MONO

Shenzhen Monochromaticity Technology CO.,LTD

Femtosecond Laser Extreme Manufacturing
Technology & Equipment Provider

CONTENT

About Us

MONO

Engineered to the Femtosecond Laser Frontier.

Headquartered in Guangming District, Shenzhen, we are dedicated to the research and application of femtosecond laser micro-machining technology. Our business encompasses equipment R&D, manufacturing, sales, as well as testing and processing services. We provide extreme-precision manufacturing solutions—achieving ultra-high precision, minimal dimensions, massive quantities, and rapid efficiency—for a wide range of difficult-to-process materials. From China to the globe, our technology is widely trusted and adopted by clients across industries, including biomedical, semiconductor microelectronics, and aerospace.

Corporate Values

· **Integrity & Reliability:** We honor every trust placed in us by consistently delivering exceptional customer service.

· **Technology-Driven:** We build our competitive advantage through relentless technological innovation.

· **Shared Success:** We foster a supportive and high-achieving community by sharing common goals and celebrating mutual success.

Production Base
5000+m^2

Employees
60+人

R&D Team
30+人

R&D Experience
10+年

Some of Our Partners

MONO

Well-known Enterprises

HUAWEI
oppo
新凯来 SiCARRIER
启尔机电
常州纺兴
华天科技 HT-Tech
中国航天科技集团公司 China Aerospace Science and Technology Corporation
Keyto 星拓
Lifetech 先健 SCIENTIFIC
ACOTEC 先瑞达
NURTRON 诺尔康
MicroPort 微创
贵研铂业
forssmann
Junray 众瑞仪器
CETC 中国电科
Fisher 费世科技
威视 NUCTECH

Universities & Research Institutes

北京大学 PEKING UNIVERSITY
清華大學 Tsinghua University
浙江大学 ZHEJIANG UNIVERSITY
北京理工大学 BEIJING INSTITUTE OF TECHNOLOGY
电子科技大学 University of Electronic Science and Technology of China
上海交通大學 SHANGHAI JIAO TONG UNIVERSITY
西安交通大學 XI'AN JIAOTONG UNIVERSITY
中国科学院半导体研究所
中国科学院光电技术研究所 Institute of Optics and Electronics, Chinese Academy of Sciences
中国工程物理研究院 CHINA ACADEMY OF ENGINEERING PHYSICS
核工业北京地质研究院 BEIJING RESEARCH INSTITUTE OF URANIUM GEOLOGY CNNC
国防科技大学 National University of Defense Technology
哈爾濱工業大學 HARBIN INSTITUTE OF TECHNOLOGY
復旦大學 FUDAN UNIVERSITY
北京航空航天大學 BEIHANG UNIVERSITY
中国核动力研究设计院 Nuclear Power Institute Of China

Understanding Femtosecond Laser

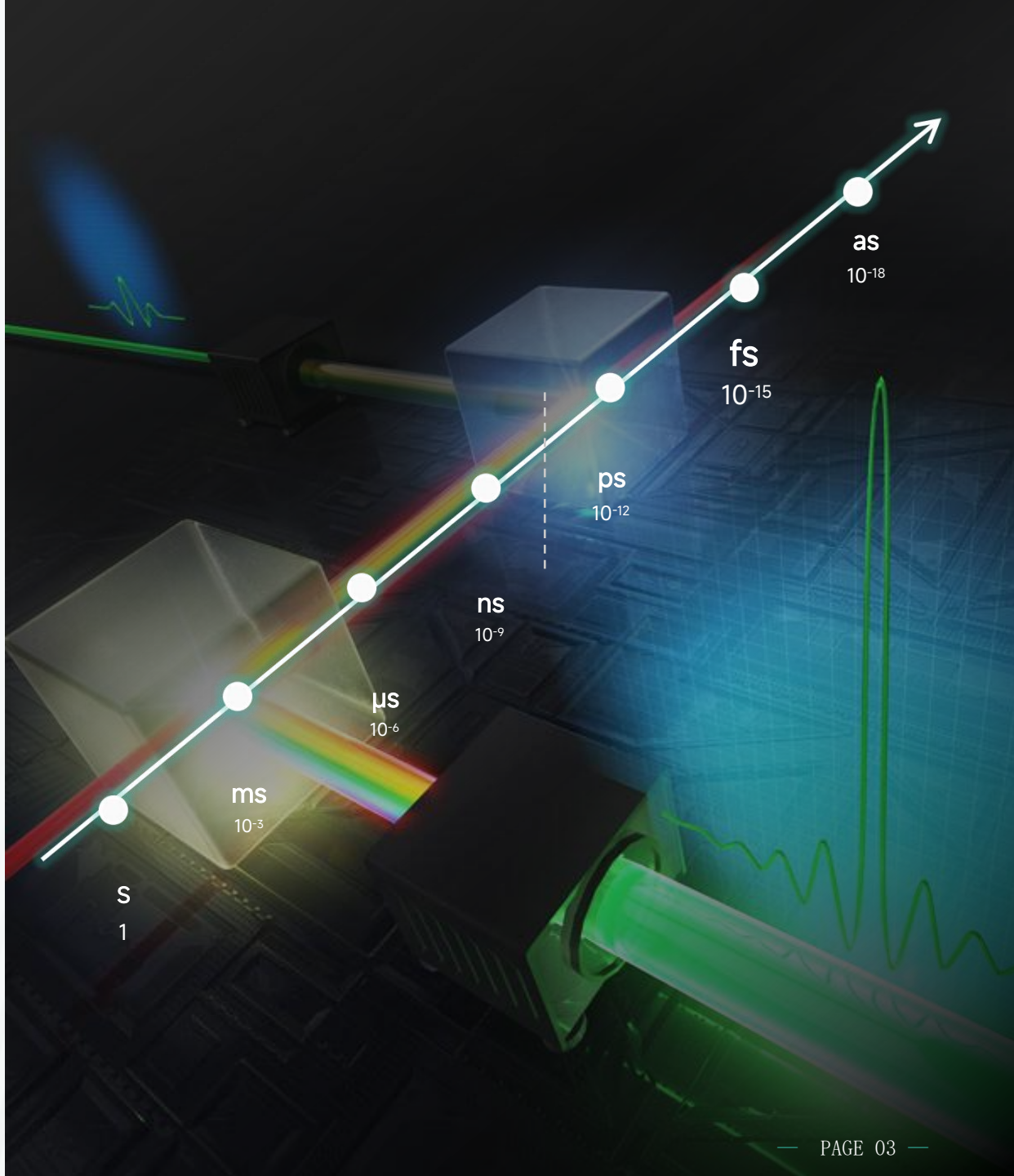
What is a Femtosecond Laser?

