" the exposed material. This allows **ultra-fine features** and burr-free tungsten parts (e.g. etch-formed grids, springs, membranes) useful in aerospace, medical, and electronics applications ⁸.

These combined capabilities let Xinxin handle everything from pressing/sintering carbide blanks to final shaping, finishing and inspection.

Special Focus: Custom Tungsten Needle Production

Shenzhen Xinxin excels in producing **fine tungsten needles and probes** to customer spec. Tungsten needles are typically drawn from 99.95% pure tungsten or W-Re alloy, yielding exceptional stiffness and hardness even at diameters of a few microns ⁹. Such needles are commonly used as instrument probes (e.g. 4-point wafer probes, micro-assembly probes) because tungsten "pierces the oxide layer to enable signal test" on semiconductor wafers ¹⁰. We offer custom wire drawing, grinding and tip-polishing to create needles with precise length, tip angle and geometry. Whether you need probe needles for IC testing, micro-injection, or medical micromanipulation, our process yields consistent sharp tips and straightness every time ⁹ ¹⁰.

Technical Advantages: Accuracy and Durability

By combining superior materials with precise processes, our tungsten carbide parts deliver technical advantages that tooling engineers demand:

- **Ultra-fine Tolerances:** We routinely achieve micron-level accuracy. For example, carbide tooling has been produced with tolerances down to $\pm 0.005\text{ mm}$ ¹¹. This level of precision ensures exact fits in dies, molds and fixtures.
- **Superior Surface Finish:** Polished carbide surfaces (e.g. $R_a \sim 0.01\text{ }\mu\text{m}$) reduce friction and wear. In one case, finished carbide tools achieved an extremely smooth $R_a 0.01$ ¹¹, crucial for high-precision manufacturing.
- **Dimensional Stability:** Tungsten carbide exhibits **exceptional dimensional stability** under stress and temperature ¹². Carbide posts, spacers and inserts hold their shape without creep or distortion, ensuring that a mold or die maintains tolerances over long production runs ¹².
- **Repeatability:** Our quality systems ensure each custom component matches the approved sample. We measure and control processes so that every batch of custom parts is identical (high repeatability) ¹².

- **Longevity:** Because WC is so hard and thermally robust, our parts yield **long tool life**. Cemented carbide inserts and punches last far longer than steel tools in abrasive stamping, forging or cutting, making them cost-effective despite the higher upfront cost ¹³ .

Application Areas

Precision tungsten carbide parts find critical roles across industries:

- **Tool & Die Manufacturing:** Carbide punches, dies and mold cores deliver lasting precision in stamping, blanking, and injection molding.
- **Cutting & Metalworking:** Carbide inserts, endmills and form tools cut machining cycles dramatically. These tools hold sharp edges longer, improving throughput in automotive, aerospace and heavy industry ¹⁴ .
- **Electronics & Semiconductors:** Fine carbide pins and tungsten probe needles are used in wafer test equipment and micro-assembly, providing the needed precision and rigidity ¹⁰ .
- **Plastics & Molding:** Carbide nozzles and valve components in extrusion and blow molding run continuously under heat and pressure while maintaining tight tolerances.
- **Wear-Resistant Parts:** Components like pump plungers, seals, and valve seats in oil, gas and mining equipment exploit carbide's abrasion resistance ⁴ .
- **Medical & Dental:** Surgical instrument tips, dental burrs and orthopedic tool inserts use tungsten carbide for durability and biocompatible hardness.

By choosing WC for these applications, manufacturers achieve consistent part quality and longer maintenance intervals.

Why Shenzhen Xinxin Precision Equipment?

Shenzhen Xinxin Precision Equipment Co., Ltd. is a dedicated source manufacturer of precision metal parts, with a specialty in tungsten and refractory metals. Established in 2011, we combine an ISO-quality production environment with years of carbide expertise. Our facility houses advanced multi-axis CNC machines, EDM stations, grinding centers and a wet/chemical etching lab. This in-house toolkit lets us handle everything from sintered carbide blanks to fully finished components. We work closely with customers on custom designs, providing engineering feedback, prototype runs and volume production under tight quality control. With Xinxin, tooling companies worldwide get cost-effective custom tungsten carbide solutions with on-time delivery and consistent quality.

Contact & Custom Orders

Ready to upgrade your tooling with precision tungsten carbide parts? **Contact Shenzhen Xinxin Precision Equipment Co., Ltd. today** for a quote or custom design. Email us at info@machinedesign.top or visit our website machinedesign.top to discuss your requirements. Our engineering team will respond promptly to help you specify and order the custom tungsten carbide components you need.

Keywords: tungsten carbide parts, custom tungsten components, precision tungsten machining, carbide tooling, tungsten needle manufacturing

Sources: Material properties and use cases are confirmed by industry references ¹ ² ⁴ ¹¹ ¹² ¹⁰ .

1 14 Characteristics of Tungsten Carbide: The Ultimate Guide|Blog|ZCCF

<https://www.zccfcarbide.com/Article/characteri.html>

2 3 4 5 Tungsten carbide - Wikipedia

https://en.wikipedia.org/wiki/Tungsten_carbide

6 CNC Machining Tungsten Carbide: Everything You Should Know

<https://www.dekmake.com/machining-tungsten-carbide/>

7 Wire EDM | RAM EDM | Tungsten Carbide EDM

<https://www.basiccarbide.com/edm-tungsten-carbide/>

8 Tungsten Chemical Etching - Acid Etched Tungsten Parts | Fotofab

<https://fotofab.com/metals-we-etch/tungsten-photo-etched-parts/>

9 Tungsten Needle | Refractory Metals and Alloys

<https://www.refractorymetal.org/tungsten-needle.html>

10 A Closer Look at Utilizing Tungsten Wire for Probes - Metal Cutting Corporation

<https://metalcutting.com/knowledge-center/a-closer-look-at-utilizing-tungsten-wire-for-probes/>

11 13 Tungsten carbide tools with extreme tolerances [Case]

<https://www.sollex.com/blog/post/sollex-supplies-carbide-tools-with-extreme-tolerances>

12 Exploring California Nanotechnologies' Tungsten Carbide Tooling

<https://www.calnanocorp.com/nanotechnologies-news-corner/exploring-california-nanotechnologies-tungsten-carbide-tooling>