

Introduction

Femtosecond Laser Equipment Applications



Engineered to the Femtosecond Laser Frontier.

Focused on Solving Micron/Nano Processing Challenges in Precision Drilling, Etching and Cutting.

Shenzhen Monochrome technology Co., Ltd.

Founded in Guangming District, Shenzhen, China, Shenzhen MonoChrome technology Co., Ltd. Tech Co., Ltd. is committed to the research and application of femtosecond laser micromachining technology, covering equipment R&D, production, sales, testing and processing services. We provide comprehensive extreme manufacturing solutions (ultra-high precision, ultra-small size, ultra-large quantity, ultra-high efficiency) for difficult-to-process materials in biomedical, semiconductor microelectronics, aerospace and other industries, which have been widely applied and recognized.

5000 + m²

Production Base

60%

Proportion of R&D Team

2000 +

extreme demands from industry-leading enterprises have been addressed.

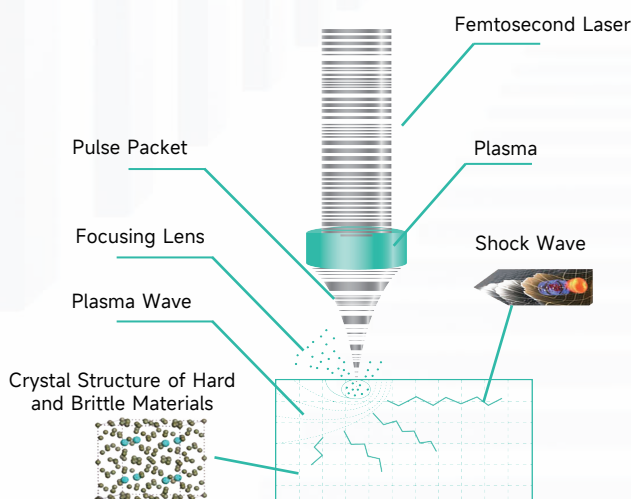
10 +

years of experience

About Femtosecond Laser

Processing Principle

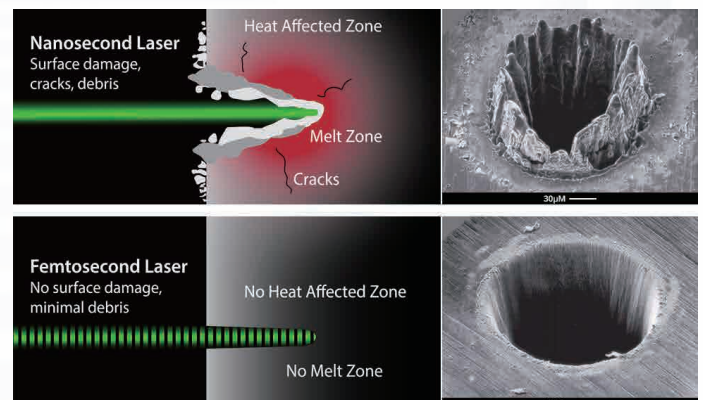
High peak power femtosecond laser relies on Coulomb repulsion to break molecular bonds of materials, involving multiple complex reactions such as nonlinear photoionization and avalanche ionization.



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.



PRODUCT



ML-VORTEX



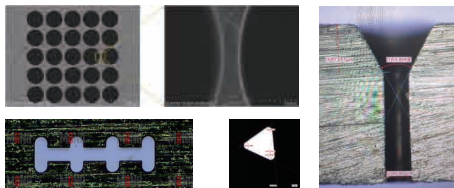
Features

- High-Quality, Industrial-Grade Customizable fs-Laser Source
- Beam shaping and regulation functions across five dimensions
- 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

ML-ETCH



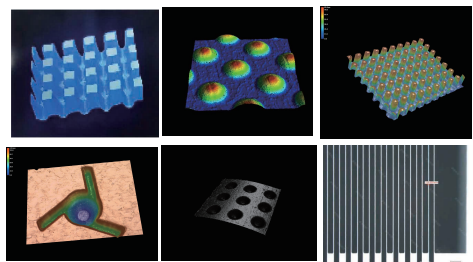
Features

- 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

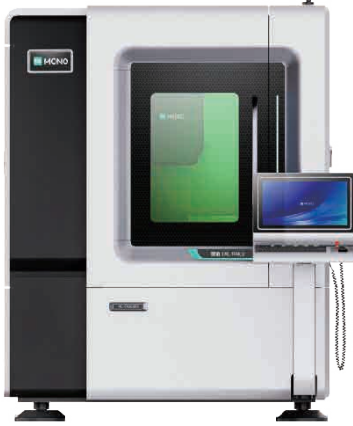


Item		Details
Laser Source		Femtosecond Laser (1030/515/343nm)
Processing Area		Planar: 400mm×400mm; Stereo: 150mm×150mm×100mm
Positioning Accuracy (X/Y/Z/B/C)		≤±1μm/≤±1μm/≤±1μm/≤±5arcsec/≤±3arcsec
Processing	Workpiece Type	Planar, Curved Surface
	Minimum Line Width	3μm
	Surface Roughness	≤Ra0.2
	Dimensional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

PRODUCT



ML-TRACK



Features

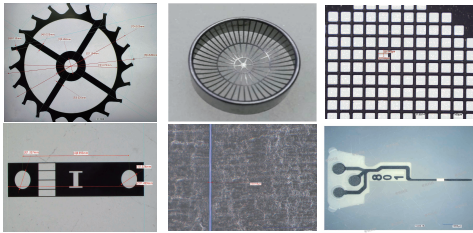
- High-quality industrial-grade femtosecond customizable light source;
- Excellent mechanical and thermal stable equipment base;
- Multi-function motion and laser control system;
- Fully sealed optical path transmission system structure;
- Suitable for high-speed cutting of any organic & inorganic materials;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