Femtosecond laser is an ultrashort pulse laser, featuring extremely high peak power and energy density, which can directly ionize materials. Its core advantages include: an extremely small heat-affected zone, extremely high processing precision, and being material-independent—advantages that conventional lasers can hardly match.

Types of Laser Pulse Widths

Classified by pulse width, commonly used pulse lasers mainly include: nanosecond (ns), picosecond (ps), and femtosecond (fs).

Pulse Width	Definition	Displacement @ Speed of Light	Displacement @ Speed of Sound
Picosecond	10^{-12}s	0.3 millimeter	0.34 millimeter
Femtosecond	10^{-15}s	0.3 micrometer	0.34 micrometer
Attosecond	10^{-18}s	0.3 nanometer	0.34 kilometer



Understanding Femtosecond Laser

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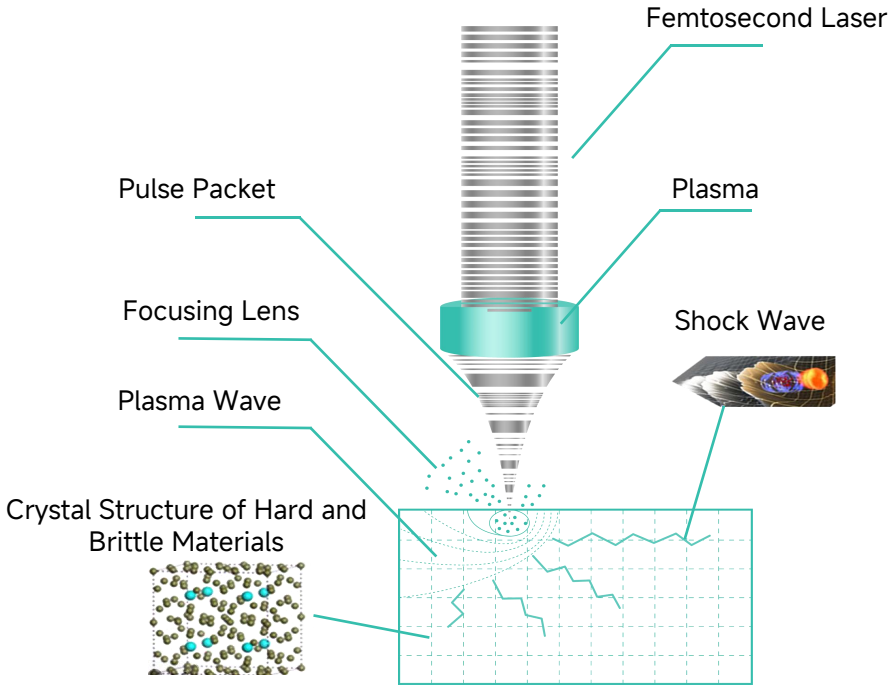
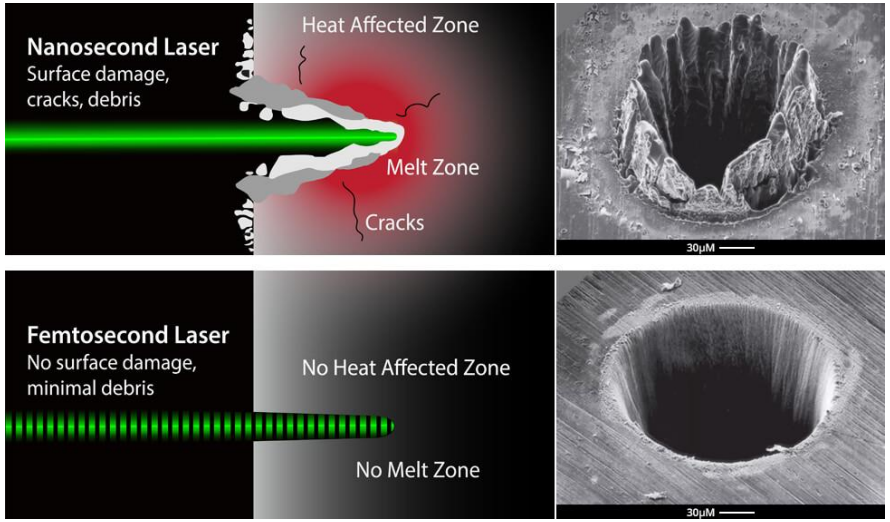
Processing Principle

High peak power femtosecond laser relies on Coulomb repulsion to break molecular bonds of materials, involving multiple complex reactions such as nonlinear photoionization and avalanche ionization.



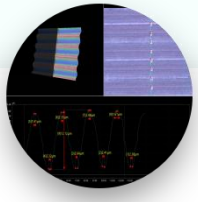
Processing Advantage Comparison

- **Long-pulse Laser:** Long interaction time with material surface. Material heats, melts, vaporizes—leaves debris/recast layers; adjacent structures have stress deformation. Suitable for general processing (e.g., PCB depaneling in 3C electronics).
- **Short-pulse Laser:** High peak power, ultra-short interaction time. Material vaporizes directly—no recast layers, microcracks, or stress deformation. Ideal for extreme intelligent manufacturing.



Key Technologies

MONO



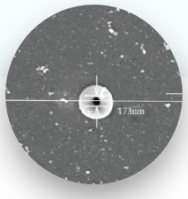
Closed-Loop Laser Power Monitoring & Compensation

Ultra-high precision power stability for nanoscale depth/3D reconstruction

Key: Dual real-time monitoring + dynamic compensation

< ±0.1%

Laser power fluctuation



Nanoscale Laser Micro-Nano Processing System

Sub-wavelength focusing for sub-micron extreme manufacturing

Key: Multi-sensor fusion + closed-loop control

< 200nm

Minimum linewidth

Spatial Attitude Adaptive Positioning System

Ultra-precise adaptive processing on complex curved surfaces

Key: 3D vision reconstruction + real-time trajectory compensation

5μm/0.05°

Spatial adaptive accuracy

Real-Time Digital Twin System

Virtual simulation boosts efficiency & precision

Key: Full-process high-fidelity simulation + intelligent trajectory optimization

20%

higher efficiency

80%

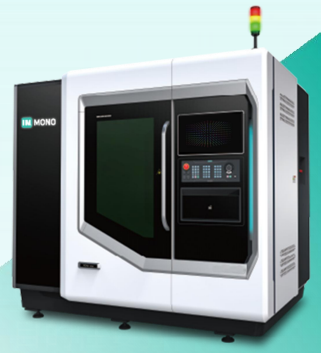
lower error costs

Femtosecond Laser Micro-Nano Processing Solutions

Full-cycle services (development & verification / equipment delivery / technical optimization)
to accelerate customers' product upgrade and implementation.

01

Special-Shaped Microhole Drilling



ML-VORTEX

02

Curved Micro Structure Etching

ML-ETCH

03

Thin Sheet Micro Cutting

ML-TRACK

04

Micro-Tubing Cutting

ML-EDGE

05

Nanostructure Forming for Research

ML-NEBULA

ML-VORTEX

Features

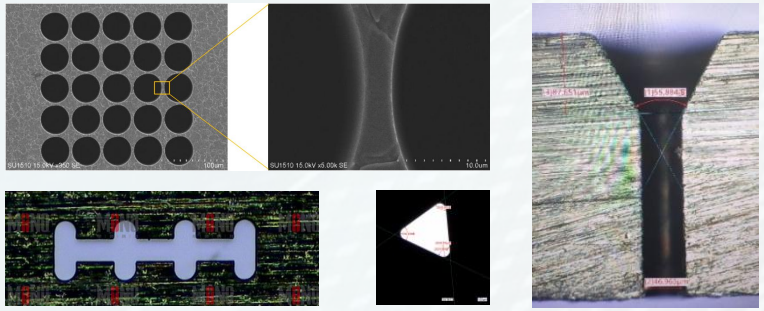
- High-Quality, Industrial-Grade Customizable fs-Laser Source
- Multi-Dimensional Beam Shaping and Control Capabilities
- Real-Time Monitoring of Beam Pointing and Quality
- Superior Mechanical and Thermally Stable Base Platform
- High-Dynamic Response, Multi-Functional Control System
- Fully Sealed Beam Delivery and Optical Path System
- Coordinated Multi-Axis Precision Machining for 3D Surfaces
- Comprehensive 3D Collision Avoidance System