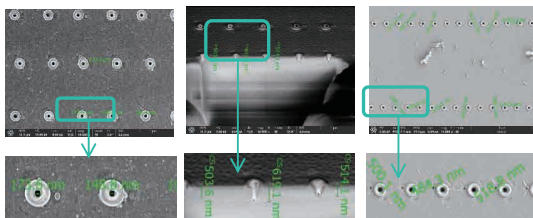
Features

- 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

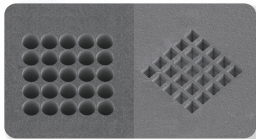
Cases



Item		Details
Laser		Femtosecond Laser (1030/515/343nm)
Processing Area		500mm×500mm 30mm×30mm
Positioning Accuracy (X/Y/Z)		≤0.3μm/≤0.3μm/≤1μm ≤0.15μm/≤0.15μm/≤0.5μm
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

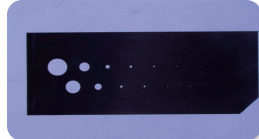
Application Cases

➤ Femtosecond Laser Drilling



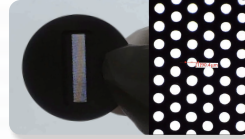
Silicon Nitride Vertical Through Holes

Material: Silicon Nitride
Size: 0.05 mm × 0.05 mm
Range: ≤ 0.005 mm



Micro-holes in Cemented Carbide

Material: Molybdenum / Tungsten
Minimum hole diameter: 0.015 mm
Thickness: 0.2 mm



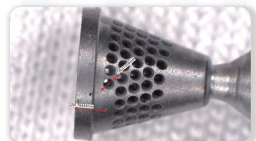
Array Holes on Metal Workpiece

Material: Stainless Steel
Hole diameter: 0.09 mm $\pm$ 0.001 mm
Thickness: 0.6 mm



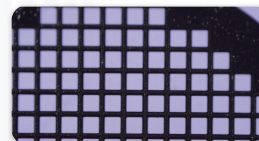
3D Micro-channel Drilling (Internal Fillet)

Material: Ceramic
Depth: 0.3 mm $\pm$ 0.001 mm
Inner surface roughness: $R_a \leq 0.4$ μ m



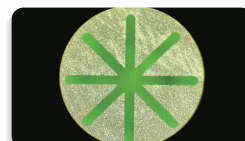
Filter Nozzle Drilling

Material: 15-5PH CRES
Hole diameter: 0.27 mm $\pm$ 0.002 mm
Thickness: 0.5 mm



Nickel Mesh (Square Holes)

Material: Nickel
Aperture: 0.09 × 0.09 mm $\pm$ 0.001 mm
Fillet radius (R): ≤ 0.005 mm



Cross-shaped Special-shaped Holes

Material: Stainless Steel
Width: 0.06 mm
Tolerance: ± 0.002 mm



Polymer Micro-hole Drilling

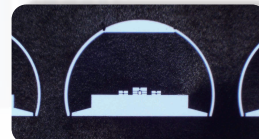
Material: Polydimethylsiloxane (PDMS)
Hole diameter: 0.007 mm $\pm$ 0.001 mm
Thickness: 0.05 mm

➤ Femtosecond Laser Cutting



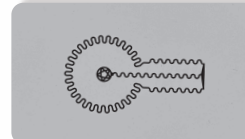
Ultra-fine Cutting of Molybdenum

Material: Molybdenum
Width: 0.1 mm $\pm$ 0.003 mm
Tolerance: ± 0.005 mm



Ultra-fine Metal Cutting

Material: Tungsten
Minimum rib width: 0.005 mm
Thickness: 0.3 mm



Molybdenum Electrode Cutting

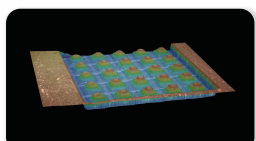
Material: Molybdenum
Cut width: 0.19 mm $\pm$ 0.003 mm
Thickness: 0.05 mm



Slit Plate Cutting

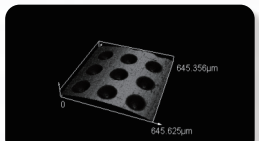
Material: Tungsten
Slit width: 0.005 mm $\pm$ 0.001 mm
Thickness: 0.2 mm

➤ Femtosecond Laser Etching



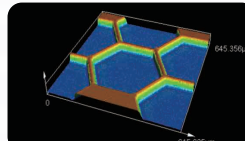
Mold Etching (Boss Structure)

Material: Stainless Steel
Depth: 0.065 mm
Tolerance: ± 0.002 mm



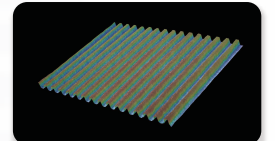
Blind Hole Etching

Material: Stainless Steel
Depth: 0.05 mm $\pm$ 0.002 mm
Diameter: 0.12 mm $\pm$ 0.002 mm



Hexagonal Etching

Material: Stainless Steel
Depth: 0.036 mm $\pm$ 0.001 mm
Tolerance: ± 0.002 mm



Blind Groove Etching

Material: Stainless Steel
Depth: 0.04 mm
Tolerance: ± 0.002 mm

Femtosecond Laser Extreme Manufacturing Technology and Equipment Provider

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