Applications

Precision Machining of Shaped Micro-Holes

- **Aerospace:** Precision Component Drilling
- **Watchmaking:** Intricate Parts Manufacturing
- **Semiconductors:** Micro-Holes for Probe Cards
- **Advanced Materials:** Custom-Shaped Holes for Spinneret Plates

Cases



Item		Details
Laser Source		Femtosecond laser（1030/515nm）
Processing Range		Planar: 400mm×400mm； Stereo: 200mm×200mm×150mm
Positioning Accuracy (X/Y/Z/B/C)		≤±1μm/≤±1μm/≤±1μm/≤±5arcsec/≤±3arcsec
Processing Capability	Processing Types	Straight holes, taper holes, countersinks, composite holes, etc.
	Max Processing Depth	2mm
	Max Depth-to-Diameter Ratio	12:1
	Hole Diameter Range	0.02mm~2.5mm
	Hole Diameter Precision/Concentricity	≤±1μm / ≤1.5μm
	Taper Control Precision	≤±1μm
	Counterbore Chamfer R	≤4μm

Product

MONO

ML-ETCH

Features

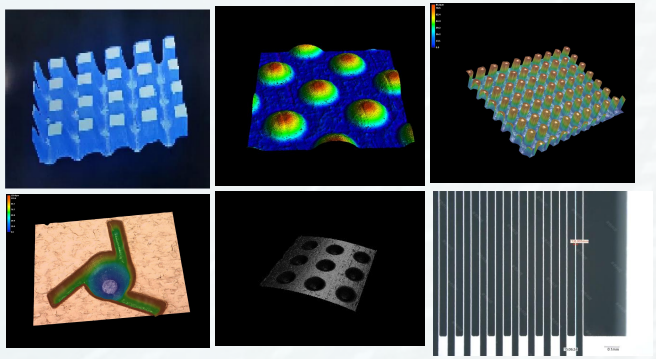
- High-quality industrial-grade fs-laser customizable light source;
- Three-dimensional beam shaping and control functions;
- Excellent mechanical and thermal stable equipment base;
- High dynamic response multi-function control system;
- Fully sealed optical path transmission system structure;
- Multi-axis curved surface precision processing;

Applications

Microstructure Forming & Curved Surface Etching

- Irregular microstructure of light guide plate;
- Semiconductor special-shaped probe etching;
- Deflector microchannel forming;
- Ultra-fine texture processing.

Cases



Item		Details
Laser Source		Femtosecond Laser (1030/515/343nm)
Processing Area		Planar: 400mm×400mm; Stereo: 150mm×150mm×100mm
Positioning Accuracy (X/Y/Z/B/C)		≤±1μm/≤±1μm/≤±1μm/≤±5arcsec/≤±3arcsec
Processing Capability	Workpiece Type	Planar, Curved Surface
	Minimum Line Width	3μm
	Surface Roughness	≤Ra0.2
	Dimensional Accuracy	≤±2μm
	Depth-to-Diameter Ratio Accuracy	≤±0.3μm
	Comprehensive Processing Accuracy	≤±3μm

ML-TRACK

Features

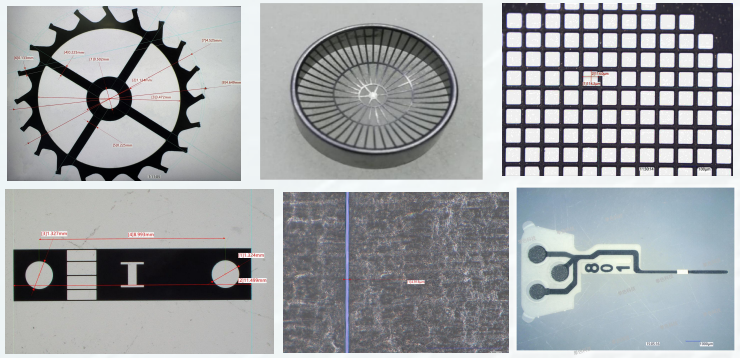
- High-quality industrial-grade femtosecond customizable light source;
- Excellent mechanical and thermal stable equipment base;
- Multi-function motion and laser control system;
- Fully sealed optical path transmission system structure;
- Suitable for high-speed cutting of any organic & inorganic materials;
- Enables precision processing of almost any solid material.

Applications

Precision Cutting of Thin Metal & Non-Metal Sheets

- Tungsten/molybdenum diaphragms and slit diaphragms;
- Precision cutting of beryllium copper probes;
- PI/PET blind holes, through holes, and dense hole clusters;
- Silicon-based drilling and grooving.

Cases



Item		Details
Laser		Femtosecond Laser (1030/515/343nm)
Processing Area		400mm×400mm
Positioning Accuracy (X/Y/Z)		≤±1μm/≤±1μm/≤±1μm
Processing Capability	Workpiece Type	Planar
	Minimum Line Width	≥3μm
	Surface Roughness	≤Ra0.1
	Dimensional Accuracy	≤±0.5μm
	Depth-to-Etching Depth Accuracy	≤±0.1μm
	Comprehensive Processing Accuracy	≤±3μm

ML-EDGE

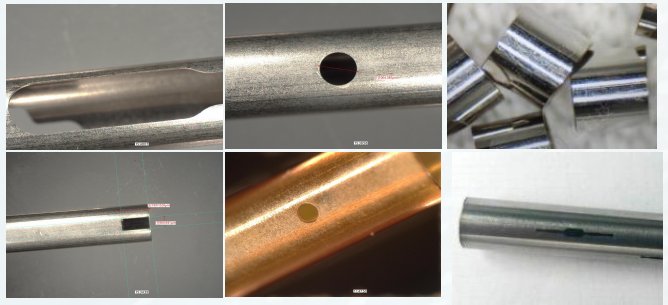
Features

- High-quality industrial-grade fs -laser customizable light source;
- Multi-dimensional beam shaping and control functions;
- Excellent mechanical and thermal stable equipment base;
- High dynamic response multi-axis control system;
- Fully sealed optical path transmission system structure;
- Multi-axis linkage precision processing;
- Small cutting taper, high efficiency;
- Minimal thermal impact on end faces, smooth surface, no burrs.

Applications

- Interventional Medical Device Precision Processing
- Surgical Instrument Precision Processing
- Endoscope Snake Bone Tubes & Other Precision Processing
- Precision 3C Structural Components
- Automotive Parts
- Semiconductor Integrated Circuits

Cases



Item		Details
Laser		Femtosecond Laser (1030/515nm)
Processing Area		Pipe Diameter: Φ0.1-Φ20mm±0.02mm; Length: ≤1000mm
Positioning Accuracy (X/Y/Z/θ)		≤±1μm/≤±1μm/≤±1μm/≤±15arcsec
Processing Capability	Cutting Thickness	≤1mm
	Cutting Slit Width	≥15μm
	Minimum Width	≤15μm
	Taper	≤20μm@0.5mm Thickness
	Cutting Surface Roughness	≤Ra0.4
	Cutting Accuracy	≤±2μm

Product

MONO

ML-NEBULA

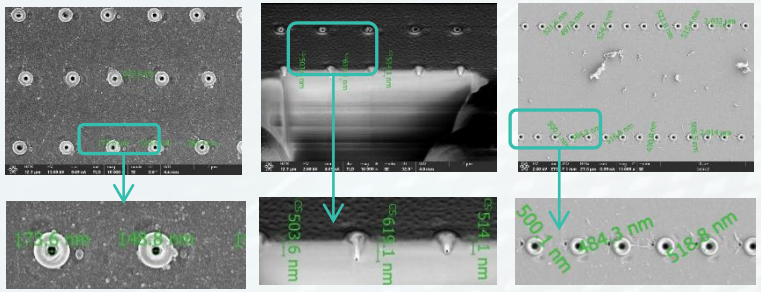
Features

- Support multi-optical path and multi-focus composite processing;
- Multi-dimensional beam shaping and control functions;
- 24/7 beam directivity and quality detection;
- Excellent mechanical and thermal stable equipment base;
- Processing precision covering nano, sub-micron and micron scales;
- Nanojoule-level pulse energy precise control system;
- Nanoscale positioning accuracy;
- Multi-axis linkage precision processing.

Applications

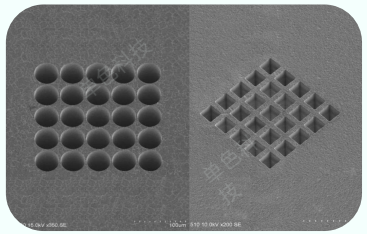
- Functional Surface Micro-Nano Structure Fabrication
- Optical Waveguide Direct Writing Processing
- Microfluidic Chip Fabrication
- Nanoscale Linewidth Grating Lithography
- Slit Diaphragm/Aperture Diaphragm Processing

Cases

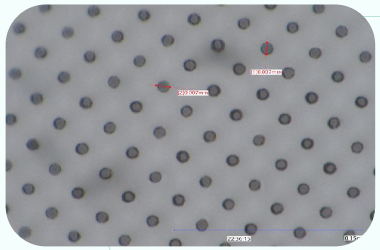


Item		Details	
Laser		Femtosecond Laser (1030/515/343nm)	
Processing Area		500mm×500mm	30mm×30mm
Positioning Accuracy (X/Y/Z)		<±0.3um/<±0.3um/<±1um	<±0.15um/<±0.15um/<±0.5um
Processing Capability	Processable Material Types	Planar, cylindrical, spherical, 3D curved surfaces, etc., customizable combination	
	Processing Contents	Depth-controlled etching, carbon-free cutting, through-hole drilling, nanomanufacturing, etc., customizable combination	
	Minimum Hole Diameter	≥500nm， customizable as required	
	Minimum Processable Line Width	≥300nm，customizable as required	
	Processable Hole Diameter Range	≥200nm，customizable as required	
	Hole Diameter Precision	≥±50nm， customizable as required	

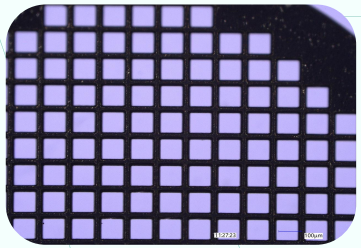
Drilling Applications



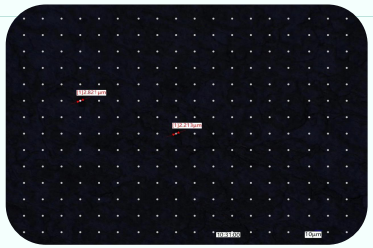
Silicon Nitride Straight Hole & Square Hole Processing
Material：Silicon Nitride
Dimensions：Φ 50μm×50μm
R Angle：≤5μm
Field：Semiconductor



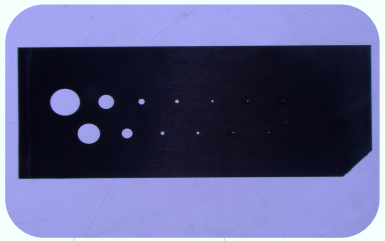
Cell Filter Membrane Cluster Hole Processing
Material：PET
Hole Quantity: 100,000
Aperture：Φ7μm± 0.5μm
Field：Biomedical Field



Microporous Grid
Material：Stainless Steel
Aperture：Φ50μm ± 1μm
Hole Quantity：6000个
Field：Aerospace

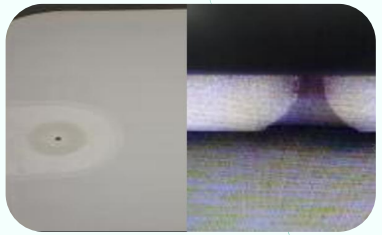


Aluminum Sheet Through-Hole Processing
Material：Aluminum
Aperture：Φ 2μm
Precision：±0.5μm
Field：Aerospace, Biomedical

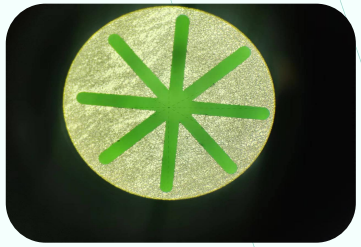


Aluminum Sheet Aperture
Material：Aluminum
Minimum Aperture：Φ 7μm
Precision：±1μm
Field：Optical Instruments

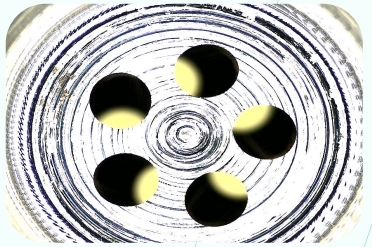
Filter Nozzle Drilling
Material：15-5PH CRES
Aperture：Φ 150μm ± 1μm
Wall Thickness：0.5mm
Field：Aerospace



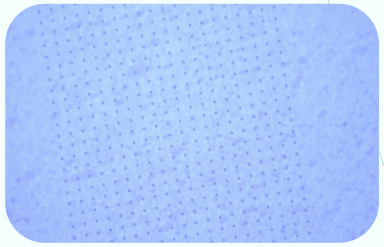
Microfluidic Channel 3D Drilling (Internal Fillet)
Material：Ceramic
Depth：300μm
Inner Hole Roughness：Ra ≤0.4μm
Field：Biomedical



Special-Shaped Hole Processing
Material：Stainless Steel
Slit Width：60μm ± 2μm
Thickness：0.3mm
Field：Textile

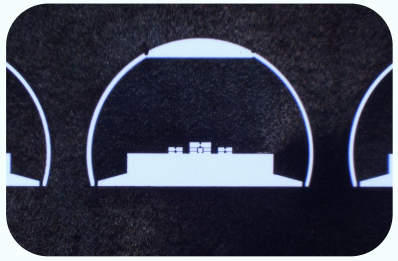


Angled Hole Processing
Material：Stainless Steel
Aperture：Φ 50μm±1μm
Inner Hole Roughness: Ra ≤0.4um
Field：Automotive

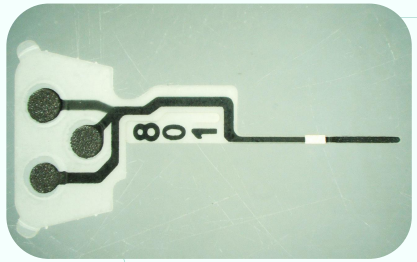


PDMS Membrane Micropore
Material：PDMS
Aperture：Φ 8μm ± 0.5μm
Precision：50.5μm
Field：Biomedical

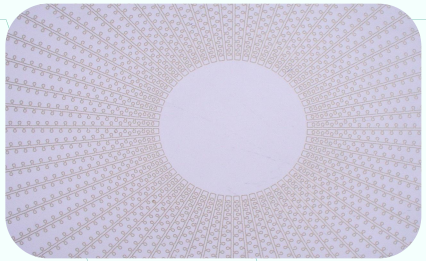
Cutting Applications



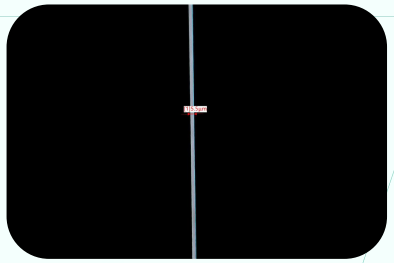
Ultra-Precision Cutting of Metal
Material：Tungsten
Cutting Width：6μm ± 0.5μm
Thickness：0.05mm
Field：Optical Instruments



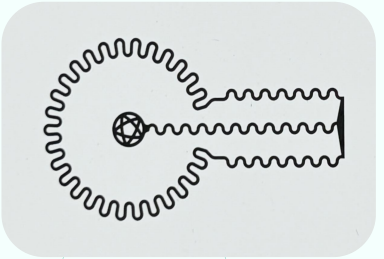
Blood Glucose Needle
ProbeMaterial：PET
Thickness：0.2mm
Cutting Width: 10μm ± 1μm
Field：Biomedical



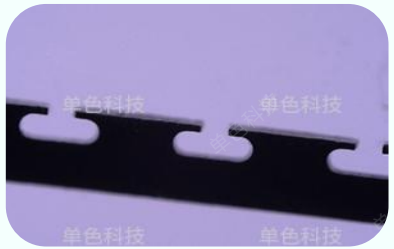
Microfluidic Chip
Material：PDMS膜
Cutting Width：10μm ± 1μm
Thickness：15μm
Field：Biomedical



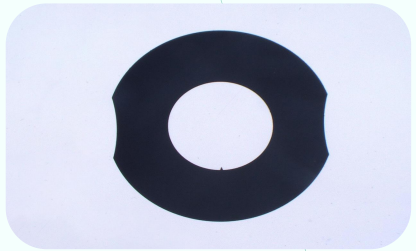
Tungsten SlitMaterial：钨
Cutting Width：5μm
Precision：± 0.5μm
Field：Optical Instruments



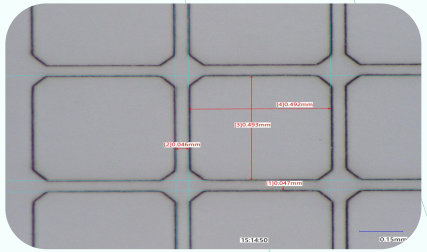
Electrode Cutting
Material：Molybdenum
Thickness：0.05mm
Cutting Width：190μm ± 2μm
Field：Semiconductor



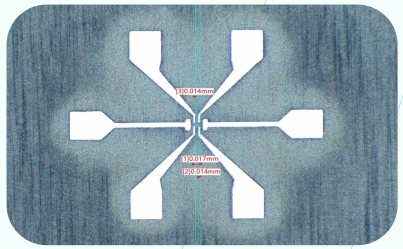
Minimally Invasive Surgical Knife Cutting
Material：Platinum
Thickness：0.1mm
Groove Width：50μm ± 2μm
Field：Biomedical



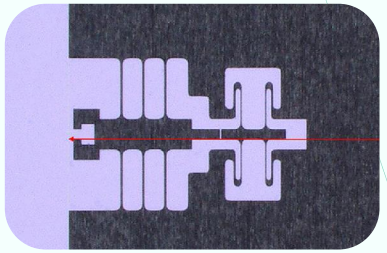
Quadrant Plate
Material：Tungsten
Sharp Angle：40°
Sharp Angle Length：40μm ± 2μm
Field：Biomedical、Optical Instruments



ePTFE Film Cutting
Material：ePTFE
Cutting Width：20μm
Precision: ±1μm
Field：Biomedical

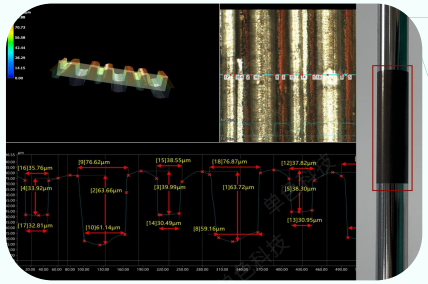


Special-Shaped Cutting of Tungsten Sheet
Material：Tungsten
Cutting Width：17μm ± 1μm
Thickness：0.05mm
Field：Semiconductor、Mold Manufacturing

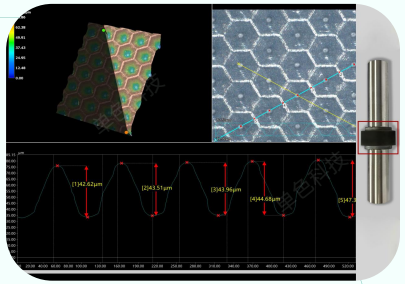


Special-Shaped Cutting of Stainless Steel
Material：Stainless Steel
Thickness：0.01mm
Cutting Width：5μm ± 0.5μm
Field：Semiconductor

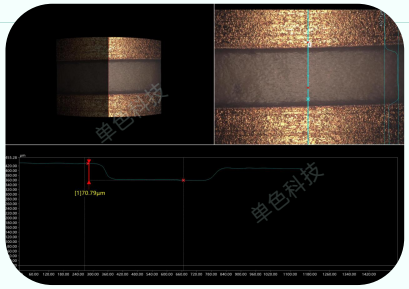
Etching Applications



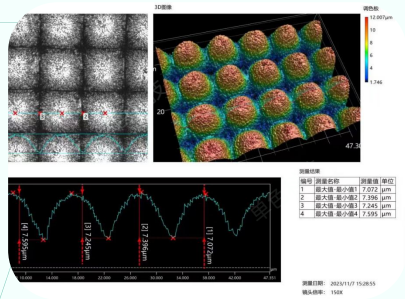
Intermediate Roller Etching
Material：Metal
Etching Depth：60um±1μm
Etching Width：70um±1μm
Field: Tool Production, Mold Manufacturing



Roller Hexagonal Blind Groove Etching
Material：Metal
Etching Depth：43um±1μm
Precision：1μm
Field: Tool Production, Aerospace

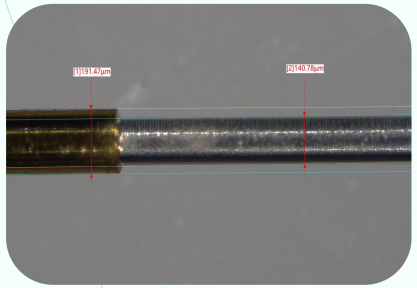


Ceramic Gold-Plated Cylinder Etching
Material：Gold
Etching Depth：70μm ± 2μm
Etching Width：500μm ±2μm
Field: Semiconductor Microelectronics

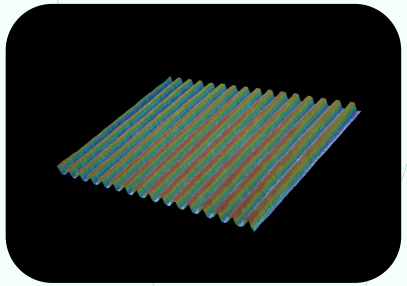


Platinum-Iridium Alloy Surface Microstructure Etching
Material：Platinum-Iridium Alloy
Etching Depth：7μm±0.5μm
Etching Width：5μm±0.5μm
Field：Biomedical

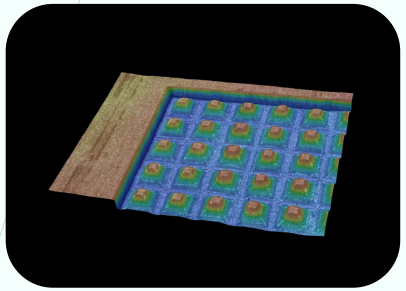
CT Tube Bearing
Material：Molybdenum
Etching Depth：15μm
Roughness：Ra≤0.3μm
Field：Biomedical



Platinum-Iridium Alloy Fixed-Depth Etching
Material：Platinum-Iridium Alloy
Etching Depth：15μm
Precision：1μm
Field：Biomedical



Blind Groove Etching
Material：Stainless Steel刻蚀
Etching Depth：40μm
Precision：±2μm
Field：Mold Manufacturing



Mold Etching
Material：Stainless Steel
Etching Depth：65μm
Precision：±2μm
Field：Mold Manufacturing

Quality Assurance

Beam Quality Inspection

Ensure the precision of light field distribution after beam shaping

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· Laser Spot Analyzer;

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Verify nano/micro-level line width and zero-taper processing effect

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· Olympus Confocal Microscope;
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